



VIGNAN'S INSTITUTE OF MANAGEMENT AND TECHNOLOGY FOR WOMEN

(An Autonomous Institution)

[Sponsored by Lavu Educational Society, Affiliated to JNTUH & Approved by AICTE, New Delhi]
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ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE-VR24

III B.Tech.-I Semester

S.No.	Course Code	Course	L	T	P	Credits
1	EC501PC	Microcontrollers	3	1	0	4
2	EC502PC	IoT Architectures and Protocols	3	0	0	3
3	EC503PC	Control Systems	3	1	0	4
4	MS504BS	Business Economics & Financial Analysis	3	0	0	3
5		Professional Elective – I	3	0	0	3
6	EC505PC	Microcontrollers Laboratory	0	0	2	1
7	EN506BS	Advanced English Communication Skills Laboratory	0	0	2	1
8	EC507PC	IoT Architectures and Protocols Laboratory	0	0	2	1
9	MC508BS	Intellectual Property Rights	3	0	0	0
		Total	18	2	6	20

III B.Tech.-II Semester

S.No.	Course Code	Course	L	T	P	Credits
1	EC601PC	Antennas and Wave Propagation	3	0	0	3
2	EC602PC	Digital Signal Processing	3	0	0	3
3	EC603PC	CMOS VLSI Design	3	0	0	3
4		Professional Elective - II	3	0	0	3
5		Open Elective – I	3	0	0	3
6	EC604PC	Digital Signal Processing Laboratory	0	0	2	1
7	EC605PC	CMOS VLSI Design Laboratory	0	0	2	1
8	EC606PC	Advanced Communication Laboratory	0	0	2	1
9	EC607PC	Industry Oriented Mini Project/ Internship	0	0	4	2
10	MC608BS	Environmental Science	3	0	0	0
		Total	18	0	10	20

Note: L-Theory

T-Tutorial

P-Practical

C-Credits

B.Tech.ECE

L T P C

III Year-II Semester

3 0 0 3

ANTENNAS AND WAVE PROPAGATION**Pre-requisite:** Electromagnetic Theory and Transmission Lines**Course Objectives:** The course objectives are:

- To understand the concept of radiation, antenna definitions and significance of antenna parameters, to derive and analyze the radiation characteristics of thin wire dipole antennas and solve numerical problems.
- To analyze the characteristics and design relations of UHF, VHF and Microwave Antennas.
- To identify the antenna array requirements, to determine the characteristics of ULAs and estimate the patterns of BSA, EFA, and Binomial Arrays.
- To understand the concepts and set-up requirements for microwave measurements and familiarize with the procedure to enable antenna measurements.
- To define and distinguish between different phenomenon of wave propagation (ground wave, space wave and sky wave), their frequency dependence, and estimate their characteristics, identifying their profiles and parameters involved

Course outcomes: Upon completing this course, the student will be able to

- Explain the mechanism of radiation, definitions of different antenna characteristic parameters and establish their mathematical relations.
- Analyze and characterize antennas based on operating frequency, geometry, and construct radiation patterns for various antennas and arrays.
- Demonstrate and evaluate antenna measurement setups for far-field pattern and gain determination.
- Classify the different wave propagation mechanisms, determine the characteristic features of different wave propagation, and estimate the parameters involved
- Design and analyze antennas using modern simulation tools and evaluate their performance for specific communication applications

UNIT-I: Antenna Basics

Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height. Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Radiation, Retarded Potentials – Helmholtz Theorem

Thin Linear Wire Antennas – Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths. Loop Antennas - Small Loop, Comparison of Far Field of Small Loop and Short

Dipole, Radiation Resistances and Directivities of Small Loops (Qualitative Treatment).

UNIT-II: Antenna Arrays

Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays.

Antenna Measurements: Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods)

UNIT-III: VHF, UHF and Microwave Antennas - I

Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes, Horn Antennas – Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns.

UNIT-IV: VHF, UHF and Microwave Antennas - II

Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Reflector Antennas – Introduction, Flat Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features.

UNIT-V: Wave Propagation

Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts,

Ground Wave Propagation –Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections.

Space Wave Propagation –Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Troposphere Propagation.

Sky Wave Propagation –Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation

Text Books:

1. J.D. Kraus, R.J. Marhefka and Ahmad S. Khan -Antennas and Wave Propagation, 4th ed., (Special Indian Edition), TMH, New Delhi, 2010.
2. E.C. Jordan and K.G. Balmain -Electromagnetic Waves and Radiating Systems, PHI, 2nd ed., P2000

Reference Books:

1. C.A. Balanis - Antenna Theory, 3rd Edition. John Wiley & Sons, 2005.
2. K.D. Prasad, Satya Prakashan - Antennas and Wave Propagation, Tech India Publications, New Delhi, 2001.
3. Keith Henney - Radio Engineering Handbook, 3rd edition TMH.
4. John Leonidas Volakis -Antenna Engineering Handbook, 3rd edition, 2007G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.

B.Tech.ECE

L T P C

III Year-II Semester

3 0 0 3

DIGITAL SIGNAL PROCESSING**Prerequisite:** Signals and Systems**Course Objectives:**

- To provide background and fundamental material for the analysis and processing of digital signals.
- To understand the fast computation of DFT and appreciate the FFT processing.
- To study the designs and structures of digital (IIR and FIR) filters and analyze and synthesize for a given specification.
- To acquaint in Multi-rate signal processing techniques and finite word length effects.

Course Outcomes: Upon completing this course, the student will be able to Students will

- Students will be able to understand LTI system characteristics and Multi rate signal processing.
- Students will be able to represent inter-relationship between DFT and various transforms.
- Students will be able to design a digital IIR filter for a given specification.
- Students will be able to design a digital FIR filter for a given specification.
- Students will be able to acknowledge the significance of various filter structures and effects of round off errors.

UNIT-I: Introduction:

Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Normalized Frequency, Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems

Multi rate Digital Signal Processing: Introduction, Down Sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion.

UNIT-II Discrete Fourier series:

Fourier Series, Fourier Transform, Laplace Transform and Z-Transform relation, DFS Representation of Periodic Sequences, Properties of Discrete Fourier Series, Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z Transform.

Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT.

UNIT-III: IIR Digital Filters

Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

UNIT-IV: FIR Digital Filters

Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

UNIT-V: Realization of Digital Filters

Applications of Z – Transforms, Solution of Difference Equations of Digital Filters, System Function, Stability Criterion, Frequency Response of Stable Systems, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel Forms.

Finite Word Length Effects: Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round Off Noise, Methods to Prevent Overflow, Trade Off Between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

Text Books:

1. A. V. Oppenheim and R.W. Schaffer - Discrete Time Signal Processing, PHI, 2009
2. John G. Prokes, Dimitris G. Manolakis - Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education / PHI, 2007.

Reference Books:

1. Li Tan - Digital Signal Processing – Fundamentals and Applications, Elsevier, 2008
2. Robert J. Schilling, Sandra L. Harris - Fundamentals of Digital Signal Processing using MATLAB, Thomson, 2007
3. S. Saliva Hanan, A. Vallavaraj and C. Ghanapriya - Digital Signal Processing, TMH, 2009
4. Emmanuel C. Ifeakor and Barrie W. Jervis - Digital Signal Processing - A Practical approach, 2nd Edition, Pearson Education, 2009

B.Tech.ECE

III Year-II Semester

L	T	P	C
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CMOS VLSI DESIGN**Prerequisite:** Electronic Circuit Analysis; Switching Theory and Logic Design **Course Objectives:**

The objectives of the course are to:

- Give exposure to different steps involved in the fabrication of ICs.
- Explain electrical properties of MOS and Bi CMOS devices to analyze the behavior of inverters designed with various loads.
- Give exposure to the design rules to be followed to draw the layout of any logic circuit.
- Provide design concepts to design building blocks of data path of any system using gates.
- Understand basic programmable logic devices and testing of CMOS circuits

Course Outcomes: Upon completing this course, the student will be able to

- Understand MOS transistor theory, fabrication process, and electrical characteristics used in VLSI design
- Analyze CMOS logic styles, circuit design principles, and performance metrics such as delay, power, and noise.
- Design combinational and sequential logic circuits using CMOS technology and optimize for area, speed, and power.
- Apply VLSI design methodology, including layout design rules, stick diagrams, and transistor-level implementation
- Use EDA tools (Cadence/Mentor/DSCH/Micro wind) to simulate, verify, and evaluate VLSI circuits and systems.

UNIT-I: Introduction

Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & Bi CMOS

Basic Electrical Properties: Basic Electrical Properties of MOS and Bi CMOS Circuits: I_{ds} - V_{ds} relationships, MOS transistor threshold Voltage, g_m , g_{ds} , Figure of merit; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.**UNIT-II: VLSI Circuit Design Processes**

VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT-III: Gate Level Design

Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out.

UNIT-IV: Data Path Subsystems

Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories.

UNIT-V: Programmable Logic Devices

Design Approach – PLA, PAL, Standard Cells FPGAs, CPLDs. CMOS Testing: CMOS Testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

Text Books:

1. Kamran Eshraghian, Eshraghian Douglas and A. Puck Nell - Essentials of VLSI circuits and systems, PHI, 2005
2. Neil H. E Weste, David Harris, Ayan Banerjee - CMOS VLSI Design – A Circuits and Systems Perspective, 3rd Edition, Pearson, 2009.

Reference Books:

1. Ming-BO Lin - Introduction to VLSI Systems: A Logic, Circuit and System Perspective, CRC Press, 2011
2. John. P. Uyemura - CMOS logic circuit Design, Springer, 2007.
3. Wayne Wolf - Modern VLSI Design, 3rd Edition, Pearson Education, 1997.
4. K. Lal Kishore, V. S. V. Prabhakar -VLSI Design, I.K International, 2009.

B.Tech.ECE

III Year-II Semester

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DIGITAL IMAGE PROCESSING (PE – II)**Prerequisite:** Digital Signal Processing**Course Objectives:**

- To provide an approach towards image processing and introduction about 2D transforms
- To expertise about enhancement methods in time and frequency domain
- To expertise about segmentation and compression techniques
- To understand the Morphological operations on an image

Course Outcomes: Upon completing this course, the student will be able to

- Explore the fundamental relations between pixels and utility of 2-D transforms in image processor.
- Articulate the enhancement, segmentation and restoration processes on an image.
- Implement the various Morphological operations on an image
- Utilize basic compression algorithms
- Apply image restoration, segmentation, and compression techniques to digital images.

UNIT-I: Digital Image Fundamentals & Image Transforms

Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels.

Image Transforms: 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.**UNIT-II: Image Enhancement (Spatial Domain)**

Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighborhood criterion, Median Filter, Spatial Domain High-Pass Filtering.

Image Enhancement (Frequency Domain): Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.**UNIT-III: Image Restoration**

Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT-IV: Image Segmentation

Detection of Discontinuities, Edge Linking And Boundary Detection, thresholding, Region Oriented Segmentation.

Morphological Image Processing: Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation.

UNIT-V: Image Compression

Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods -Digital Image Processing, 3rd Edition, Pearson, 2008
2. S Jayaraman, S Sakurajima, T Veerakumar - Digital Image Processing- - TMH, 2010.

Reference Books:

1. Scotte Umbaugh- Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools, 2nd Ed, CRC Press, 2011
2. Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings - Digital Image Processing using MATLAB, 2nd Edition, TMH, 2010.
3. Somka, Hlavac, Boyle-Digital Image Processing and Computer Vision –Cengage Learning (Indian edition) 2008.
4. Adrian low- Introductory Computer Vision Imaging Techniques and Solutions-,2nd Edition, BS Publication, 2008.

B.Tech.ECE

L T P C

III Year-II Semester

3 0 0 3

MOBILE COMMUNICATIONS AND NETWORKS (PE-II)**Prerequisites:** Analog and Digital Communications**Course Objectives:**

- To provide the student with an understanding of the cellular concept, frequency reuse, handoff strategies.
- To provide the student with an understanding of Co-channel and Non-Co-Channel interferences.
- To give the student an understanding of cell coverage for signal and traffic, diversity techniques and channel assignment
- To give the student an understanding type of handoff.
- To understand challenges and application of Ad hoc wireless Networks

Course Outcomes: Upon completing this course, the student will be able to

- Known the evolution of cellular and mobile communication system.
- Explore the Co-Channel and Non-Co-Channel interferences.
- Known how to overcome the different fading effects
- Familiar with cell coverage for signal and traffic, diversity, techniques, frequency management, Channel assignment and types of handoffs.
- Demonstrate the difference between cellular and Ad hoc Networks and design goals of MAC Layer protocol.

UNIT-I: Introduction to Cellular Mobile Radio Systems

Limitations of Conventional Mobile Telephone Systems. Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems. Uniqueness of Mobile Radio Environment-Fading-Tie Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.

Fundamentals of Cellular Radio System Design: Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I from a Normal Case in an Omni Directional Antenna System, System Capacity Improving Coverage and Capacity in Cellular Systems Cell Splitting, Sectoring, Microcell Zone Concept.

UNIT-II: Co-Channel Interference

Measurement of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and their effects, diversity techniques-space diversity, polarization diversity, frequency diversity, time diversity.

Non-Co-Channel Interference: Adjacent Channel Interference, Near end far end interference, cross talk, effects on coverage and interference by power decrease, antenna height decrease, effects of cell site components.

UNIT-III: Cell Coverage for Signal and Traffic

Signal Reflections in flat and Hilly Terrain, effects of Human Made Structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long-distance propagation, path loss from a point-to-point prediction model in different conditions, merits of lee model.

Frequency Management and Channel Assignment: Numbering and Grouping, Setup Access and Paging Channels, Channel Assignments to Cell Sites and Mobile Units.

UNIT- IV: Handoffs and Dropped Calls

Handoff Initiation, types of Handoffs, Delaying Handoff, advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem handoff, Introduction to Dropped Call Rates and their Evaluation.

UNIT- V: Ad Hoc Wireless Networks

Introduction, Cellular and Ad Hoc wireless Networks, Applications and Ad Hoc Wireless Networks, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet, MAC Protocols for Ad Hoc Wireless, Introduction, issues in designing AMAC Protocol for Ad Hoc wireless Networks, Design Goals of AMAC protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols.

Text Books:

1. W.C.Y. Lee - Mobile Cellular Telecommunications, 2nd edition, Mc Graw Hill, 1989.
2. Theodore. S. Rapport - Wireless Communications, 2nd edition, Pearson Education, 2002.

Reference Books:

1. C. Siva ram Murthy and B.S. Manoj - Ad Hoc Wireless Networks: Architectures and Protocols, PHI, 2004.
2. Simon Haykin, Michael Moher - Modern Wireless Communications, Pearson Education, 2005.
3. Vijay Garg - Wireless Communications and Networking, Elsevier Publications, 2007.
4. Andrea Goldsmith -Wireless Communications-, Cambridge University Press, 2005.

B.Tech.ECE

L T P C

III Year-II Semester

3 0 0 3

EMBEDDED SYSTEM DESIGN (PE-II)**Prerequisites:** Microprocessors and Microcontrollers; Computer Organization and Operating Systems**Course Objectives:**

- To provide an overview of Design Principles of Embedded System.
- To provide clear understanding about the role of firmware.
- To understand the necessity of operating systems in correlation with hardware systems.
- To learn the methods of interfacing and synchronization for tasking.

Course Outcomes: Upon completing this course, the student will be able to

- Understand the architecture, components, and design principles of embedded systems including hardware–software co-design.
- Analyze embedded processors, memory, buses, I/O interfaces, and real-time operating systems for various applications.
- Apply real-time constraints, scheduling algorithms, and embedded firmware development techniques.
- Design embedded system applications using microcontrollers, sensors, actuators, and communication interfaces
- Use embedded design tools (Keil, MPLAB, Arduino/ARM IDEs) to model, simulate, and evaluate embedded applications

UNIT-I: Introduction to Embedded Systems

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT-II: Typical Embedded System

Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT-III: Embedded Firmware

Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT- IV: RTOS Based Embedded System Design

Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT- V: Task Communication

Shared Memory, Message Passing, Remote Procedure Call and Sockets

Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, Methods to Choose an RTOS.

Text Books:

1. Shibu K.V - Introduction to Embedded Systems, Mc Graw Hill.

Reference Books:

1. Raj Kamal - Embedded Systems, TMH.
2. Frank Vahid, Tony Givargis - Embedded System Design, John Wiley.
3. Lyla - Embedded Systems, Pearson, 2013
4. David E. Simon - An Embedded Software Primer, Pearson Education, 2007.

B.Tech.ECE

L T P C

III Year-II Semester

3 0 0 3

FUNDAMENTALS OF INTERNET OF THINGS (OE – I)

Course Objectives: The objectives of the course are to:

- Make concepts of Internet of Things understandable to build IoT applications.
- Teach the programming and use of Arduino and Raspberry Pi boards.
- provide Knowledge about data handling and analytics in SDN.

Course Outcomes: Upon completing this course, the students will be able to

- Know basic protocols in sensor networks.
- Program and configure Arduino boards for various designs.
- Python programming and interfacing for Raspberry Pi.
- Design IoT applications in different domains.

UNIT – I Introduction to Internet of Things:

Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.

UNIT - II Machine-to-Machine Communications:

Difference between IoT and M2M, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino.

UNIT – III Introduction to Python programming:

Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi.

UNIT - IV Implementation of IoT with Raspberry Pi:

Introduction to Software defined Network (SDN), SDN for IoT, Data Handling and Analytics.

UNIT - V Cloud Computing:

Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT.

Case Study: Agriculture, Healthcare, Activity Monitoring

TEXT BOOKS:

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
 2. "Make sensors": Terokarvinen, kemo, karvinen and villeyvaltokari, 1st edition, maker media, 2014.
- "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti

REFERENCE BOOKS:

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
2. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice".
Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, Apress, 2013

B.Tech.ECE

L T P C

III Year-II Semester

3 0 0 3

PRINCIPLES OF SIGNAL PROCESSING (OE- I)**Course Objectives:**

- To give the basics of Signals and Systems required for all Engineering related courses.
- To provide the basic characteristics of LTI systems.
- To provide knowledge on signal transmission requirements.
- To give basic understanding of signal statistical properties and noise source concepts.

Course Outcomes: Upon completing this course, the students will be able to

- Differentiate various signal functions.
- Understand the characteristics of linear time invariant systems.
- Understand the concepts of sampling theorem and signal to noise ratios.
- Determine the Spectral and temporal characteristics of Signals.

UNIT I: Signal Analysis:

Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

UNIT - II Signal Transmission through Linear Systems Linear System:

Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Convolution and Correlation of Signals, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution.

UNIT – III Sampling theorem:

Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

UNIT - IV Temporal characteristics of signals:

Concept of Stationarity and Statistical Independence, First-Order Stationary Processes, Time Averages and Ergodicity, Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Cross-Correlation Function and Its Properties, Power Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function.

UNIT - V Noise sources:

Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its

properties.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, B.S. Publications, 2013.
2. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4 th Ed., 2001.

REFERENCE BOOKS:

1. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2 Ed.
2. Fundamentals of Signals and Systems - Michel J. Robert, MGH, 2008.
3. Random Processes for Engineers-Bruce Hajek, Cambridge unipress, 2015
4. Statistical Theory of Communication – S.P Eugene Xavier, New Age Publications, 2003

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L T P C

III Year-II Semester

3 0 0 3

DIGITAL ELECTRONICS FOR ENGINEERING (OE-I)

Course Objectives:

- To provide basic understanding of properties and theorems of Boolean Algebra.
- To provide knowledge on logic gates and universal gates.
- To teach techniques to reduce the Boolean expressions using K map.
- To give introduction to Logic families and different types Integrated circuits.

Course Outcomes: Upon completing this course, the students will be able to

- Get basic knowledge on logic gates, Universal gates and their switching logics.
- Realize Boolean expressions using NAND/NOR gates and reduce them using K map.
- Know all types of combinational and sequential circuits.
- Acquire knowledge on realization of logic families using diodes and transistor, and also on different types of integrated circuits.

UNIT I: Number Systems:

Number systems, Complements of Numbers, Codes- Weighted and Non- weighted codes and its Properties. Boolean Algebra: Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT - II Minimization of Boolean functions:

Karnaugh Map Method - Up to four Variables, Don't Care Map Entries, Tabular Method, Combinational Logic Circuits: Adders, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations.

UNIT – III Sequential Circuits Fundamentals:

Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Fundamentals of shift registers, ripple and decade counters.

UNIT - IV Realization of Logic Gates Using Diodes & Transistors:

AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL, CML and CMOS Logic Families and its Comparison, standard TTL NAND Gate Analysis & characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tristate outputs, CMOS transmission gate,

UNIT - V Integrated Circuits:

Classification, chip size and circuit complexity, basic information of Op- amp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC Characteristics, 741 opamp and its features, modes of operation-inverting, non-inverting, differential.

TEXT BOOKS:

1. Switching and Finite Automata Theory - ZviKohavi& Niraj K. Jha, 3rd Edition, Cambridge, 2010.
2. Modern Digital Electronics – R. P. Jain, 3rd Edition, 2007- Tata McGraw-Hill
3. Linear Integrated Circuits, D. Roy Chowdhury, New Age International(p) Ltd.
4. Op-Amps & Linear ICs, Ramakanth A. Gayakwad, PHI

REFERENCE BOOKS:

1. Digital Design- Morris Mano, PHI, 4th Edition,2006
2. Operational Amplifiers & Linear Integrated Circuits, R.F. Coughlin & Fredrick F. Driscoll, PHI
3. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications, Denton J. Daibey, TMH.

B.Tech.ECE	L	T	P	C
III Year-II Semester	0	0	2	1

DIGITAL SIGNAL PROCESSING LABORATORY

Course Outcomes: Upon completing this course, the student will be able to

- Implement basic DSP operations (convolution, correlation, DFT/IDFT, FFT/IFFT) using MATLAB / Python / DSP processors
- Design and analyze digital IIR and FIR filters using standard techniques and verify the responses through simulation
- Develop real-time DSP applications using DSP kits / processors and evaluate system performance.
- Implement sampling, quantization, and multi rate signal processing concepts in software/hardware.
- Prepare technical reports and demonstrate DSP experiments effectively through oral presentation

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

Note: - Minimum of 12 experiments must be conducted.

List of Experiments:

1. Generation of Sinusoidal Waveform / Signal based on Recursive Difference Equations
2. Histogram of White Gaussian Noise and Uniformly Distributed Noise.
3. To find DFT / IDFT of given DT Signal
4. To find Frequency Response of a given System given in Transfer Function/ Differential equation form.
5. Obtain Fourier series coefficients by formula and using FET and compare for half sine wave.
6. Implementation of FFT of given Sequence
7. Determination of Power Spectrum of a given Signal(s)
8. Implementation of LP FIR Filter for a given Sequence/Signal.
9. Implementation of HP IIR Filter for a given Sequence/Signal
10. Generation of Narrow Band Signal through Filtering
11. Generation of DTMF Signals
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of I/D Sampling Rate Converters
15. Impulse Response of First order and Second Order Systems.

B.Tech.ECE

L T P C

III Year-II Semester

0 0 2 1

CMOS VLSI DESIGN LABORATORY**Note:** Any **SIX** of the following experiments from each part are to be conducted (Total 12)**Course Outcomes:** Upon completing this course, the student will be able to

- Understand the physical design process of Digital Integrated Circuits
- Describe procedure for designing of programmable circuits.
- Demonstrate the ability to use various EDA tools for digital system design
- Implement various combinational and sequential circuits using VHDL on FPGA
- Implement schematic and layout of various digital CMOS logic circuits using EDA tools.

Part - I**All the following experiments must be implemented using HDL**

1. Realize all the logic gates
2. Design of 8-to-3 encoder (without and with priority) and 2-to-4 decoder
3. Design of 8-to-1 multiplexer and 1-to-8 demultiplexer
4. Design of 4 bit binary to gray code converter
5. Design of 4-bit comparator
6. Design of Full adder using 3 modeling styles
7. Design of flip flops: SR, D, JK, T
8. Design of 4-bit binary, BCD counters (synchronous/ asynchronous reset) or any sequence counter
9. Finite State Machine Design

Part - II**Layout, physical verification, placement & route for complex design, static timing analysis, IR drop analysis and crosstalk analysis for the following:**

1. Basic logic gates
2. CMOS inverter
3. CMOS NOR/ NAND gates
4. CMOS XOR and MUX gates
5. Static / Dynamic logic circuit (register cell)
6. Latch
7. Pass transistor
8. Layout of any combinational circuit (complex CMOS logic gate)

B.Tech.ECE**L T P C****III Year-II Semester****0 0 2 1****ADVANCED COMMUNICATIONS LABORATORY****Course Outcomes:**

- The ability to analyse and simulate antenna performance
- Generation of different types of signals using Vector Signal Generator
- Study the features of Network and spectrum analyzer
- Simulate the Radiation resistance for different antennas using HFSS/ ADS/ MATLAB and compare the measurement using Network analyzer
- Reading analog and digital sensors data using UART Using ICONT setup.

Note: Minimum Eight experiments should be conducted**List of Experiments:**

1. Study the features of Network and spectrum analyzer
2. Simulate the Radiation pattern for different antennas using HFSS/ADS/MAT LAB and compare the measurement using Network analyzer.
 - i. Dipole Antenna
 - ii. Horn antenna
 - iii. Microstrip Antenna etc.
3. Simulate the Radiation resistance for different antennas using HFSS/ ADS/ MATLAB and compare the measurement using Network analyzer.
 - i. Dipole Antenna
 - ii. Horn antenna
 - iii. Microstrip Antenna etc.
4. Plotting eye diagram for baseband signal using MATLAB and verifying using Network analyzer.
5. Plotting Constellation Diagram of QAM using MATLAB and verify using kit.
6. OFDM generation and detection using Simulink and verify using kit.
7. Generation of different types of signals using Vector Signal Generator
8. Modulation analysis on digital modulated single carrier signals using MAT LAB.
9. Reading analog and digital sensors data using UART Using ICONT setup.
10. Collecting sensor values of remote nodes using RIME broadcasting Using ICONT setup.

B.Tech.ECE

L T P C

III Year-II Semester

3 0 0 3

ENVIRONMENTAL SCIENCE**Course Objectives:**

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures
- Understanding the environmental policies and regulations.

Course Outcomes: Based on this course, the Engineering graduate will

- Explain the structure and functions of ecosystems and the importance of natural resources
- Identify and analyze environmental pollution types, causes, and control measures.
- Interpret environmental policies, acts, and sustainable development practices.
- Recognize the impact of human activities on biodiversity and propose conservation strategies.
- Demonstrate awareness of environmental ethics, green technologies, and global environmental issues.

UNIT-I: Ecosystems

Definition, Scope and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio magnification, ecosystem value, services and carrying capacity, Field visits.

UNIT-II: Natural Resources

Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems.

Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources,

Land resources: Forest resources,

Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.

UNIT-III: Biodiversity And Biotic Resources

Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT- IV: Environmental Pollution and Control Technologies Environmental Pollution:

Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of

pollution, drinking water quality standards.

Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil.

Noise Pollution: Sources and Health hazards, standards,

Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management.

Pollution control technologies: Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation.

Global Environmental Problems and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

UNIT - V Environmental Policy, Legislation & EIA:

Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).

Towards Sustainable Future:

Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

Reference Books:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.