III YEAR B.TECH (ECE) COURSE STRUCTURE
R21 REGULATION

III – Year I Semester

S.No	Course Code	Course Title	Category	L	T	P	C
1.	21EC3111	Linear Integrated Circuits and Applications	PC	3	0	0	3
2.	21EC3112	Microprocessors & Microcontrollers	PC	3	0	0	3
3.	21EC3113	Electromagnetic theory	PC	3	1	0	4
4.		**Open Elective-I**	OE	3	-	-	3
5.		**Professional Elective-I**					
	21EC3171	Electronic Measurements and Instrumentation	PE-I	3	0	0	3
	21EC3172	Machine Learning and Computer Vision Applications					
	21EC3173	Scripting Languages					
	21EC3174	Coding Theory and Techniques					
6.	21EC3151	Linear IC Applications Lab	PC	0	0	3	1.5
7.	21EC3152	Microprocessors & Microcontrollers Lab	PC	0	0	3	1.5
8.	21HS3153	Advanced English Communication Skills lab	HS	0	0	2	1
9.	21MC0005	Indian Constitution	MC	3	0	0	0
9.	21MC0006	Aptitude and logical reasoning	MC	3	0	0	0
10.	21EC3181	Summer Internship*	PW	-	-	-	1
Total				**18**	**1**	**8**	**21**

III – Year II Semester

S.No	Course Code	Course Title	Category	L	T	P	C
1.	21EC3211	VLSI design	PC	3	1	0	4
2.	21EC3212	Digital Signal Processing	PC	3	0	0	3
3.	21EC3213	Data Communications and Networks	PC	3	0	0	3
4.	21EC3214	Antennas and Wave Propagation	PC	3	0	0	3
5.		**Professional Elective-II**					
	21EC3271	Embedded System Design	PE-II	3	0	0	3
	21EC3272	Deep Learning					
	21EC3273	Spread Spectrum Communication					
	21EC3274	Data Science and Data Analytics					
6.	21EC3251	VLSI-design Lab	PC	0	0	3	1.5
7.	21EC3252	Digital Signal Processing Lab	PC	0	0	3	1.5
8	21EC3253	Data Communications and Networks Lab	PC	0	0	2	1
9.	21MC0007	Yoga And Indian Philosophy	MC	3	0	0	0
Total				**18**	**1**	**8**	**20**

Note ** Mini Project has to be perceived during summer vacation after III year II semester

LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

B.Tech. III Year I Sem. **L T P C**

Course Code: 21EC3111 **3 0 0 3**

Pre-requisite: Electronic Devices & Circuits

Course Objectives: The main objectives of the course are:

1. To introduce the basic building blocks of linear integrated circuits.
2. To teach the linear and non-linear applications of operational amplifiers.
3. To introduce the theory and applications of analog multipliers and PLL
4. To teach the theory of ADC and DAC.

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

1. Interpret operational amplifiers with linear integrated circuits and analyze its characteristics.
2. Determine the solution for linear & non-linear applications using IC741.
3. Compute the solution for active filters and oscillators.
4. Analyze functional diagrams and applications of IC 555and IC 565.
5. Discuss Data converters.

UNIT – I: Differential Amplifiers: Differential Amplifiers: Differential amplifier configurations, Balanced and unbalanced output differential amplifiers, current mirror, level Translator
Op-Amp: Basic information of Op-amp, ideal and practical Op-amp, Op-amp characteristics: DC and AC Characteristics, 741 op-amp and its features, modes ofoperation: Inverting, non-inverting Amplifiers

UNIT - II: Applications of Op-amp: Instrumentation amplifier, ac amplifier, V to I and I to V converters, Sample & hold circuits, multipliers and dividers, differentiators and integrators, comparators, Schmitt trigger, Multivibrators, introduction to voltage regulators, features of 723

UNIT – III: Active Filters & Oscillators: Introduction, 1st order LPF, HPF filters, Band pass, Band reject and all pass filters. Oscillator types and principle of operation- RC, Wien bridge and quadrature type, waveform generators - triangular, sawtooth, square wave.

UNIT – IV: Timers & Phase Locked Loops: Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565.

UNIT – V: D-A and A-D Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - parallel comparator type ADC, countertype ADC, successive approximation ADC dual slope integration type ADC, DAC and ADC specifications.

TEXT BOOKS:

1. Linear Integrated Circuits, D. Roy Chowdhury, New Age International(p)Ltd., 6th Edition, 2018
2. Op-Amps & Linear ICs, Ramakanth A. Gayakwad, PHI, 2015

REFERENCES BOOKS:

1. Operational Amplifiers & Linear Integrated Circuits, R.F. Coughlin & Fredrick F. Driscoll, PHI.
2. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications, Denton J. Daibey, TMH.
3. Design with Operational Amplifiers & Analog Integrated Circuits, Sergio Franco, McGraw Hill.

MICROPROCESSORS AND MICROCONTROLLERS

B.Tech. III Year I Sem. **L T P C**

Course Code: 21EC3112 **3 0 0 3**

Course Objectives:

1. To familiarize the architecture of microprocessors and microcontrollers
2. To provide the knowledge about interfacing techniques of bus &memory.
3. To develop programming skills using 8051 based systems
4. To understand the concepts of ARM architecture

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

1. To understand the internal architecture, organization and assembly language programming of 8086 processors.
2. To apply the knowledge of instruction set and assembly launguage programming of 8086 processors.
3. To understand the internal architecture, organization and assembly language programming of 8051 microcontrollers.
4. To extend the knowledge of interfacing using 8051
5. To understand the internal architecture and functional desciprtion of ARM processor

UNIT -I:

8086 Architecture: 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.

UNIT -II:

Instruction Set and Assembly Language Programming of 8086: Maximum mode and minimum mode, Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

UNIT –III:

Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051.

8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

UNIT –IV:

I/O And Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232, USB.

UNIT – V:

ARM Architecture: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions, Introduction to Cortex processor.

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals – A. K. Rayand K. M. Bhurchandani, TMH, 2nd Edition 2006.
2. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012

REFERENCE BOOKS:

1. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed,2004.
2. Microprocessors and Interfacing, D. V. Hall, TMGH, 2nd Edition2006.
3. The 8051 Microcontrollers, Architecture and Programming and Applications -K. Uma Rao, Andhe Pallavi, Pearson, 2009

ELECTROMAGNETIC THEORY

B.Tech. III Year I Sem. **L T P C**

Course Code: 21EC3113 **3 1 0 4**

Course Objectives:

This is a structured foundation course, dealing with concepts, formulations and applications of Electromagnetic Theory and Transmission Lines, and is the basic primer for all electronic communication engineering subjects. The main objectives of the course are

1. Understand the coordinate system and vector calculus.
2. To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields and Magnetostatic Fields, and apply them to solve engineering problems.
3. To distinguish between static and time-varying fields, and understand the significance and utility of Maxwell's Equations and Boundary Conditions, and gain ability to provide solutions to communication engineering problems.
4. To analyze the characteristics of Uniform Plane Waves (UPW) in different mediums and understand the Poynting Theorem.
5. To theoretically understand the Reflection and Refraction concepts of a UPW at different incidence angle and leads to understand the concept of Total Internal Reflection.

Course Outcomes: Having gone through this foundation course, the students would be able to

1. Visualize the concept of coordinate system and State the concepts and its applications of Basic Laws of Electrostatic Fields
2. Analyze the Electric Field due to various charge distributions
3. Analyze the Magnetic field in terms of Scalar and Magnetic Potentials.
4. Solve the set of Maxwell's Equations and Boundary Conditions, and use them for solving engineering problems
5. Analyze the behavoiur of EM wave in different media and evaluate the UPW Characteristics for several practical media of interest.

UNIT – I

Introduction to Co-ordinate System – Rectangular – Cylindrical and Spherical Co- ordinate System – Introduction to line, Surface and Volume Integrals –Definition of Curl, Divergence and Gradient – Meaning of Stokes theorem and Divergence theorem

Electrostatics: Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications.

UNIT – II

Electrostatics II: Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation,

Relaxation Time, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

UNIT – III

Magnetostatics: Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Illustrative Problems.

UNIT – IV

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements, Conditions at a Boundary Surface : Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems. Poynting Vector and Poynting Theorem – Applications, Illustrative Problems.

UNIT – V

EM Wave Characteristics - I: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems. EM Wave Characteristics – II: Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance.

TEXT BOOKS:

1. Principles of Electromagnetics – Matthew N.O. sadiku and S.V. Kulkarni, 6th Ed.,Oxford University Press, Asian Edition, 2015.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, 2nd Ed. 2000, PHI.

REFERENCE BOOKS:

1. Engineering Electromagnetics – Nathan Ida, 2nd Ed., 2005, Springer (India) Pvt. Ltd.,New Delhi.
2. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, 7th Ed., 2006, MC GRAW HILL EDUCATION.

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
(Professional Elective–I)

B.Tech III Year I SemesterCourse	**L**	**T**	**P**	**C**
Code: 21EC3171	3	-	-	3

Course Objectives:

1. To understand the various measuring systems functions and metrics for performance analysis.
2. To understand the principle of operation and working of different electronic instruments.
3. To understand the construction and principle of operation of different electronic instruments via oscilloscope and special purpose oscilloscopes.
4. To understand the working principles of various transducers
5. To aware students how to use bridges to measure resistance, capacitance, and inductance using various measuring techniques.

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

1. Understand and identify the various electronic instruments based on their specifications for carrying out a particular task of measurement..
2. Analyze various types of signal generators and signal analysers for generating and analysing various real time signals.
3. Analyze different types of oscilloscopes and acquire the knowledge of measuring parameters of different real time signals.
4. Measure various physical parameters by appropriately selecting the transducers.
5. Understand about bridges for the measurement of resistance, capacitance and inductance and also can learn how all the physical parameters can be measured.

UNIT - I

Block Schematics of Measuring Systems: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multi meters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

UNIT - II

Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

UNIT - III

Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

UNIT - IV

Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

UNIT - V

Bridges: Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.

Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure – High Pressure, Vacuum level, Temperature -Measurements, Data Acquisition Systems.

TEXT BOOKS:

1. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.
2. Electronic Instrumentation: H. S. Kalsi – McGraw Hill Education, 2nd Edition2004.
3. Electronic Instrumentation and Measurements – David A. Bell, 3rd Edition Oxford Univ.Press,2013.

REFERENCES:

1. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D.Helbincs, W.D. Cooper: PHI 5th Edition, 2003.
3. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage MC GRAW HILLEDUCATION Reprint, 2009.
4. Industrial Instrumentation: T.R. Padmanabham Springer, 2009.

MACHINE LEARNING AND COMPUTER VISION APPLICATIONS

B.Tech. III Year I Sem.	**L**	**T**	**P**	**C**
Course Code:21EC3172	**3**	**-**	**-**	**3**

Course Objectives:

1. To prepare students for career in computer science & engineering where knowledge of AI & ML techniques leading to the advancement of research and technology.
2. Identify problems where artificial intelligence techniques are applicable.
3. To explore the use of Genetic algorithms and Reinforcement learning.
4. Judge applicability of more advanced techniques.
5. Participate in the design of systems that act intelligently and learn from experience.

Course Outcomes:

At the end of the course the students will be able to

1. Analyze the supervised learning algorithms and theory of Machine learning
2. Characterize the unsupervised learning algorithms
3. Model the concepts of Artificial Neural Networks
4. Infer Genetic algorithms and Reinforcement learning.
5. Discuss the concepts of image processing and computer vision with its applications

UNIT I

INTRODUCTION TO MACHINE LEARNING: Types of machine learning, application of machine learning.

Supervised Learning: Regression-Linear-Simple, Multiple, Logistic Regression--Case Study

Classification- Naive Bayes Classifier, k-NN classifier, Support Vector Machines -Linear, Non Linear--Case Study

UNIT II

Decision Trees-ID3 (Iterative Dichotomiser3), Random forest, Ensemble methods- Bagging, Boosting, Stacking--Case Study

UNSUPERVISED LEARNING: Measures of Distance, Clustering: K-means, Hierarchical Clustering: Agglomerative and Divisive--Case Study

UNIT III

Artificial Neural Networks– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm, Remarks on the Back-Propagation algorithm--Case Study

UNIT IV

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example

Reinforcement Learning – Introduction, the learning task, *Q*–learning, non-deterministic, rewards andactions, temporal difference learning, an illustrative example

UNIT V

Introduction to Image Processing – Digital Image Representation, Image types

Introduction to CV – Image formation: Geometric primitives and transformations, photometric image formation

Computer Vision Applications - Self driving cars, Pedestrian detection, X-Ray Analysis

TEXT BOOKS:

1. Artificial Intelligence A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.
2. Machine Learning –Tom M. Mitchell,- Tata McGraw-Hill
3. Computer Vision Algorithms & Applications, Richard Szeliski, Springer.

REFERENCE BOOKS:

1. S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt.Ltd., 2017.

2. “Reinforcement Learning Algorithms: Analysis and Applications,” Boris Belousov, Hany Abdul samad, Pascal Klink, Simone Parisi, and Jan Peters First Edition, Springer 2021.

3. 3. Digital Image Processing Using MATLAB, Rafael C. Gonzalez, Richard E. Woods and Steven L. Eddins, 2004.

SCRIPTING LANGUAGES
(Professional Elective–I)

B.Tech III Year I Semester

L	T	P	C
3	-	-	3

Course Code: 21EC3173

Prerequisites: Computer Programming and Data Structures

Course Objectives:

1. Able to differentiate scripting and non-scripting languages.
2. To learn Scripting languages like PERL
3. To learn Scripting languages such as TCL/TK python and BASH.
4. Expertise to program in the Linux environment.
5. Usage of scripting languages in IC design flow.

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

1. Known about basics of Linux and Linux Networking
2. Use Linux environment and write programs for automation
3. Understand the concepts of Scripting languages
4. Create and run scripts using PERL/ TCl
5. Understand concepts of R Programming.

UNIT–I:Linux Basics

Introduction to Linux, File System of the Linux, General usage of Linux kernel & basic commands, Linux users and group, Permissions for file, directory and users, searching a file & directory, zipping and unzipping concepts.

UNIT–II: Linux Networking

Introduction to Networking in Linux, Network basics & Tools, File Transfer Protocol in Linux, Network file system, Domain Naming Services, Dynamic hosting configuration Protocol & Network information Services.

UNIT–III: Perl Scripting.

Introduction to Perl Scripting, working with simple values, Lists and Hashes, Loops and Decisions, Regular Expressions, Files and Data in Perl Scripting, References &Subroutines, Running and Debugging Perl, Modules, Object–Oriented Perl.

UNIT–IV: TCL /TK Scripting

TCL Fundamentals, String and Pattern Matching, TCL Data Structures, Control Flow Commands, Procedures and Scope, Evel, Working with Unix, Reflection and Debugging, Script Libraries, TK Fundamentals, TK by examples, The Pack Geometry Manager, Binding Commands to X Events, Buttons and Menus, Simple TK Widgets, Entry and List box Widgets Focus, Grabs and Dialogs.

UNIT–V: Introduction to R Programming

R interpreter, Introduction to major R data structures like vectors, matrices, arrays, list and data frames, Control Structures, vectorized if and multiple selection, functions**,** Installing, loading and using packages, Designing GUI, Building packages

TEXT BOOKS:

1. Practical Programming in TCL and TK by Brent Welch, Updated fort TCL 7.4 and TK4.0.
2. Red Hat Enterprise Linux4: System Administration Guide Copyright, Red Hat Inc, 2005.

REFERENCE BOOKS:

1. Learning Python–Mark Lutzand David Ascher, 2nd Ed., O'Reilly,2003.
2. Learning Perl–4thEd. Randal Schwartz, Tom Phoenix and Braindfoy.2005.
3. Python Essentials– Samuele Pedroni and Noel Pappin.O'Reilly, 2002.
4. Programming Perl–Larry Wall, Tom Christiansen and John Orwant, 3rdEdition, O'Reilly, 2000.(ISBN0596000278)

CODING THEORY AND TECHNIQUES
(Professional Elective - I)

B.Tech. III Year II Sem. **L T P C**
Course Code: 21EC3174 **3 0 0 3**

Course Objectives:

1. To acquire the knowledge in measurement of information and errors
2. Understand the importance of various codes for communication systems.
3. Able design encoder and decoder of various codes.
4. To Analyze the applicability of source codes.
5. To Analyze the applicability of channel codes.

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

1. Learn measurement of information and errors.
2. Obtain knowledge in designing various source codes
3. Design encoders and decoders for block and cyclic codes
4. Obtain knowledge in designing various channel codes.
5. Understand the significance of codes in various applications.

Unit-I :

Coding for Reliable Digital Transmission and storage: Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codesover a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

Unit-II

Cyclic Codes: Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

Unit-III

BCH codes: Linear algebra, Galois field, Definition and Construction of Binary BCH Codes, Error Syndromes in finite fields, Decoding SEC and DE

Reed-Solomon (RS) Codes: Dimension, Definition of distance, Generator polynomial, Minimum distance and binary expansion of RS codes. Reed-Solomon (RS) Codes: Decoding overview, PGZdecoder for RS codes

Unit-IV

Convolutional Codes: Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system

Unit -V

Turbo Codes: LDPC Codes- Codes based on sparse graphs, Decoding for binary erasure channel, Log-likelihood algebra, Brief propagation, Product codes, Iterative decoding of product codes, Concatenated convolution codes- Parallel concatenation, The UMTS Turbo code, Serial concatenation, Parallel concatenation, Turbo decoding

TEXT BOOKS:

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J. Costello, Jr, Prentice Hall,Inc.
2. Error Correcting Coding Theory-Man Young Rhee- 1989, McGraw-Hill

REFERENCE BOOKS:

1. Error Correcting Coding Theory-Man Young Rhee-1989, McGraw – Hill Publishing, 19
2. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
3. Digital Communications- John G. Proakis, 5th ed., 2008, TMH.
4. Introduction to Error Control Codes-Salvatore Gravano-oxford
5. Error Correction Coding – Mathematical Methods and Algorithms – Todd K. Moon, 2006, Wiley India.
6. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Edition, 2009, TMH.

LINEAR IC APPLICATIONS LAB

Course Code: 21EC3151 **L T P C**
B.Tech. III Year I Sem. **0 0 3 1.5**

Course Objectives:

1. To apply operational amplifiers in Linear applications.
2. To apply operational amplifiers in non-linear applications.
3. To acquire basic knowledge of IC 555 and its applications
4. To apply voltage regulation ICs and some special function ICs
5. To perform various types of Data converters.

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

1. Design and analyze various applications of op-amps.
2. Design and analyze various linear applications of op-amps.
3. Design and analyze filter circuits using op-amp.
4. Design and analyze the applications of special function ICs.
5. Design and analyze data converters.

List of Experiments (any twelve Experiments are to be conducted)

Design and Verification of
Applications of op amp using IC 741

1. Voltage Follower
2. Inverting Amplifier and Non Inverting Amplifier
3. Adder, Subtractor
4. Zero Crossing Detector/Comparator
5. Schmitt Trigger using IC 741
6. Differentiator
7. Integrator
8. Voltage Regulator Using IC 723
9. Three terminal voltage regulators-7805, 7809, 7912
10. Active filters-LPF, HPF (First Order)
11. RC Phase Shift Oscillator Using Op Amp
12. Wein Bridge Oscillator
13. Multivibrators Using 555 Timer
    a. Astable
    b. Monostable
14. VCO Using 565 PLL
15. 4-bit R/2R Ladder type DAC

Major Equipment required for Laboratories:

1. 5 V Fixed Regulated Power Supply/ 0-5V or more Regulated Power Supply.
2. 20 MHz Oscilloscope with Dual Channel.
3. Bread board and components/ Trainer Kit.
4. Multimeters

ICs required: IC 741, IC 555, IC565, IC 723, 7805, 7809, 7912

MICROPROCESSORS & MICROCONTROLLERS LAB

B.Tech. III Year I Sem. **L T P C**

Course Code: 21EC3152 0 0 3 1.5

COURSE OBJECTIVES:

1. To Introduce Assembly Language Program concepts
2. Write ALP for arithmetic and logical operations in 8086
3. Write ALP for arithmetic and logical operations in 8051
4. To Interface I/O devices with 8051 microcontroller
5. To Interface I/O devices with ARM

COURSE OUTCOMES: At the end of the course, student will be able to

1. Implement the basic programming for Arithmetic and Logical operations in 8086 micro-processor.
2. Implement the basic programming for Arithmetic and Logical operations in 8051 Microcontroller
3. Identify the assembly level programming in given problem.
4. Implement interfacing of I/O devices with 8051 Microcontroller.
5. Implement interfacing of I/O devices with ARM

Cycle 1: Using 8086 Processor Kits and/or Assembler (5 Weeks)

- Assembly Language Programs to 8086 to Perform
  1. Arithmetic, Logical, String Operations on 16 Bit and 32-Bit Data.
  2. Logical Operations, Rotate, Shift, Swap and Branch Operations.

Cycle 2: Using 8051 Microcontroller Kit (5 weeks)

- Introduction to IDE
  1. Assembly Language Programs to Perform Arithmetic (Both Signed and Unsigned) 16 Bit Data Operations, Logical Operations (Byte and Bit Level Operations), Rotate, Shift, Swap and Branch Instructions
  2. Time delay Generation Using Timers of 8051.
  3. Serial Communication from / to 8051 to / from I/O devices.

Cycle 3: Interfacing I/O Devices to 8051(4 Weeks)

1. Matrix Keypad to 8051.
2. LCD Interfacing using 8051.
3. 8 bit ADC Interface to 8051.
4. Triangular Wave Generator through DAC interfaces to 8051.

Cycle 4: Interfacing I/O devices to ARM (2weeks)

1. LCD/LED interfacing to ARM
2. Buzzer interfacing to ARM

ADVANCED ENGLISH COMMUNICATION SKILLS LAB

B.Tech. III Year I Sem. **L T P C**

Course Code: 21HS3153 0 **0 2 1**

Introduction

A course on Advanced English Communication Skills (AECS) Lab is considered essential at the third year level of B.Tech and Pharmacy courses. At this stage, the students need to prepare themselves for their career which requires them to listen to, read, speak and write in English both for their professional and interpersonal communication. The main purpose of this course is to prepare the students of Engineering for their placements.

Course Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

1. To improve students' fluency in spoken English
2. To enable them to listen to English spoken at normal conversational speed
3. To help students develop their vocabulary
4. To read and comprehend texts in different contexts
5. To communicate their ideas relevantly and coherently in writing
6. To make students industry-ready
7. To help students acquire behavioral skills for their personal and professional life
8. To respond appropriately in different socio-cultural and professional contexts

Course Outcomes: Students will be able to:

1. Acquire vocabulary and use it contextually
2. Listen and speak effectively
3. Develop proficiency in academic reading and writing
4. Increase possibilities of job prospects
5. Communicate confidently in formal and informal contexts

The following course activities will be conducted as part of the Advanced English Communication Skills (AECS) Lab:

Unit-I: Inter-personal Communication and Building Vocabulary –Starting a Conversation– Responding Appropriately and Relevantly –Using Appropriate Body Language –Role Play in Different Situations – Synonyms and Antonyms, One-word Substitutes, Prefixes and Suffixes, Idioms and Phrases and Collocations.

Unit-II: Reading Comprehension –General Vs Local Comprehension, Reading for Facts, Guessing Meanings from Context, , Skimming, Scanning, Inferring Meaning.

Unit-III: Writing Skills –Structure and Presentation of Different Types of Writing –Letter Writing/Resume Writing/ e-correspondence/ Technical Report Writing.

Unit-IV: Presentation Skills –Oral Presentations (individual or group) through JAM Sessions/Seminars/PPTs and Written Presentations through Posters/Projects/Reports/ emails/Assignments…etc.,

Unit-V: Group Discussion and Interview Skills –Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas and Rubrics of Evaluation-Concept and Process, Pre-interview Planning, Opening Strategies, Answering Strategies, Interview through Tele-conference & Video-conference and Mock Interviews.

REFERENCES:

1. Kumar, Sanjay and Pushpa Latha. English for Effective Communication, Oxford UniversityPress, 2015.
2. Konar, Nira. English Language Laboratories –A Comprehensive Manual, PHI Learning Pvt.Ltd.

21MC0005: INDIAN CONSTITUTION

B. Tech. III Year I Sem **L T P C**
3 0 0 0

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments.

The Constitution of India reflects the idea of "Constitutionalism" –a modern and progressive concept historically developed by the thinkers of "liberalism" –an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950.

The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world".

COURSE CONTENT:

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status

6. The Directive Principles of State Policy –Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India –The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government –Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

APTITUDE AND LOGICAL REASONING

B.Tech. III Year I Sem. **L T P C**

Course Code: 21MC0006 3 0 0 0

Course Objectives:

1.Student learns the techniques to solve all the problems in his real life.
2.It can improve the numerical ability.
3.The quicker methods are useful to solve the problems within the time and it is helpful in his duties.
4.Quantative Aptitude helps in solving the practical life problems.
5.Students can use Quantitative Aptitude in everyday life to figure out mathematically.
6.Student can improve his mental capacity.
7.It helps in sharpening their minds.

UNIT I

Number System, Percentages, Profit And Loss, Simple Interest - Compound Interest, Partnership Ratio And Proportion ,Chain Rule, Time And Work - Pipes And Cistern, Time And Distance - Problems On Trains, Boats And Streams, Races And Games Of Skill

UNIT II

Average, Alligation And Mixture, Permutation-Combination, Probability, Geometry (Co-Ordinate, Solid-2d Areas & 3d Volumes), D I (Tabulation, Bar Graphs, Pie Charts & Line Graphs), Elementary Statistics

UNIT III:

Series Completion, Analogy, Classification / Odd One Out, Coding – Decoding, Blood Relations, Deciphering Jumbled up Descriptions,

UNIT IV:

Relation Puzzle, Direction sense test, Number, Ranking & Time Sequence Test, Puzzle Test, Seating Arrangements Comparison Type Questions, Sequential Order of Things, Selection Based on gave conditions,

UNIT V

Family – Based Puzzles, Jumbled Problems. Logical Venn Diagrams
Alpha Numeric Sequence Puzzle, Cubes, Dice, Clocks, Calendar, Data Sufficiency, Syllogism.

TEXT BOOKS:

1. Quantitative Aptitude by R.S.Agarwal
2. Quantitative Aptitude by Abhijit Guha
3. Quantitative Aptitude for Competative Examinations, U.Mohan Rao, Scitech Publication.

SUMMER INTERNSHIP

B.Tech. III Year I Sem.	L T P C
Course Code: 21EC3181	- - - 1

VLSI DESIGN

B.Tech. III Year II semester **L T P C**
Course Code: 21EC3211 **3 1 0 4**

Prerequisites - Electronic Devices and Circuits, Digital logic Design

Course Objectives: The objectives of the course are to:

1. Give exposure to different steps involved in the fabrication of ICs and electrical properties using MOS Transistor analyze the behavior of inverters designed with various loads.
2. Give exposure to the design rules to be followed to draw the layout of any logic circuit.
3. Provide concept to design different types of logic gates using CMOS inverter and
4. Provide design concepts to design building blocks of data path of any system using gates.
5. Acquire the fundamentals on Analog CMOS ICs

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

1. Acquire qualitative knowledge about the fabrication process of integrated circuitusing MOS transistors.
2. Draw the layout of any logic circuit which helps to understand and estimate parasitic of any logic circuit
3. Understand Gate level designs of different gates and driving capacitive Loads.
4. Provide design concepts required to design building blocks of data path using gates and design of simple memories using MOS Transistors.
5. Understand the concepts of CMOS Amplifiers.

UNIT – I

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS
Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: Ids Vds relationships, MOS transistor threshold Voltage, gm, gds, Figure of merit ωo; Pas 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, 2 μm CMOS Design rules for wires, Contacts and 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,

Choice of layers.

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

CMOS Amplifiers: CS, CD amplifiers, Differential Amplifiers, Cascode Amplifiers, Current Mirrors- Wilson mirror, Wildar mirror, Single stage op-amp

TEXT BOOKS:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, PHI, 2005 Edition
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.
3. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

REFERENCE BOOKS:

1. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
2. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
3. Design of Analog CMOS Integrated Circuits, Behzad Razavi, TMH Edition

DIGITAL SIGNAL PROCESSING

B.Tech. III Year II Semester **L T P C**

Course code: 21EC3212 **3 0 0 3**

Prerequisite: Signals and Systems

Course Objectives:

1. To provide background and fundamental material for the analysis and processing of digital signals.
2. To understand the fast computation of DFT and appreciate the FFT processing.
3. To study the designs and structures of digital IIR filters and analyze and synthesize for a given specifications.
4. To study the designs and structures of digital FIR filters and analyze and synthesize for a given specifications
5. 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

1. Understand the LTI system characteristics and Multirate signal processing.
2. Understand the inter-relationship between DFT and various transforms.
3. Design a IIR filter for a given specification.
4. Design a FIR filter for a given specification
5. Understand 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 Multirate 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. 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.

REFERENCES:

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

DATA COMMUNICATIONS AND NETWORKS

B.Tech. III Year II semester **L T P C**
Course Code: 21EC3213 **3 0 0 3**

Pre-requisite: Digital Communications

Course Objectives:

1. To introduce the Fundamentals of data communication networks
2. To demonstrate the Functions of various protocols of Data link layer.
3. To demonstrate Functioning of various Routing protocols.
4. To introduce the Functions of various Transport layer protocols.
5. To understand the significance of application layer protocols

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

1. Know the Categories and functions of various Data communication Networks
2. Design and analyze various error detection techniques.
3. Demonstrate the mechanism of routing the data in network layer
4. Know the significance of various Flow control and Congestion control Mechanisms
5. Know the Functioning of various Application layer Protocols.

UNIT - I:

Introduction to Data Communications: Components, Data Representation, Data Flow, Networks- Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks Inter connection of Networks, The Internet-A Brief History, The Internet Today, Protocol and Standards -Protocols, Standards, Standards Organizations, Internet Standards. Network Models, Layered Tasks, OSI model, Layers in OSI model, TCP/IP Protocol Suite.

UNIT - II:

Data Link Layer: Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC) , Framing, Flow Control and Error Control protocols , Noisy less Channels and Noisy Channels, HDLC, Multiple Access Protocols, Random Access ,ALOHA, Controlled access, Channelization Protocols. Introduction to 802.11 architecture a-g, IEEE 802.11 Frame

UNIT - III:

The Network Layer: Introduction, Forwarding and Routing, Network Service Models, Virtual Circuitand Datagram Networks-Virtual-Circuit Networks, Datagram Networks, Origins of VC and DatagramNetworks, Inside a Router-Input Processing, Switching, Output Processing, Queuing, The Routing Protocol, The Internet Protocol(IP):Forwarding and Addressing in the Internet-

Datagram format, Ipv4 Addressing, Internet Control Message Protocol(ICMP),IPv6

UNIT - IV:

Transport Layer: Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP-UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N(GBN), Selective Repeat(SR), Connection Oriented Transport: TCP - The TCP Connection, TCP Segment Structure, Round Trip Time Estimation and Timeout, Reliable Data Transfer, Flow control, TCP Connection Management, Principles of Congestion Control-The Cause and the Costs of Congestion, Approaches to Congestion Control

UNIT - V:

Application Layer: Principles of Networking Applications – Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP,- FTP Commands and Replies, Electronic Mail in the Internet- STMP, Comparison with HTTP, DNS-The Internet's Directory Service – Service Provided by DNS, Overview of How DNS Works, DNS Records and messages.

TEXTBOOKS:

1. Computer Networking A Top-Down Approach–Kurose James F,KeithW, 6th Edition, Pearson.
2. Data Communications and Networking Behrouz A. Forouzan 4 Edition McGraw-Hill Education

REFERENCES:

1. Data communication and Networks - Bhusan Trivedi, Oxford university press, 2016
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education Understanding Communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning

ANTENNAS AND WAVE PROPAGATION

B.Tech. III Year II Sem. **L T P C**

Course Code: 21EC3214 **3 0 0 3**

Course Objectives: The course objectives are:

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 antennas and 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 ULAs and 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 their profiles and parameters involved.

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

1. Explain the mechanism of radiation, definitions of different antenna characteristic parameters and establish their mathematical relations.
2. Characterize the antennas based on frequency, configure the geometry and establish the radiation patterns of VHF, UHF and Microwave antennas.
3. Carry out the Linear Array Analysis, estimate the array factor and characteristics and sketch the pattern for 2-element array, N-element BSA, EFA, modified EFA, Binomial Arrays.
4. Specify the requirements for microwave measurements and arrange a setup to carry out the antenna far zone pattern and gain measurements in the laboratory.
5. Classify the different wave propagation mechanisms, determine the characteristic features of different wave propagations, and estimate the parameters involved.

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, FieldZones, 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: Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire

Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays.
Arrays with Parasitic Elements, Folded Dipoles and their Characteristics, Yagi-Uda Array

UNIT - III:
VHF, UHF and Microwave Antennas: 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. **Paraboloidal Reflectors** – Geometry and general properties of parabola, Patterns of large circular aperture with uniform illumination, Feed Methods, Reflector Types – Related problems

UNIT - IV
Microstrip Antennas– Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Radiation pattern and feed methods.

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 - 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. Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, TMH, NewDelhi, 4th ed., 2010. (Special Indian Edition)
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000.
3. Antenna Theory- C.A. Balanis, John Wiley & Sons, 2nd ed., 2001.

REFERENCES BOOKS

1. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, NewDelhi, 2001

EMBEDDED SYSTEM DESIGN

(Professional Elective - II)

B.Tech. III Year II Sem. **L T P C**

Course Code: 21EC3271 **3 0 0 3**

Course objectives

1. Understand the basics and applications of an embedded system
2. learn the method of designing an embedded system for any type of application
3. Firmware design approach of an embedded system
4. understand operating system concepts , RTOS Architecture
5. understand the Task Communication and Device Drivers. How to Choose RTOS

Course outcomes

By the end of this course, Students should be able to

1. understand the design flow of an embedded system and they can implement this on real time embedded systems.
2. able to differentiate different types of processors and interfacing memory types to design an embedded systems.
3. design control circuits for embedded system and develop the programs using programming languages.
4. to learn about RTOS for Embedded system Design, multiprocessing, multitasking techniques.
5. analyze Task Communications and Synchronization techniques in RTOS and task synchronization and latency issues

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

Integration and Testing of Embedded Hardware and Firmware: Integration of Hardware and Firmware, Boards Bring up

The Embedded System Development Environment: The Integrated Development Environment (IDE), Types of files generated on Cross-Compilation, Disassembler / Decompiler, Simulators, Emulators and Debugging, Target Hardware Debugging, Boundary Scan.

TEXT BOOKS:

1. Shibu K V, "Introduction to Embedded Systems", Second Edition, Mc Graw Hill

REFERENCES:

1. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill
2. Frank Vahid and Tony Givargis, "Embedded Systems Design" – A Unified Hardware /Soft-ware Introduction, John Wiley
3. Lyla, "Embedded Systems" –Pearson
4. David E.Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.

DEEP LEARNING

(Professional Elective - II)

B.Tech III Year II Sem.	**L T P C**
Course Code: 21EC3272	**3 0 0 3**

Course Objectives:

1. Introduced to the basic concepts of neural networks.
2. To Identify and analyze the various types of neural networks and models of neuron and apply accordingly.
3. Introduce the concept of deep learning and its types.
4. Explore the concepts of applications of deep learning.
5. Understand recursive networks, memory, Stochastic Encoders and Decoders

Course Outcomes:

Upon completing this course students will be able to:

1. Analyze and apply the basic the concepts of neural networks
2. Analyze various types of neural networks and use various activation functions to solve complex problems.
3. Relate the concept of deep learning and its architecture.
4. Design and carryout empirical analysis for various types of applications of deep learning systems.
5. Analyze recursive networks, memory, Stochastic Encoders and Decoders.

UNIT-I- Introduction to Neural networks: Characteristics of Neural Networks, Historical Development of Neural Networks Principles, Artificial Neural Networks: Terminology, Models of Neuron, Topology, Basic Learning Laws, Pattern Recognition Problem, Basic Functional Units, Pattern Recognition Tasks by the Functional Units. Introduction, Analysis of pattern Association Networks, Analysis of Pattern Classification Networks, Analysis of pattern storage Networks. Analysis of Pattern Mapping Networks.

UNIT – II-Feedback Neural Networks: Introduction, Analysis of Linear Auto associative FF Networks, Analysis of Pattern Storage Networks. Competitive Learning Neural Networks & Complex pattern Recognition

Introduction, Analysis of Pattern Clustering Networks, Analysis of Feature Mapping Networks, Associative Memory.

UNIT-III: Fundamentals of Deep Learning: Defining Deep Learning, Common architectural principles of Deep Networks, Building Blocks of Deep Networks, and Major architectures of Deep Networks: Unsupervised Pre trained Networks, Convolution Neural Networks (CNNs), Recurrent Neural Networks.

UNIT-IV: Convolution Neural Networks: The convolution operation, motivation, pooling, Convolution and Pooling as an Infinitely Strong Prior, Applications of deep learning: Large scale deep learning, Computer vision, Speech Recognition, Natural Processing, other applications.

UNIT V: Sequential Modelling Recurrent neural networks: Recursive neural networks, The long short – term Memory, explicit memory, Auto encoders: Under complete, regularized, Stochastic Encoders and Decoders, Denoising Auto encoders

TEXT BOOKS:

1. Artificial Neural Networks B. Yagna Narayana, PHI.(Chapter 1,2 and 3)
2. Deep Learning: A Practitioner's Approach by Josh Patterson, Adam Gibson.
3. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book inpreparation. (2015)-http://www.deeplearningbook.org/

REFERENCES:

1. Neural Networks by Simon Haykin PHI
2. Deep learning (Adaptive computation &Machine learning) by Ian Good Fellow, Yoshua Bengio,Aran Courville.
3. Fundamentals of Neural Networks: Architectures, Algorithms and Applications, by Fausett.

SPREAD SPECTRUM COMMUNICATION

(Professional Elective-II)

B.Tech. III Year I Sem. **L T P C**

Course Code: 21EC3273 **3 0 0 3**

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

1. Understand the concept of Spread Spectrum and study various types ofSpread spectrum sequences and their generation.
2. Understand the principles of Code Division Multiple Access (CDMA) anduse of Spread spectrum concept in CDMA
3. Understand various Code tracing loops for optimum tracking of wideband signals.
4. Understand the procedure for synchronization of receiver for receiving the Spread spectrum signal.
5. Study the performance of spread spectrum systems in Jamming environment.

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

1. Generate various types of Spread spectrum sequences
2. Apply principles of Code Division Multiple Access (CDMA) and use of Spread spectrum concept in CDMA
3. Can provide various Code tracing loops for optimum tracking of wideband signals.
4. Analyze the performance of Spread spectrum systems in Jamming environment.
5. Analyze the performance of Spread spectrum systems with Forward Error Correction.

UNIT – I

Introduction to Spread Spectrum Systems: Fundamental Concepts of Spread Spectrum Systems, Pseudo Noise Sequences, Direct Sequence Spread Spectrum, Frequency Hop Spread Spectrum, Hybrid Direct Sequence Frequency Hop Spread Spectrum, Code Division Multiple Access.

Binary Shift Register Sequences for Spread Spectrum Systems: Introduction, Definitions, Mathematical Background and Sequence Generator Fundamentals, Maximal Length Sequences, Gold Codes.

UNIT – II

Introduction to random processes, Wide-Sense Stationary (WSS), Autocorrelation, Power Spectral Density(PSD).

Code Tracking Loops: Introduction, Optimum Tracking of Wideband Signals, BaseBand Delay-Lock Tracking Loop, Tau-Dither Non- Coherent Tracking Loop.

UNIT – III

Initial Synchronization of the Receiver Spreading Code: Introduction, Problem Definition and the Optimum Synchronizer, Serial Search Synchronization Techniques, Synchronization by Estimated the Received Spreading Code.

UNIT – IV

Cellular Code Division Multiple Access (CDMA) Principles: Introduction, Wide Band Mobile Channel, the Cellular CDMA System, Single User Receiver in a Multi User Channel, CDMA System Capacity, Multi-User Detection in CDMA Cellular Radio: Optimal Multi-User Detection, Linear Suboptimal Detectors, Interference Combat Detection Schemes, Interference Cancellation Techniques.

UNIT - V

Performance of Spread Spectrum Systems in Jamming Environments: Spread Spectrum Communication System Model, Performance of Spread Spectrum Systems without Coding. Performance of Spread Spectrum Systems with Forward Error Correction: Elementary Block Coding Concepts, Optimum Decoding Rule, Calculation of Error Probability, Elementary Convolution Coding Concepts, Viterbi Algorithm, Decoding and Bit-Error Rate.

TEXT BOOKS:

1. Rodger E Ziemer, Roger L. Peterson and David E Borth - "Introduction to Spread Spectrum Communication- Pearson, 1st Edition, 1995.
2. Mosa Ali Abu-Rgheff– "Introduction to CDMA Wireless Communications." Elsevier Publications, 2008.

REFERENCE BOOKS:

1. George R. Cooper, Clare D. McGillem - "Modern Communication and Spread Spectrum," McGraw Hill, 1986.
2. Andrew j. Viterbi - "CDMA: Principles of spread spectrum communication," Pearson Education, 1stEdition, 1995.
3. Kamilo Feher - "Wireless Digital Communications," PHI, 2009.
4. Andrew Richardson - "WCDMA Design Handbook," Cambridge University Press, 2005.
5. Steve Lee - Spread Spectrum CDMA, McGraw Hill, 2002.

DATA SCIENCE AND DATA ANALYTICS

(Professional Elective – II)

B.Tech. III Year II Sem. **L T P C**

Course Code: 21EC3274 **3 0 0 3**

Course objectives :

1. To introduce the concepts of Data analytics, Big data and data visualization tools
2. To introduce the Applications of modeling in business.
3. To introduce regression concepts, analytical applications to various business domains.
4. To understand object segmentation.
5. To know data visualization techniques.

Course outcomes : By the end of the course students will be able to

1. Understand Data analytics, Big data and data visualization tools
2. Understand the need and Applications of modelling in business.
3. Understand regression concepts, analytical applications to various business domains.
4. Understand object segmentation.
5. Understand data visualization techniques.

UNIT - I

Introduction to Data Analytics: Introduction to Data- Importance of analytics- Data for Business Analytic-Big Data- Business Analytics in Practice. Data Visualization- Data Visualization tools Data Queries statistical methods for summarizing data, exploring data using pivot tables.

UNIT - II

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modelling in Business, Databases & Types of Data and variables, Data Modelling Techniques, Missing Imputations etc. Need for Business Modelling.

UNIT - III

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc. Logistic Regression: Model Theory, Model fit Statistics,Model Construction, Analytics applications to various Business Domains etc.

UNIT - IV

Object Segmentation: Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building– Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc. Time SeriesMethods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model asHeight, Average Energy etc and Analyze for prediction

UNIT - V

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS:

1. Student's Handbook for Associate Analytics – II, III. R18 B.Tech.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.
3. Business Analytics, James evans, 2 edition Pearson 2017.

REFERENCE BOOKS:

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway Labs Jeffrey DUllman Stanford Univ.

VLSI- DESIGN LAB

B.Tech. III Year II Semester **L T P C**

Course Code: 21EC3251 0 0 3 1.5

Course objectives: Train the students

1. To understand the design of analog and digital circuits using CAD tools.
2. To understand the DRC rules for layout design.
3. To understand the process of physical verification, floor planning.
4. To understand the circuit optimization with respect to area, power and delay.
5. To analyze the results of logic and timing simulations and to extract the parasitics.

Course outcomes: By the end of the course student will be able to

1. Design CMOS logic circuits.
2. Simulate circuits within a CAD tool and compare to design specifications.
3. Design Layout, physical verification, placement & route for complex design.
4. Designing of optimized layouts satisfying DRC rules with respect to area, power and delay
5. Analyze DC/Transient characteristics of analog/digital design and to extract the parasitics.

List of Experiments

- Design and implementation of the following CMOS digital/analog circuits using **Cadence /Mentor Graphics / Synopsys /Equivalent** CAD tools.
- The design includes layout and Scaling of CMOS Inverter using design rules
- Circuit optimization with respect to area,performance and/or power and delay
- Design of Layout, Extraction of Parasitics and DC/ Transient analysis, Verification of layouts (DRC, LVS)

1. CMOS inverter schematic and layout
2. CMOS NOR gates schematic and layout
3. CMOS NAND gates schematic and layout
4. Design of any Boolean expression using AOI/OAI gates
5. Transmission gate layout
6. Design a 2:1 Mux using Transmission gate
7. Latch schematic and layout
8. Perform AC analysis of CS amplifier
9. Perform AC analysis of CD amplifier
10. Differential Amplifier layout
11. Single stage Op-amp
12. Current mirror

Note: Any **TEN of** the above 12 experiments are to be conducted

DIGITAL SIGNAL PROCESSING LAB

B.Tech. III Year II Semester	**L T P C**
Course Code: 21EC3252	**0 0 3 1.5**

Course Objectives:

1. To generate the elementary signals/ waveforms.
2. To plot frequency response of a given LTIsystem
3. To Calculate and Plot DFT / IDFT and FFT of given DT signal.
4. To develop algorithms for designing and implementation of FIR and IIR filters with standard techniques.
5. To develop the Multirate signal processing.

Course Outcomes

1. Able to generate elementary signals/ waveforms and perform arithmetic operations on signals.
2. Able to plot frequency response of a given system and verify the properties of LTI system.
3. Analyze the digital signals using various digital transforms DFT, FFT etc.
4. Able to Implement FIR and IIR filter for a given sequence and calculate the filter coefficients.
5. Able to Implement Decimation and Interpolation Process the sampling rate.

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 has to 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 System

DATA COMMUNICATIONS AND NETWORKS LAB

B.Tech. III Year II Semester **L T P C**

Course code: 21EC3253 **0 0 2 1**

Course Objectives:

1. To introduce the Fundamentals of data communication networks
2. To demonstrate the Functions of various protocols of Data link layer.
3. To demonstrate Functioning of various Routing protocols.
4. To introduce the Functions of various Transport layer protocols.
5. To understand the significance of application layer protocols

Course Outcomes:

1. Demonstrate the physical connections in Data Communication networks.
2. Demonstrate the queuing techniques in various links of Data Communication networks.
3. Verification of various routing protocol functionalities.
4. Verifying the functionalities of Application protocols.
5. Knowledge of different packets involved in various transmission data.

A. Minimum of 12 Experiments have to be conducted
B. All the Experiments may be Conducted using Network Simulation software like NS-2, NSG-2.1 and Wire SHARK/equivalent software.

Note: For Experiments 2 to 10 Performance may be evaluated through simulation by using the parameters Throughput, Packet Delivery Ratio, Delay etc.

1. Generate a TCL Script to create two nodes and links between nodes
2. Generate a TCL Script to transmit data between nodes
3. Evaluate the performance of various LAN Topologies
4. Evaluate the performance of Drop Tail and RED queue management schemes
5. Evaluate the performance of CBQ and FQ Scheduling Mechanisms
6. Evaluate the performance of TCP and UDP Protocols
7. Evaluate the performance of TCP, New Reno and Vegas
8. Evaluate the performance of AODV and DSR routing protocols
9. Evaluate the performance of AODV and DSDV routing protocols
10. Evaluate the performance of IEEE 802.11 and IEEE802.15.4
11. Capturing and Analysis of TCP and IP Packets
12. Simulation and Analysis of ICMP and IGMP Packets
13. Analyze the Protocols SCTP, ARP, NetBIOS, IPXVINES
14. Analysis of HTTP, DNS and DHCP Protocols

Major Equipment Required:

Required software (Open Source) like NS-2, NSG-2.1 and Wire SHARK

YOGA AND INDIAN PHILOSOPHY

B.Tech. III Year II Semester **L T P C**

Course code: 21MC0007 **3 0 0 0**

Unit-1

Bhagavad Gita, chapter 2 SankhyaYoga slokas 54-72 about emotional intelligence(Stitaprajnata)

Unit-2

Bhagavad Gita, chapters 3-7

Unit-3

Bhagavad Gita, chapters 8-11

Unit-4

Bhagavad Gita, chapters 12-15

Unit-5

Bhagavad Gita, chapters 16-18

10 quotes from each chapter of ref.(2)

References:

1) Bhagavad Gita By Swami Swarupananda, R K Math Publication
2) Vivekananda-His Call to the Nation, R K Math Publication