EC601PC: ANTENNAS AND PROPAGATION

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC601PC	PC	3	1	-	4	30	70	100

Prerequisite: Electromagnetic Theory and Transmission Lines

Course Objectives:

1. To understand the concept of radiation, antenna definitions and significance of antenna parameters, to derive and analyze the radiation characteristics of thin wire dipole antenna sand solve numerical problems.
2. To analyze the characteristics and design relations of UHF, VHF and Microwave Antennas.
3. To identify the antenna array requirements, to determine the characteristics of ULA sand estimate the patterns of BSA, EFA, and Binomial Arrays.
4. To understand the concepts and set-up requirements for microwave measurements, and familiarize with the procedure to enable antenna measurements.
5. 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 heir profile sand 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.

1. Characterize the antennas based on frequency, configure the geometry and establish the radiation atterns of VHF, UHF and Microwave antennas and also antenna arrays.
2. Specifytherequirementsformicrowavemeasurementsandarrangeasetuptocarryouttheantenna farzone pattern and gain measurements in the laboratory.
3. Classify the different wave propagation mechanisms, determinethecharacteristicfeaturesofdifferentwavepropagations,and estimate the parameters involved.

Unit: I — Antenna Basics, Thin Linear Wire Antennas

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

Unit: II — Antenna Arrays, Antenna Measurements

Antenna Arrays: Point Sources–Definition, Patterns**,** arrays of 2IsotropicSources-DifferentCases,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-AntennaMethods)

Unit: III — VHF, UHF and Microwave Antennas - I

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

VHF, UHF and Microwave Antennas - II:Microstrip Antennas – Introduction, Features, AdvantagesandLimitations,RectangularPatchAntennas–GeometryandParameters,CharacteristicsofMicrostrip Antennas.ReflectorAntennas–Introduction,FlatSheetandCornerReflectors,ParaboloidalReflectors– Geometry,PatternCharacteristics,FeedMethods,ReflectorTypes–RelatedFeatures

Unit: V	Wave Propagation, Ground Wave Propagation, Space Wave Propagation AND Sky Wave Propagation

WavePropagation-Definitions,CategorizationsandGeneralClassifications,DifferentModesofWavePropagation,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.

SkyWavePropagation–StructureofIonosphere,RefractionandReflectionofSkyWavesbyIonosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation

Text Books:

1. Antennas and Wave Propagation–J.D. Kraus, R.J. MarhefkaandAhmadS.Khan,TMH,NewDelhi,4th ed.,(Special Indian Edition),2010.
2. ElectromagneticWavesandRadiatingSystems–E.C.JordanandK.G.Balmain,PHI,2nded.,2000.

Reference Books:

1. Antenna Theory- C. A. Balanis, John Wiley&Sons,3rdEd.,2005.
2. Antennas and Wave Propagation–K.D.Prasad, SatyaPrakashan,TechIndiaPublications,NewDelhi,2001.
3. Radio Engineering Handbook- Keithhenney,3rd edition TMH.
4. Antenna Engineering Handbook–John Leonidas Volakis, 3rdedition, 2007

EC602PC: DIGITALSIGNALPROCESSING

B. Tech. III Year II Semester								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
EC513PC	**PC**	3	1	-	4	30	70	100

Prerequisite: Signals and Systems

Course Objectives:

1. Toprovidebackgroundandfundamentalmaterialfortheanalysisandprocessingofdigitalsignals.
2. To understand the fast computation of DFT and appreciate the FFT processing.
3. To study the designs and structures of digital (IIR and FIR) fil ters and analyze and synthesize for a given specifications.
4. ToacquaintinMulti-ratesignalprocessingtechniquesandfinitewordlengtheffects.

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

1. Apply time, frequency, and Z -transform domain analysis on Discrete time signals and systems.
2. Analyze the inter-relationship between DFT and various transforms
3. Implement various filter structures and understand the effects of round off errors.
4. Design a digital filter for a given specification
5. Examine the computation of DFT and appreciate the FFT processing
6. Compare the tradeoffs between normal and multi rate DSP techniques and finite length word effects

Unit: I — Introduction, Multirate Digital Signal Processing

Introduction: IntroductiontoDigitalSignalProcessing:DiscreteTimeSignals&Sequences,conversionofcontinuoustodiscretesignal,NormalizedFrequency,LinearShiftInvariantSystems,Stability,andCausality, lineardifferentialequationtodifferenceequation,LinearConstantCoefficientDifference Equations, Frequency Domain Representation of Discrete Time Signals and Systems

Multirate Digital Signal Processing: Introduction, Down Sampling, Decimation, Upsampling, Interpolation, Sampling Rate Conversion.

Unit: II — Discrete Fourier series, Fast Fourier Transforms

Discrete Fourier series: Fourier Series, Fourier Transform, Laplace Transform and Z-Transformrelation, 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.

FastFourierTransforms: FastFourierTransforms(FFT)-Radix-2Decimation-in-TimeandDecimation-in-FrequencyFFTAlgorithms,Inverse FFT

Unit: III — IIR Digital Filters

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

FIR Digital Filters: Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Filters: Fourier Method, Digital FiltersusingWindowTechniques,FrequencySamplingTechnique,ComparisonofIIR &FIR filters.

Unit: V — Realization of Digital Filters, Finite Word Length Effects

Realization of Digital Filters: Applications of Z – Transforms, Solution of Difference Equations ofDigitalFilters,SystemFunction,StabilityCriterion,FrequencyResponseofStableSystems,RealizationofDigital 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. Discrete Time Signal Processing–A.V. Oppenheim andR.W.Schaffer,PHI,2009
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G.Proakis, Dimitris G.Manolakis, Pearson Education /PHI,2007.

Reference Books:

1. DigitalSignalProcessing–FundamentalsandApplications–LiTan,Elsevier,2008
2. FundamentalsofDigitalSignalProcessingusingMATLAB–RobertJ.Schilling,SandraL.Harris,Thomson,2007
3. DigitalSignalProcessing–S.Salivahanan,A.VallavarajandC.Gnanapriya,TMH,2009
4. DigitalSignalProcessing-APracticalapproach,EmmanuelC.IfeachorandBarrieW.Jervis,2nd Edition, Pearson Education,2009

Web References: 1. https://nptel.ac.in/courses/108/106/108106151/

2. https://nptel.ac.in/courses/108/101/108101174/

E-Text Books: 1.Digital signal processing Second Edition by Steven W. Smith

EC603PC: VLSI DESIGN

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC603PC	PC	3	1	-	4	30	70	100

Prerequisite: Electronic Circuit Analysis; Switching Theory and Logic Design

Course Objectives:

1. Give exposure to different steps involved in the fabrication of ICs.
2. Explain electrical properties of MOS and Bi CMOS devices to analyze the behavior of inverters design edwithvarious loads.
3. Give exposure to the design rules to be followed to draw the layout of any logic circuit.
4. Provide design concepts to design building blocks of data path of anysys temusing gates.
5. Underst and basic programmable logic devices and testing of CMOS circuits.

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

- Acquire qualitative knowledge about the fabrication process of integrated circuits using MOS transistors.
- Draw the layout of any logic circuit which helps to understand and estimate parasitic of any logic circuit
- Design different types of logic gates using CMOS inverter and analyze their transfer characteristics
- Design building blocks of data path subsystems and memories using basic digital logic devices.
- Design simple logic circuits using PLA,PAL, FPGA and CPLD
- Understand different types of faults that can occur in a system and learn the concept of testing.

Unit: I — Introduction, Basic Electrical Properties

Introduction: IntroductiontoICTechnology–MOS,PMOS,NMOS,CMOS&BiCMOS

Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: I_{ds}-V_{ds}relationships, MOS transistor threshold Voltage, g_m,g_{ds}, Figureofmerit; Passtransistor, NMOSInverter, Variouspull ups,CMOS Inverteranalysis and design, Bi-CMOSInverters.

Unit: II — VLSI Circuit Design Processes

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

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, Choice of Layers.

Unit: IV — Data Path Subsystems, Array Subsystems

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, CMOS Testing

Programmable Logic Devices: Design Approach–PLA, PAL, Standard Cells FPGAs, CPLDs.

CMOSTesting: CMOSTesting, Test Principles, Design Strategies for test, Chiplevel Test Techniques.

Text Books:

1. EssentialsofVLSIcircuitsandsystems–KamranEshraghian,EshraghianDouglesandA.Pucknell,PHI,2005 Edition
2. CMOSVLSIDesign– ACircuitsandSystemsPerspective,NeilH.EWeste,DavidHarris,AyanBanerjee,3rdEd,Pearson,2009.

Reference Books:

1. IntroductiontoVLSISystems:ALogic,CircuitandSystemPerspective–Ming-BOLin,CRCPress,2011
2. CMOS logic circuitDesign-John.P.Uyemura,Springer,2007.
3. Modern VLSI Design –Wayne Wolf, Pearson Education,3rd Edition,1997.
4. VLSIDesign-K.LalKishore,V.S.V.Prabhakar,I.KInternational,2009.

Web References:

1.https://nptel.ac.in/courses/117/101/117101058/

2.https://nptel.ac.in/courses/108/107/108107129/

3. http://www.vlsi-expert.com/p/vlsi-basic.html

E-Text Books:

1. https://www.phindia.com/Books/ShoweBooks/MTMzMA/MTE2NA/VLSI-Design
2. http://www.cmosvlsi.com/
3. https://www.springer.com/gp/book/9781402084461
4. https://books.google.co.in/books?id=CO8zq6_vcr8C&printsec=frontcover

EC611PE: SPEECH PROCESSING

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC611PE	PEC	3	-	-	3	30	70	100

Prerequisite: Signals and Systems and Probability Theory and Stochastic Processes

Course Objectives: The objectives of this course are to make the student

1. Understand the anatomy and Physiology of Speech Production system and perception model and to design an electrical equivalent of Acoustic model for Speech Production.
2. To analyze the speech in time domain and extract various time domain parameters which can be used for various applications like pitch extraction, end point detection, Speech Compression, Speech Synthesis etc.,
3. To study the concept of Homomorphic system and its use in extracting the vocal tract information from speech using Cepstrum which is a bye product of Homomorphic processing of Speech.
4. To study various Speech Signal Processing applications viz: Speech Enhancement, Speech Recognition, Speaker Recognition.

Course Outcomes: On completion of this course student will be able to

1. Model an electrical equivalent of Speech Production system.
2. Extract the LPC coefficients that can be used to Synthesize or compress the speech.
3. Design a Homomorphic Vocoder for coding and decoding of speech.
4. Enhance the speech and can design an Isolated word recognition system using HMM.
5. Extract the features for Automatic speaker recognition system which can used for classification.

Unit: I — Fundamentals of Digital Speech Processing

Anatomy & Physiology of Speech Organs, The process of Speech Production, The Acoustic Theory of Speech Production – Uniform lossless tube model, effect of losses in vocal tract, effect if radiation at lips, Digital models for speech signals.

Unit: II — Time Domain Models for Speech Processing

Introduction- Window considerations, Short time energy and average magnitude Short time average zero crossing rate, Speech vs Silence discrimination using energy and zero crossing, Pitch period estimation using a parallel processing approach. The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

Unit: III — Linear predictive Coding (LPC) Analysis

Basic principles of Linear Predictive Analysis : The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equation, comparison between the Method of Solution of the LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

Unit: IV — Homomorphic Speech Processing & Speech Enhancement

Homomorphic Speech Processing Introduction Homomrphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, pitch Detection, Formant Estimation, and The Homomorphic Vocoder.

Speech Enhancement-Nature of interfering sounds, Speech enhancement techniques: Single microphone Approach: spectral subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multi microphone Approach.

Unit: V — Automatic Speech & Speaker Recognition, Hidden Markov Model (HMM) for Speech , Speaker Recognition

Automatic Speech & Speaker Recognition

Basic pattern recognition approaches, parametric representation of speech, evaluating the similarity of speech patterns, isolated digit Recognition System, Continuous digit Recognition System

Hidden Markov Model (HMM) for Speech

Hidden Markov Model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS.

Speaker Recognition

Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification Systems, Speaker identification Systems.

Text Books:

1. Digital Processing of Speech Signals – L.R. Rabiner S. W. Schafer. Pearson Education.
2. Speech Communication : Human & Machine – Douglas O' Shaughnessy, 2nd Ed., EEE Press.
3. Digital Processing of Speech Signals L.R Rabinar and RW Jhaung, 1978, PHI

Reference Books:

1. Discrete Time Speech Signal Processing: Principles and Practice – Thomas F. Quateri, 1st Ed., PE.
2. Speech & Audio Signal Processing – Ben Gold & Nelson Morgan, 1st Ed., Wiley.

EC612PE: ELECTRO MAGNETIC INTERFERNCE & ELECTROMAGNETIC COMPATIBILITY (EMI / EMC)

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC612PE	PEC	3	-	-	3	30	70	100

Prerequisite: Electromagnetic Theory and Transmission Lines

Course Objectives:

1. To introduce important system concepts such as Electromagnetic interference and Electromagnetic compatibility (EMI&EMC).
2. To familiarize with unavoidable and naturally happening sources of EMI and problems to ensure EMC.
3. To study various techniques to reduce EMI from systems and to improve EMC of electronic systems.

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

1. Gain basic knowledge of problems associated with EMI and EMC from electronic circuits and systems.
2. Analyze various sources of EMI and various possibilities to provide EMC.
3. Understand and analyze possible EMI prevention techniques such as grounding, shielding, filtering and use of proper coupling mechanisms to improve compatibility of electronic circuits and systems in a given electromagnetic environment.

Unit: I — Sources of EMI &EMI/EMC Standards

Sources of EMI

Definition of EMI and EMC, Classification, Natural and Man-Made EMI Sources, Switching Transients, Electrostatic Discharge, Nuclear Electromagnetic Pulse and High Power Electromagnetics.

EMI/EMC Standards

Introduction, Standards for EMI/EMC – MIL –STD 461/462 – IEEE/ANSI Standards – CISPR/IEC, Standards – FCC Regulations.

Unit: II — EMI Coupling Modes

EMI Coupling Modes

Penetration: Introduction, Shielding Theory - Shielding Effectiveness, The Circuit Approach, The Wave Approach, Aperture Theory, Calculation of Effectiveness of a Conducting Box with an Aperture, Introduction to Propagation and Cross Talk – Introduction, Basic Principles, Determination of EM Field from Transmission Lines.

Unit: III — EMI Controlling Techniques-1

EMI Controlling Techniques-1

Grounding, Principles and Practice of Earthing, Precautions in Earthing, Measurements of Ground Resistance, System Grounding for EMC, Cable Shielding Grounding. Shielding, Theory and Effectiveness, Materials, Integrity at Discontinuities, Conductive Coatings, Cable Shielding, Effectiveness Measurements, Electrical Bonding.

Unit: IV — EMI Controlling Techniques-2

EMI Controlling Techniques-2

Characteristics and Types of Filters – Impedance Mismatch, Lumped Element Low-Pass, High Pass, Band-Pass and Band-Reject Filters, Power Line Filter Design - Common Mode, Differential Mode, Combined CM and DM Filters, Design Example. EMC Gaskets – Knitted Wire-Mesh Gaskets, Wire-Screen Gaskets, Oriented Wire Mesh, Conductive Elastomer, Transparent Conductive Windows, Conductive Adhesive, Conductive Grease, Conductive Coatings, Isolation Transformers, Opto-Isolators.

Unit: V — EMI Measurements

EMI Measurements

Introduction to Open Area Test Site Measurements – Measurement Precautions – Open Area Test Site – Terrain Roughness – NSA – Measurement of Test Site Imperfections – Antenna Factor Measurement – Measurement Errors. Radiated Interference Measurements – Anechoic Chamber – TEM Cell – Reverberating Chamber – Ghz TEM Cell – Comparison of Test Facilities – Measurement Uncertainties Conducted Interference Measurements – Characterization – Conducted EM Noise on Power Supply Lines – Conducted EMI from Equipment – Immunity – Detectors and Measurement – Pulsed EMI Immunity – Electrostatic Discharge.

Text Books:

1 Engineering Electromagnetic Compatibility – V. Prasad Kodali – 2/e – IEEE Press – Wiley India Pvt. Ltd – 2001.
2. Principles and Techniques of Electromagnetic Compatibility – Christos Christopoulos – 2/e – CRC Press (Taylor & Francis Group) – 2007.

Reference Books:

1 Introduction to Electromagnetic Compatibility – Clayton R.Paul – John Wiley & Sons, 1992.
2. Electromagnetic Compatibility of Integrated Circuits – Techniques for Low Emission and Susceptibility – Edited by Sonia Ben Dhia, Mohamed Ramdani and Etienne Sicard – Springer, 2006.
3. EMI reduction in Electronic Systems – Mills – J.P – Prentice Hall Inc. 4. Noise Reduction in Electronic Systems – Henry W.Ott, 2nd Edition, Wiley Interscience, 1988.

EC613PE: EMBEDDED SYSTEM DESIGN

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC613PE	PE	3	-	-	3	30	70	100

Prerequisite: MicroprocessorsandMicrocontrollers;ComputerOrganizationandOperatingSystems

Course Objectives:

1. To provide an over view of Design Principles of Embedded System.
2. To provide clear understanding about the role of firmware.
3. Tounderstandthenecessityofoperatingsystemsincorrelationwithhardwaresystems.
4. To learn the methods of interfacing and synchronization for tasking.

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

1. TounderstandtheselectionprocedureofProcessorsintheembeddeddomain.
2. Design Procedure for Embedded Firmware.
3. To visualize the role of Real time Operating Systems in Embedded Systems.
4. To evaluate the Correlation between ask synchronization and latency issues

Unit: I — Introduction to Embedded Systems

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems VsGeneral 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

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

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock,WatchdogTimer,EmbeddedFirmwareDesignApproachesandDevelopmentLanguages

Unit: IV — RTOS Based Embedded System Design

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, Synchronization

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. Introduction to Embedded Systems-ShibuK.V,McGraw Hill.

Reference Books:

1. Embedded Systems- RajKamal,TMH.
2. Embedded System Design- FrankVahid, Tony Givargis, JohnWiley.
3. EmbeddedSystems–Lyla,Pearson,2013
   An Embedded Software Primer-DavidE.Simon, Pearson Education

Web References:

1. https://link.springer.com/book/10.1007/978-3-319-56045-8

E-Text Books:

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.
2. The Art of Designing Embedded Systems 2nd Edition, Kindle …
3. An Embedded Software Primer - David E. Simon

EC604PC: DIGITAL SIGNAL PROCESSING LAB

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC604PC	PC	-	-	3	1.5	30	70	100

Prerequisite:

Course Objectives:

1. To implement DFT and FFT on a given sequence
2. Determine transfer function and predict frequency response of discrete-time systems
3. Design of digital IIR and FIR filters
4. To implement multirate signal processing operations on a given sequence

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

1. **Construct all classes of discrete time signals using MATLAB**
2. **Design and simulate Digital IIR and FIR filter using MATLAB**
3. **Design and simulate Interpolator and Decimator using MATLAB**
4. **Apply DSP algorithms for audio applications using MATLAB**
5. **Analyse frequency response for the given system**
6. **Make use of DSP algorithms on a DSP processor for real time applications.**

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

Note: -Minimumof12experimentshastobeconducted.

List of Experiments:

1. GenerationofSinusoidalWaveform/SignalbasedonRecursiveDifferenceEquations
2. Histogram of White Gaussian Noise and Uniformly Distributed Noise.
3. To find DFT/IDFT of given DT Signal
4. TofindFrequencyResponseofagivenSystemgiveninTransferFunction/Differentialequationform.
5. Obtain Fourierseriesco efficient by formula and using FET and compareforhalfsine wave.
6. Implementation of FFT of given Sequence
7. Determination of Power Spectrum of a given Signal(s).
8. Implementation of LPFIR Filter for a given Sequence/Signal.
9. Implementation of HPIIR 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.

List of Equipment Required: The Programs shall be implemented in Software (Using MATLAB Programming/Equivalent)and Hardware (Using TI/ Analog Devices/Motorola/Equivalent DSP processors).

Text Books:

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

Reference Books:

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

Web References: 1. https://nptel.ac.in/courses/108/106/108106151/

2. https://nptel.ac.in/courses/108/101/108101174/

E-Text Books: 1.Digital signal processing Second Edition by Steven W. Smith

EC605PC: e- CADLAB

B. Tech. III Year II Semester								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
EC604PC	**PC**	-	-	3	1.5	30	70	100

Prerequisite:

Course Objectives: The course should enable the students to:

1. Understand the EDA tools
2. Understand the various modeling styles in Hardware Description Language(HDL)
3. Design and analyze the various digital systems (like combinational, sequential, memories and FSM) using HDLs
4. Design and estimate various characteristics of digital integrated circuits.
5. Draw the layout of Various Logic gates using CMOS Logic
6. Draw the layout of Combinational Circuits using Pass Transistor Logic
7. Draw the layout of Combinational Circuits using CMOS Logic
8. Draw the layout of Basic Sequential Circuits using CMOS Logic and Pass Transistor Logic

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

1. Design and analyze the combinational circuits using various modeling styles of Hardware Description Language(HDL)
2. Design and analyze the sequential circuits using various modeling styles of Hardware Description Language(HDL)
3. Design and Analyze the layout of Various Logic gates using CMOS Logic
4. Design and Analyze the layout of Combinational Circuits using Pass Transistor Logic
5. Design and Analyze the layout of Combinational Circuits using CMOS Logic
6. Design and Analyze the layout of Basic Sequential Circuits using CMOS Logic and Pass Transistor Logic

Note: Any SIX of the following experiments from eachpartare to be conducted (Total12)

Part -I

All the following experiments have to be implemented using HDL

1. Realizeall the logic gates
2. Designof8-to-3encoder(without and with priority)and2-to-4decoder
3. Designof8-to-1multiplexerand1-to-8demultiplexer
4. Designof4bitbinaryto gray code converter
5. Designof4bitcomparator
6. Design of Full adder using3modelingstyles
7. Design of flipflops:S R,D,JK,T
8. Designof4-bitbinary,BCDcounters(synchronous/asynchronousreset)oranysequencecounter
9. Finite State Machine Design

Part-II

Layout,physicalverification,placement&routeforcomplexdesign,statictiminganalysis,IRdropanalysis and cross talk analysis for the following:

1. Basic logic gates
2. CMOS inverter
3. CMOS NOR/NAND gates
4. CMOSXOR 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).

List of Equipment Required: Xilinx Vivado EDA Tool

Text Books:

1. T.R. Padmanabhan, B Bala Tripura Sundari, Design Through Verilog HDL, Wiley 2009.
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009

CMOS logic circuit Design - John. P. Uyemura, Springer, 2007.

Reference Books:

1. Fundamentals of Digital Logic with Verilog Design - Stephen Brown,ZvonkocVranesic, TMH, 2nd Edition
2. Verilog HDL - Samir Palnitkar, 2nd Edition, Pearson Education, 2009.

Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997

Web References:

1. https://www.xilinx.com/support/documentation/university/Vivado-Teaching/HDL-Design/2013x/Nexys4/Verilog/docs-pdf/Vivado_tutorial.pdf
2. https://www.xilinx.com/support/university/vivado/vivado-teaching-material/hdl-design.html

http://www.vlsi-expert.com/p/vlsi-basic.html

E-Text Books:

1. https://notesavior.files.wordpress.com/2018/02/stephen-brown-and-zvonko-vranesic-fundamental-of-digital-logic-with-verilog-design.pdf
2. https://drive.google.com/file/d/0BwpN8Fd0ZobvMjdhNDlkNDMtZWYyMi00YTA4LThjODMtOGFmNDU1MmY5MGE3/view?resourcekey=0-nLmkJl07k4I8NyVc3urhfQ
3. http://www.cmosvlsi.com/
4. https://www.springer.com/gp/book/9781402084461
5. https://books.google.co.in/books?id=CO8zq6_vcr8C&printsec=frontcover

EC606PC: SCRIPTING LANGUAGES LAB

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC606PC	PC	-	-	2	1	30	70	100

Prerequisite:

Course Objectives:

- ToUnderstandtheconceptsofscriptinglanguagesfordevelopingweb-basedprojects
- To understand the applications the of Ruby, TCL, Perlscripting languages

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

- AbilitytounderstandthedifferencesbetweenScriptinglanguagesandprogramminglanguages
- Able to gain some fluency programming in Ruby, Perl, TCL

List of Experiments:

1. Write a Ruby script to create a new string which is n copies of a given string where n is a non-negative integer
2. WriteaRubyscriptwhichacceptstheradiusofacirclefromtheuserandcomputetheparameterandarea.
3. Write a Ruby script which accept the user's first and last name and print them in reverse orderwitha space between them
4. Writea Rubyscript to accept a filename from the user print the extension of that
5. Write a Rubyscript to find the greatest of three numbers
6. Write a Rubyscriptto print odd numbersfrom10to1
7. Write a Ruby script to check two integers and return trueifoneofthemis20otherwisereturntheir sum
8. WriteaRubyscripttochecktwotemperaturesandreturntrueifoneislessthan0andtheotherisgreaterthan 100
9. Write a Ruby script to print the elements of a give narray
10. WriteaRubyprogramtoretrievethetotalmarkswheresubjectnameandmarksofastudentstoredin a hash
11. Write a TCL script to find the factorial of a number
12. Write aTCLscriptthatmultipliesthenumbersfrom1 to10
13. Write a TCL script for Sorting a list using a comparison function
14. WriteaTCLscriptto(i)createalist(ii)appendelementstothelist(iii)Traversethelist(iv)Concatenatethelist
15. Write a TCL script to comparing the filemo difiedtimes.
16. Write a TCL script to Copya file and trans late tonative format.
17. a)Write a Perl script to find the largest number among three numbers.
    b)WriteaPerlscript to print them ultiplicationtablesfrom 1-10usingsubroutines.
18. Write a Perl program to implement the following list of manipulating functions
    a) Shiftb)Un
    shiftc)Push
19. a) Writea Perlscriptto substitute a word, withanotherword inastring.
    b) Writea PerlscripttovalidateIPaddressandemail address.
20. Writea Perlscriptto printthefileinreverse orderusing commandline arguments

MC601EC: Numerical Ability & Reasoning

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
MC601EC	MC	3	-	-	-	30	70	100

Prerequisite:

Course Objectives:

This is a foundation course and aims at enhancing employability skills in students. Students will be introduced to higher order thinking skills and problem solving on the following areas - Arithmetic ability, Numerical ability and General reasoning. Students will be trained to work systematically with speed and accuracy while problemsolving.

The major areas covered in this course include

1. Arithmetic Ability
2. Numerical Ability
3. Quantitative Aptitude
4. Verbal Reasoning
5. Logical reasoning

Visual Reasoning

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

1. Solve questions on the above mentioned areas using short cuts and smart methods
2. Understand the fundamentals concepts of Aptitude skills
3. Perform calculations with Speed & Accuracy
4. To improve Logical thinking.
5. To improve Application Knowledge

Unit: I **ARITHMETIC ABILITY FOUNDATION**

ARITHMETIC ABILITY FOUNDATION: Square root, Cube roots, Speed Maths using Vedic Maths, Surds & Indices, Logarithms

Number Systems - Types of numbers, Divisibility tests, LCM and HCF, Unit digit, Number of zeroes, Factorial, No. of factors, Remainder concepts, Successive Divisors

Unit: II **COMMERCIAL ARITHMETIC&ARITHMETIC ABILITY ADVANCED**

COMMERCIAL ARITHMETIC: Percentages, Profit and Loss, Discount, Simple Interest & Compound Interest

ARITHMETIC ABILITY ADVANCED: Time, Speed & Distance- Basics, Average Speed, Problems on Trains, Relative Speed, Boats & Streams, Races & Games, Circular Motion

Time and work, Work & Wages, Chain Rule, Pipes and Cisterns

Unit: III **ALGEBRA&LOGICAL REASONING**

ALGEBRA: Linear Equations, Quadratic Equations and In-equations, Averages, Ratio, Proportion & Variations, Ages, Partnership

LOGICAL REASONING: Statements & Conclusions, Statements & Course of Actions, Statements & Assumptions, Cause & Effect, Coded Inequalities, Syllogism, Input Output

Unit: IV **MODERN APTITUDE**

MODERN APTITUDE - I: Permutations & Combinations, Circular Permutation, Probability, Area and Volumes.

MODERN APTITUDE - II: Data Sufficiency, Data Interpretation – Line graph, Pie Charts, Bar graph

Unit: V **VERBAL REASONING&VISUAL REASONING**

VERBAL REASONING: Blood relations, Directions, Coding & Decoding, Number Ranking, Venn Diagrams, Alphanumeric Symbol Test, Mathematical operations.
Series, Analogy, Classification, Analytical Reasoning - Information Ordering – Arrangements
VISUAL REASONING: Series, Analogy, Classification, Mirror & Water Images, Spotting out the Embedded figure, Pattern Incompletion, Paper Folding & Cutting, Analytical Figures, Cubes & Dice

Text Books:

1. Quantitative Aptitude for Competitive Examinations – Dr. R.S Aggarwal, S. Chand Publisher, English Medium, Revised & Enlarged Edition.

2. A Modern Approach to Verbal Reasoning (Fully Solved) – Dr R.S Aggarwal, S. Chand Publisher, English Medium.

Reference Books:

1 How to Prepare for Quantitative Aptitude for the CAT – Arun Sharma, Publisher: Mcgraw Hill TP, 8thEdition, English Medium.

2. A Modern Approach to Verbal & Non-Verbal Reasoning – Dr. R.S Aggarwal, S. Chand Publisher, English Medium, Revised Edition.

3. Quantitative Aptitude for All Competitive Examinations – Abhijit Guha, Publisher: Mcgraw Hill, 3rd Edition, English Medium.

4. Quantitative Aptitude - For Competitive Examinations – Rao U. M. Karanam,Publisher: Scitech Publications (India) Pvt. Ltd, ISBN: 9788183714631, English Medium.

5. Course in Mental Ability and Quantitative Aptitude - For Competitive Examinations – Edgar Thorpe, Publisher: Tata McGraw - Hill Education, 2nd Edition, English Medium.

MC602EC: Fundamentals of Artificial Intelligence

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
MC602EC	MC	3	-	-	-	30	70	100

Prerequisite:

Course Objectives:
To train the students to understand different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation, reasoning. Study of Markov Models enable the student ready to step into applied AI.

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

1) Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
2) Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
3) Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
4) Demonstrate proficiency developing applications in an 'AI language', expert system shell, or data mining tool.
5) Demonstrate proficiency in applying scientific method to models of machine learning.
6) Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications.

Unit: I — Introduction, Basic Search Strategies

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents
Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

Unit: II — Advanced Search, Basic Knowledge Representation and Reasoning

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning
Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

Unit: III — Advanced Knowledge Representation and Reasoning, Reasoning Under Uncertainty

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Nonmonotonic Reasoning, Other Knowledge Representation Schemes
Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

Unit: IV — Learning

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

Unit: V — Expert Systems

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

Text Books:

Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice-Hall, 2010.

Reference Books:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

Web References:

1. **https://nptel.ac.in/courses/112/103/112103280/**
2. **https://www.springerprofessional.de/en/fundamentals-of-artificial-intelligence/17866494**
3. **http://zsi.tech.us.edu.pl/~nowak/bien/**

MC603ES*: ENVIRONMENTAL SCIENCE

B. Tech. I Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
MC603ES	MC	3	-	-	0	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

Prerequisite: Nil

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 understand /evaluate / developtechnologies on the basis of ecological principles and environmental regulationswhich in turn helps in sustainable development

Unit-1	Ecosystems

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-2	Natural Resources & Energy resources

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 source, case studies.

Unit-3	Biodiversity And Biotic Resources

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-4	Environmental Pollution and Control Technologies

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 Issues 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. NAPCC-GoI Initiatives.

Unit-5	Environmental Policy, Legislation & EIA

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 Goals, 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.

Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

Web References:

1.Fundamental concepts in Environmental Studies by Dr.D.DMishra

2.Basis of Environmental Science by Micheal Allaby

E-Text Books:

1.[ebook] A Text Book of environmental studies by Shashi Chawla - Meripustak.com

2. [ebook] A Text Book of environmental studies by Dr.D.K.Asthana https://books.google.co.in