Department of Electronics and Telecommunication Engineering

Course Title: Analog Circuits **Semester: V**
Course Code: 25UET501T **Course Category: PCC**
eaching Scheme: L – T – P **Total Credits: 03**
3 – 0 – 0

Course Objectives:

The objective of this course is to

1. To study the basic characteristic, construction, open loop & close loop operations of Op- Amp.
2. To study linear and non linear applications of Op-Amp.
3. To study the applications of PLL and timer IC 555 as multivibrators.
4. To enable students to use regulator regulator ICS.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

1. Describe the basic operation of differential Amplifier using transistor and its characteristic.

2. Design of different linear Op-Amp circuits for various practical applications.

3. Design of diffrenrt non-linear Op-Amp circuits for various practical applications using IC555.Design of PLL as a frequency multiplier .

5. Design of Astable & Monostable multivibrators using IC 555.

6. Describe applications of regulator Ics 723,317 and 78XX series.

Course Content:

UNIT I

[08 Hours]

OP-Amp Fundamentals:
Block diagram of operational amplifier, Differential amplifiers using transistors.Op-Amp parameters, virtual ground concept, Ideal OP-Amp, Equivalent circuit,Voltage Transfer curve, Inverting & non inverting configurations.

UNIT II

[08 Hour]

OP-Amp Linear Applications:
Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier with three Op-amp and applications, Integrator and differentiators, Peak detector.

UNIT III

[07 Hours]

OP-Amp Non-Linear Applications:
Comparators, Schmitt trigger, Precision Rectifier. Multivibrators: Bistable, Monostable, Astableusing Op-Amp, Sample/Hold circuits,

UNIT IV

[07 Hours]

Phase Locked Loop (PLL)
PLL -Functional block diagram,working,specifications of NE 565.Applications of PLL as a Frequency divider ,Frequency multiplier.

UNIT V

[07 Hours]

Timer IC 555
Functional block diagram of IC555,pin diagram of IC 555 .Applications of IC 555 Multivibrators: Bistable, Monostable, Astable multivibrator circuits using IC 555, .

UNIT V

[08 Hours]

Voltage Regulators

Specifications ,functional block diagram and applications of IC 723,,78XX series voltage regulators and LM 317,principles and working of switching mode regulators

Textbooks:

1. David A. Bell, 'Op-amp & Linear ICs', Oxford, 2013.
2. D. Roy Choudhary, Sheil B. Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.
3. Ramakant A. Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, PearsonEducation, 2003 / PHI. 2000.

Reference books:

1. Linear Integrated Circuits Manual I, II, and III: National Semiconductor.
2. Linear Applications Handbook National Semiconductors.
3. Regulated Power supply Handbook. Texas Instruments.
4. Operational Amplifier Design and Applications Tobey, Graham, Huelsman McGraw Hill.

Analog Circuits Laboratory

Course Title: Analog Circuits | **Semester: IV**
Course Code: 25UET501P | **Course Category:PCC**
Teaching Scheme: L – T – P | **Total Credits: 01**
0 – 0 – 2

Course Objectives:

To understand the basic performance parameter of an Operational Amplifier.
2. To study Linear and Non-linear applications of an op-amp.
3. To study applications of PLL and Timer IC 555
4. To study applications of regulator IC 723 and IC 7805/7812.

Course Outcomes:

At the end of this course students will be able to
1.Design an op-amp based Inverting & Non inverting amplifier.
2.Design an op-amp based Comparators,Schmitt Trigger,Integrator & Differentiator.
3.Design of Monostable & Astable multivibrators using IC 555.
4.Design of voltage regulators using IC723 and IC 7805/7812.

List of Experiments: (Perform any 8 – 10 Experiments)

Sr. No.	Experiment
1	Design & verification of op-amp based Inverting and Non inverting amplifiers to determine frequency response.
2	Design & verification of op-amp based Non inverting amplifiers to determine frequency response.
3	Design & verification of op-amp based Summing,Scaling and Averaging amplifiers.
4	Design of op-amp based practical differentiator to observ Input-Output waveforms and find its frequency response.
5	Design of op-amp based practical integrator to observ Input-Output waveforms and find its frequency response.
6	Design of op-amp based Astable and Monostable multivibrators.
7	Design of Schmitt Trigger using op-amp IC 741 to find Hysterisis Voltage.
8	Design a precission rectifier circuit using op-amps .
9	Design of Zero Crossing detector using op-amp.
10	Design of monostable multivibrator using IC 555 to determine percentage duty cycle.
11	Design of Astable multivibrator using IC 555 to determine percentage duty cycle.
12	Design of PLL as a frequency multiplier using IC 565.
13	Study of op-amp based peak detector .
14	Study of applications of regulator IC 723.
15	Study of voltage regulator IC 7805/7812.

Department of Electronics and Telecommunication Engineering

Course Title: Digital signal Processing **Semester: V**
Course Code: 25UET502T **Course Category: PCC**
Teaching Scheme: L – T – P **Total Credits: 04**
3 – 1 – 0

Prerequisites: Basic knowledge of Signals & Systems, and its analysis

Course Objectives:

The objective of this course is to

1. Analyze discrete time signals and system.
2. Apply Fourier Transform and Concepts of frequency domain analysis using different DFT algorithms
3. Learn the Discrete time signal processing in z domain & Its relationship with other domain and it's analysis.
4. Learn design aspects of FIR digital filters.
5. Learn design aspects of IIR digital filters.
6. Learn and apply Wavelet Transform.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

1. Illustrate and Analyze discrete time signals and system.
2. Apply discrete Fourier transform, its properties & Analyze the discrete time systems in frequency domain.
3. Apply Z Transform to siganls and systems .
4. Realize and Draw the structures of various discrete time systems or transfer Functions.
5. Design the IIR and FIR digital filters by Understanding the filter design techniques determine parameters affecting its response.
6. Apply Wavelet Transform techniques in various applications.

Course Content:

UNIT I

[07 Hours]

Introduction to Digital Signals and System

Sampling theorem, sampling process and reconstruction of sampling data.Discrete time signals & systems :Elementary Discrete time signals, Characteristics of systems, LTI systems, linear convolution, Correlation Multirate Digital Signal Processing-Down sampling, Up sampling, Sampling Rate Conversion

UNIT II

[07 Hours]

Discrete Fourier Transforms

Frequency domain sampling: DFT/IDFT, Computation of DFT, Properties of DFT, Circular convolution, Computation of DFT using FFT algorithm – Decimation in time, Decimation in Frequency using radix 2 FFT – Butterfly structure. Filtering of long data sequence, complexity of DFT and FFT algorithm.

UNIT III

[08Hours]

Realization of Digital Filters

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, Realization of digital filters - Direct, Canonic, Cascade and Parallel forms

UNIT IV

[07 Hours]

IIR Filter Design

Bilinear transformation, Impulse invariant transformation, Lowpass IIR digital filters,Butterworth and Chebyshev filter, Spectral transformations.

UNIT V

[08 Hours]

FIR Filter Design

Introduction to FIR, Magnitude and Phase response of digital Filters, FIR filter design using windowing techniques (Rectangular, Hann, Hamm),Frequency sampling technique, Effects of Finite Word Length in Digital Filter, Rounding and Truncation
errors.

UNIT VI

[08 Hours]

Introduction to Wavelet transform

Introduction to Short Time Fourier Transform(STFT), Discrete Wavelet Transform, Difference between Wavelet transform and fourier transform, Applications of Wavelet Transform.Application of DSP to Speech and Radar signal processing.

Textbooks:

1. J.G. Proakis, D.G. Manolakis “Digital Signal Processing: Principles, algorithms and applications, PHI.
2. A.V. Oppenheim, R.W. Schafer, “Discrete Time Signal Processing”,PHI.
3. Rabiner Gold “Theory and Application of DSP”, PHI

Reference books:

1. Sanjit K. Mitra , ‘Digital Signal Processing – A Computer based approach’
2. S. salivahanan, A Vallavaraj, C. Gnanapriya , ‘Digital Signal Processing’, 2nd Edition McGraw Hill.
3. A. NagoorKani, ‘Digital Signal Processing’, 2nd Edition McGraw Hill.
4. P. Ramesh Babu, ‘Digital Signal Processing’ Scitech2.Sanjit K. Mitra , ‘Digital Signal Processing – A Computer based approach’

Web links:

1. https://www.bits-pilani.ac.in/digital-signal-processing-lab/
2. https://www.gecwc.ac.in/digital-signal-processing-dsp-lab/
3. https://www.srmist.edu.in/lab/digital-signal-processing-dsp-lab/
4. https://vlab.amrita.edu/?sub=3&brch=114

Digital signal Processing Laboratory

Course Title: Digital signal Processing **Semester: V**
Course Code: 25UET502P **Course Category:PCC**
Teaching Scheme: L – T – P **Total Credits: 01**
0 – 0 – 2

Course Outcomes

By the end of the course, the students will be able to.

1. Generate discrete time signals .
2. Demonstrate the sampling of continous time signal & perform different signal operation in developing discrete time system.
3. Analyze and process the signals in the discrete domain.
4. Design the filters to suit requirements of specific applications.
5. Apply the techniques, skills, and modern engineering tools like MATLAB

List of Experiments: (Perform any 8 – 10 Experiments)

Sr.No.	Experiment
1	To plot and represent following basic discrete time signals using MATLAB functions. : Unit impulse, unit step, ramp, real and complex exponential and its representations.
2	Sampling of Continuous time Signal. Reconstruction of Discrete time Signal and Illustration of Aliasing
3	To plot linear convolution of discrete signals using MATLAB functions.
4	To design Decimation filter using MATLAB
5	To design interpolation filter using MATLAB
6	Write a program to find frequency response of given system. (Transfer Function/Differential equation form).
7	To find Z transform of discrete time signal and its ROC with corresponding plot.
8	To find Inverse of Z transform
9	To compute DFT and IDFT of discrete time signals.
10	Write a program to find FFT and IFFT of given sequences.
11	Designing of Digital FIR BandPass filter using MATLAB functions
12	Designing of Digital IIR filter using impulse invariant and Bilinear Transformation method using MATLAB functions
13	Designing of Digital FIR filter using FDA tool box.

Beyond/Additional Syllabus Experiments

Sr.No.	Experiment
1	Write an Assembly language Program to Perform addition of 2 numbers and simulate in CCS using C5416 Processor
2	Write a C language Program to Perform Convolution of 2 numbers and simulate in CCS using C6x Processor
3	Write an Assembly language Program to Perform Subtraction of 2 numbers and simulate in CCS using C5416 Processor
4	Write an Assembly language Program to Perform Multiplication of 2 numbers and simulate in CCS using C5416 Processor
5	Write an Assembly language Program to Perform Division of 2 numbers and simulate in CCS using C5416 Processor
6	Write a C language Program to Generate Sinusoidal signal in CCS using C6x Processor

Reference books:

1. Digital Signal Processing Lab Using MATLAB by Book by Sanjit K. Mitra
2. "Introduction to Digital Signal Processing: A Computer Laboratory T extbook" by M.J.T. Smith and R.M. Mersereau.
3. Digital Signal Processing: Laboratory Experiments Using C and the TMS320C31 DSK by Rulph Chassaing

Department of Electronics and Telecommunication Engineering

Course Title: Electromagnetic Waves **Semester: V**
Course Code: 25UET503 T **Course Category: PCC**
Teaching Scheme: L – T – P **Total Credits: 04**
3 – 1– 0

Prerequisites: Basic Knowledge of Vectors algebra ,Engineering mathematics & Electronics required.

Course Objectives:

The objective of this course is to provide students with understanding of:

1. The concepts & basic theorems of Electric fields & Magnetic Fields.
2. Maxwells Equation,Wave equations & Uniform Plane Wave Propagation.
3. Different Wave propagation media ,Plane wave Propagation concepts
4. The principles of Transmission Lines.
5. The principles of Waveguide .
6. The basics of Antenna and its different parameters.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Describe the different coordinate system & apply Electric Field basic laws & Theorem to solve problems in electrostatics.
2. Explain the theorems of magnetic fields & apply the Maxwell's equations to solve problems in electromagnetic field theory.
3. Analyze the propagation of wave in different transmission media.
4. Analyze the various parameters of the Transmission line
5. Analyze various parameters and characteristics of the rectangular waveguide.
6. Describe the basics of Antenna and its different parameters with derivations of the radiation field, power radiated, and radiation resistance of antennas.

Course Content:

UNIT I

[08 Hours]

Electric Field :

Basics of Vectors, Vector calculus, Coordinate system and concepts of differential surface and differential volume, Basics of Coulombs Law, Gauss Law, Divergence Theorem, Electric potential ,Gradient, Curl.

UNIT II

[07 Hours]

Magnetic Field & Maxwell's equations:

Basics of Magnetic Field, Biot-Savart's Law, Amperes Circuital Law, Stokes Theorem

Maxwell's Equations for Time constant fields and Time Varying fields,Boundary conditions at Media Interface.

UNIT III

[07Hours]

Electromagnetic Waves

Electromagnetic wave equation,Uniform Plane Wave, Wave polarization,phase velocity, Wave propagation in free space, perfect dielectric and perfect conductor, Skin effect, Plane Waves at a Media Interface- Plane wave in arbitrary direction, Plane wave at dielectric interface, Reflection and refraction at media interface, Snell's Law,Total internal reflection Poynting vector and Poynting theorem.

UNIT IV

[07 Hours]

Transmission Lines

Equations of Voltage and Current on TX line, Propagation constant, Characteristic impedance and reflection coefficient, Impedance Transformation, Loss-less and Low Loss Transmission line and VSWR,Types of transmission line, Loading of Transmission Line ,Applications of transmission lines.

UNIT V

[08 Hours]

Rectangular Waveguide

Basics of Waveguide and its types, Comparison of Rectangular waveguide with Transmission Lines, TE,TM and TEM Waves, Field equations for TE and TM waves through rectangular waveguide, Modes in rectangular waveguide, Various losses, Cut-off frequency and wavelength, Phase and Group velocities, Guide Wavelength, Wave impedances in waveguide.

UNIT VI

[08 Hours]

Radiation

Retarded potential,Radiation from the Hertz dipole,Induction field, Radiation Field,Power radiated and equation of Radiation Resistance of hertz, Monopole and Dipole antenna, ,thin linear antenna, Basics of antenna and antenna terminologies,Reciprocity Theorem

Textbooks:

1. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India, 2005
2. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall,India.
3. NarayanaRao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall, 1997.
4. David Cheng, Electromagnetics, Prentice Hall.
5. William H. Hayt Jr.&John A. Buck, Engineering Electromagnetics,McGraw-Hill.

Reference books:

1. R.L. Yadav, Electromagnetic Fields and Waves, Khanna Book Publishing, 2021
2. K.D.Prasad,Antenna & Wave Propagation,Satya Prakashan ,Fourth Edition 2019-20.
3. K.D.Prasad,Electromagnetic Fields& Waves,Satya Prakashan ,Fourth Edition 2019-20.

Department of Electronics and Telecommunication Engineering

Course Title: Wireless Sensor Network
Course Code: 25UET521T
Teaching Scheme: L – T – P
3 – 0 – 0

Semester: V
Course Category: PEC
Total Credits: 03

Prerequisites: Basic Knowledge of Wireless Communication related to sensors used in various applications.

Course Objectives:

The objective of this course is to provide students with understanding of

1. To Introduce wireless sensor network architectures and its applications. .
2. To Introduce available wireless technologies & Communication protocols
3. To understand Transport Control Protocol & Routing strategies in WSN.
4. To understand Network Management for Wireless Sensor Networks.
5. To Introduce sensor network platforms & operating systems and programming tools for sensor network

Course Outcomes:

Upon completion of this course, students will :

1. Describe the advanced knowledge and Principle of wireless sensor network architecture and its application.
2. Demonstrate the knowledge of Radio technology primer & fundamentals of Medium Access Control Protocols.
3. Illustrate the Transport Control Protocols, Routing strategies, Challenges & design issues in wireless sensor network.
4. Describe the principles and architecture of Middleware for Sensor Network.
5. Describe Network Management & Traffic Management for Wireless Sensor Network .
6. Describe various Operating Systems and Hardware for Wireless Sensor Networks.

Course Content:

UNIT I

[08Hours]

Introduction to Wireless Sensor Networks and its Applications:

Introduction and Overview of Wireless Sensor Network Architecture, Sensor node Architecture, Commercial and Scientific Applications of Wireless Sensor Networks, Sensor Taxonomy, wireless network environment.

UNIT II

[07 Hours]

Wireless Transmission Technology and Medium Access Control Protocols:

Radio technology primer, Available wireless technologies, Fundamentals& design issues of Medium AccessControl Protocols for Wireless Sensor Networks, Performance requirements of MAC protocol, Categorize of MAC protocol.

UNIT III

[08Hours]

Traditional Protocols for Wireless Sensor Networks.

Different Wireless Sensor Network protocols : Traditional Transport Control Protocols, UDP,Mobile IP, transport protocol design issues, Existing transport control protocol:CODA,GARUDA,ATP

UNIT IV

[08 Hours]

Routing strategies & Middleware for Wireless Sensor Networks:

Data dissemination and gathering.Routing Challenges and design issues in wireless sensor network, Routingstrategies in WSN.Principles & Architecture of Middleware for Sensor Networks ,Data related function of middleware, Existing middleware: Milan, DSWare, IrisNet.

UNIT V

[07 Hours]

Network Management for Wireless Sensor Networks:

Network Management for Wireless Sensor Networks, Requirements, Design issues, Examples of management Architecture: MANNA,

UNIT VI

[08 Hours]

Operating Systems and Hardware for Wireless Sensor Networks:

Introduction Operating System & its Design Issues, Examples of Operating Systems: TinyOS, MANTIS, Hardware: Mica Mote.Introduction to Network Simulator 2 & 3.

Text Books:

1. “Wireless Sensor Networks: Technology, Protocols, and Applications”, Kazem Sohraby, Daniel Minoli, Taieb Znati, Wiley Interscience Publication, 2007
2. “Protocols and Architecture for Wireless Sensor Networks”, H.Karl and A.Wiling, John Wiley & Sons, India,2012.
3. C. S. Raghavendra, Krishna M. Sivalingam, Taieb F. Znati , ‘Wireless sensor networks’,Edition: 2, Published by Springer, 2004 .

Reference Books:

1. Morgan Kaufmann F. Zhao and L. Guibas, ‘ Wireless Sensor Networks’,San Francisco, 2004.
2.“Computer Networks”, Andrew Tanenbaum, 4th Edition, Pearson Education,2007

Program Elective–I(Wireless Sensor Network) Laboratory

Course Title:Wireless Sensor Network) **Semester: V**
Course Code: 25UET521P **Course Category: PEC**
Teaching Scheme: L – T – P **Total Credits: 01**
0 – 0 – 2

Course Outcomes

By the end of the course, the students will be able to.

1.To verify the implementation results on software like NS2 and simulate different networking models and implement different networking protocols.

2.To understand different data transmission techniques using TCP and UDP Protocol.

3.To analyze and implement various routing strategies for wireless sensor network

List of Experiments: (Perform any 8 – 10 Experiments)

Sr. No.	Experiment
1	Introduction of Wireless sensor network applications and its simulation.
2	Network Simulator installation of wireless sensor network.
3	Generate TCL script for UDP and CBR traffic in WSN nodes.
4	Generate TCL script for TCP and CBR traffic in WSN nodes.
5	Write TCL script for sensor nodes with different parameters.
6	Write TCL script for transmission between mobile nodes.
7	Implementation of routing protocol in NS2 for AODV protocol.
8	Implementation of routing protocol in NS2 for DSR protocol.
9	Implementation of routing protocol in NS2 for TORA protocol.
10	Study other wireless sensor network simulators.

Department of Electronics and Telecommunication Engineering

Course Title: Error Control Coding **Semester: V**
Course Code: 25UET522T **Course Category: PE-I**
Teaching Scheme: L – T – P **Total Credits: 03**
3 – 0 – 0

Prerequisites:Information Theory

Course Objectives:

The objective of this course is to provide students with understanding of.

1. The principles and applications of Information Theory and Error Control Coding in communication systems.
2. The theoretical framework upon which error-control codes are built.
3. Aspects of error control codes used in communication systems.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

1. Describe the fundamentals of Information theory in Communication System.
2. Recognize the fundamentals of Error Control Code.
3. Examine block codes for error detection and correction
4. Analyze cyclic codes for error detection and correction .
5. Design encoder and study decoding techniques for convolutional codes.
6. Interpret encoding,decoding and comparision between LDPC & Block Codes.

Course Content:

UNIT I

[07 Hours]

Introduction to Information Theory :

Introduction to Information theory,Uncertainity and Information,Average Mutual information and entropy,communication channel and its type,channel capacity, redundancy and efficiency of channels

UNIT II

[07 Hours]

Introduction to Error Control Coding :

Introduction and History of Error Control Coding ,Digital Coomunication System ,Elements & Applications, types of errors,types of codes, error control strategies,Important keywords in error control coding techniques.

UNIT III

[08 Hours]

Block Codes :

Introduction to block codes, single parity check codes, product codes,repetition codes, hamming 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, minimum distance of block codes, soft - decision decoding, automatic repeat request schemes, applications of block codes for error control in data
storage system

UNIT IV

[08 Hours]

Cyclic Codes:

Definition of cyclic codes, polynomials, generator polynomials, encoding cyclic codes, decoding cyclic codes, generator and parity-check matrices of cyclic codes,syndrome computation and error detection, decoding, cyclic hamming codes, shortened cyclic codes, error-trapping decoding for cyclic codes, dual
cyclic codes.

UNIT V

[08 Hours]

Convolutional Codes:

Encoding and state, tree and trellis diagrams, maximum likelihood decoding of convolution codes -Viterbi algorithm, sequential decoding -stack algorithm, interleaving techniques – block and convolutional interleaving, ARQ – types of ARQ,performance of ARQ, probability of error and throughput.

UNIT VI

[07 Hours]

LDPC & Turbo Code:

Brief History,Defination ,main features,regular and Irregular LDPC Code, The UMTS Turbo code,Encoding and decoding principle,applications,comparision between LDPC and Turbo Code.

Textbooks:

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
3. R.Togneri, C.J.S deSilva, Fundamentals of Information Theory and Coding Design,Taylor and Francis

Reference books:

1. Digital Communications- John G. Proakis, 5th ed., 2008, TMH.
2. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Edition, 2009, TMH.
3..Error control coding from theory to practice by Peter Sweeney - JOHN WILEY & SONS, LTD

Course Title: Error Control Coding **Semester: V**
Course Code: 25UET522P **Course Category: PE-I**
Teaching Scheme: L – T – P **Total Credits: 01**
0 – 0 – 2

Course Objectives:

1. To interpret the various conceps o f Information Theory Communication system .
2. To summarie the various conceps of Error Control Coding in communication systems.
3. To evaluate various error control codes in communication systems.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability:

1. To analyze various concepts of Information Theory in Communication system
2. To recognize the fundamentals of Error Control Code.
3. To analyze and evaluate different error control coding methods for error detection and correction .

List of Experiments: (Perform any 8 – 10 Experiments)

Sr. No.	Experiment
1	To find entropy,conditional and joint entropy ,mutual information using MATLAB.
2	To plot the graph of channel capacity in SNR(dB).
3	To encode a data block into a linear block code specified by the generator G and decodes linear block codes.
4	.To generate generating matrix (G) and the check matrix (H) for an (n,k) Hamming Code when number of parity bits (M) given.
5	To encode and decode Hamming Code using generator and check matrices (G,H).
6	To produces all possible generator polynomials for an (n, k) cyclic cod.
7	To produce a generator matrix and parity-check matrix for cyclic codes, given a codeword length of n and the generator polynomial g in systematic and nonsystematic form.
8	To encode a binary input message using Convolutional Ecoder.
9	To computes the free distance of a convolutional code.
10	To decode a received data using Viterbi Algorithm.
11	To encode the message sequence into turbo code.
12	To encode a binary input message using LDPC coding .
13	To study digital Communication systems using MATLAB Simulink.

Beyond/Additional Syllabus Experiments :
Mini Project Based on Error Control Coding in communication systems.

Textbooks:

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
3. R.Togneri, C.J.S deSilva, Fundamentals of Information Theory and Coding Design,Taylor and Francis

Reference books:

1. Digital Communications- John G. Proakis, 5th ed., 2008, TMH.
2. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Edition, 2009, TMH.
3. Error control coding from theory to practice by Peter Sweeney - JOHN WILEY & SONS, LTD
4. A practical guide to error-control coding using Matlab by Yuan Jiang

Department of Electronics and Telecommunication Engineering

Course Title: Electronics Design Techniques with HDL Semester: V
Course Code: 25UET523T Course Category: PEC
Teaching Scheme: L – T – P Total Credits: 03
3 – 0 – 0

Prerequisites: Basic Knowledge of Digital circuits

Course Objectives:

The objective of this course is to provide students with understanding of

1. To motivate the students to learn basic foundation course in VHDL.
2. To address the challenges in Hardware design by discussing the role of digital components in systemdesign
3. To concentrate on HDL based digital design ,HDL terminology, architecture and design of combinational and sequential circuit.
4. To learn about modeling of system tested with test benches & synthesis also implementation on FPGA/CPLD.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

1. Design digital systems through HDL languages.
2. Simulate HDL code with behavioral style of modelling
3. Simulate HDL code with structural and data flow style of modelling
4. To enhance programming skills by different VHDL modules.
5. Design Sequential circuits
6. Synthesize digital systems

Course Content:

UNIT I

[08Hours]

INTRODUCTION TO DIGITAL SYSTEM DESIGN:

Device technologies, System representation, Levels of abstraction, Development tasks and EDA software, Development flow, Hardware description language,VHDL in development flow, Basic VHDL concepts.

UNIT II

[07 Hours]

Behavioural Modeling:

Signal assignments, Concurrent and sequential assignments., Entity Declaration, Architecture Body, Behavioral Modeling, Process statement, Loop control statements, Multiple Processes, Delay Models, Signal Drivers.

UNIT III

[07Hours]

Dataflow and Structural Modeling Techniques:

Data flow Modeling, Concurrent Assignment statements, Block statements, Structural Modeling, Component declaration and Instantiation

UNIT IV

[08 Hours]

SUBPROGRAM:
Subprogram:Functions, Procedures, Subprogram Overloading, attributes, generic, Generate: For-generation Scheme,,If-generation Scheme,package,Configuration,Packages and Libraries,Design Libraries,, Test Bench.

UNIT V

[08 Hours]

Finite State Machine:
Overview of FSM, FSM representation, Moore machine versus Mealy machine, VHDL representation of an FSM, State assignment, Some FSM design examples – sequence detector, FSM based binary counter.

UNIT VI

[07 Hours]

Programmable Logic Devices:

Architecture of CPLD (Xilinx / Altera), FPGA XILINX 4000 Series , Overview of PLDs, CPLD, FPGA,Design Examples: ALU, barrel shifter, 4*4 Keyboard Scanner, multiplier.

Textbooks:

1. J. Bhasker, VHDL Primer, 3/e, Addison Wesley, 1999.
2. Douglas Perry, VHDL, 3/e Edition, McGraw Hill 2001.
3. Charles.H.Roth, Digital system Design using VHDL, Thompson Publishers, 2/e Edition, 2007.
4. Volnei. A.Pedroni, Circuit Design with VHDL, MIT Press Cambridge, 2004.

Reference books:

1. Peter.J.Ashenden, The Designer's Guide to VHDL-AMS,
2. Sudhakar Yalamanchili, Introductory VHDL-From Simulation to Synthesis, Pearson Education, 3/e Indian Reprint.
3. Ben Cohen, VHDL-Coding style and Methodologies, Kluwer academic Publishers,1995.

Electronics Design Techniques with HDL Laboratory

Course Title: Electronics Design Techniques with HDL

Semester: V

Course Code: 25UET523P

Course Category: PEC

Teaching Scheme: L – T – P

0 – 0 – 2

Total Credits: 01

Course Objectives:

1. To learn about modeling of system tested with test benches and simulation
2. To synthesis digital systems and also implementation on FPGA/CPLD.

Course Outcomes:

At the end of this course students will be able to

3. To create and simulate basic circuit modules (or macros) using VHDL
4. To model, simulate, verify the digital model with hardware description language
5. To design and prototype with programmable logic devices
6. To learn the modular design style to create large digital logic circuits.
7.

List of Experiments: (Perform any 8 – 10 Experiments)

S.No	Name of Experiments
1.	Design of Basic Logic Gates Using VHDL
2.	Design of Full Adder/ Substrator using VHDL
3.	Design of Multiplexer/Demultiplexer using VHDL
4.	Design of BCD to 7 segment encoder
5.	Design of Priority encoder using VHDL.
6.	Design of n bit up-down counter
7.	Design of n-bit shift register using VHDL
8.	Design of sequence detector using mealy FSM
9.	Design of sequence detector using Moore FSM
10.	Design of 4 bit ALU using VHDL
11.	Design an implementation of 4bit barrel shifter using FPGA/CPLD.
12.	Design and implementation of 4 bit multiplier using FPGA/CPLD
13.	Design & Implementation of 4 X 4 keyboard scanner using FPGA / CPLD.
14.	Design of Asynchronous sequential circuit using VHDL.

Beyond/Additional Syllabus Experiments :

Design & implement Mini project on FPGA/CPLD.

Reference Books:

1. J.Bhasker, VHDL Primer, 3/e, Addison Wesley, 1999.
2. Sudhakar Yalamanchili, Introductory VHDL-From Simulation to Synthesis, PearsonEducation, 3/e Indian Reprint.
3. Charles.H.Roth, Digital system Design using VHDL, Thompson Publishers, 2/e Edition, 2007.

Course Title: Database Management Systems **Semester : V**
Course Code : **25UCS507T** **Course Category:MDM**
Teaching Scheme: L – T – P **Total Credits: 3**
3 – 0 – 0

Prerequisites :23UFY1B3T Programming for Problem Solving
23UFY225T Basic of Computation

Course Objectives:

1. To illustrate the general idea of database management system
2. To develop skills to implement real time applications that involve database handling
3. To demonstrate an understanding of career opportunities in subject areas of database storage techniques, data handling.

Course Outcomes:

After successful completion of this course the student will be able to:

1. Apply basic database concepts and and the Architecture used in DBMS.
2. Implement the relational data modeling techniques used in Database Management System.
3. Develop and execute SQL scripts incorporating DDL, DML, and DCL commands.
4. Demonstrate the concept Functional Dependancies, Normalizations and views for creating tables used in database and SQL
5. Illustrate Query processing , optimization, pipeline and materialization.
6. Demonstrate basics of File Organizations and indexing.

Course Content:

UNIT I

Introduction to Database Systems **[8 Hours]**

Purpose of Database Management System, Database system Applications, view of Database, Database system Structure, Data methods, Approaches to building a database, Three-schema architecture of a database, Challenges in building a DBMS, DBMS Architecture-Various components of a DBMS

UNIT II

[8 Hours]

Relational Data Model

Database Design & ER Model, Types of data models :Entity,Attributes,Relationships, Constraints, Key, Design Process, ER Models, E-R Diagram.

UNIT III

[8 Hours]

SQL Concepts

Basics of SQL, DDL, DML, DCL, Structure-Creation, alteration, defining constraints , functions-Aggregate functions, Built-in functions-numeric, date string functions, set operation, use of group by, having, order by cluase, join and its types.

UNIT IV

[8 Hours]

Functional Dependency(FD) and Views

Concepts of Functional dependency, Normalization-1NF, 2NF, 3NF, BCNF, 4NF.Introduction to views, data independence, security, updates on views, comparison between tables and views

UNIT V

[7 Hours]

Query Processing and Optimization

Query Processing and Optimization process, measures of query cost estimation in query optimization, pipelining and Materialization, Structure of query evaluation plans.

UNIT VI

[7 Hours]

File Organization And Indexing

File Organizations and its types, Concept of indexing, B-trees, hash index, function index, bitmap index.

Textbooks:

1. Database System Concepts by Avi Silberschatz, Henry F. Korth, S. Sudarshan, Tata McGraw Hill, Fifth Edition
2. "Fundamentals of Database Systems" – Ramez Elmasri & Shamkant Navathe

Reference books:

1. Database Management Systems - by Raghu Ramakrishnan and Johannes Gehrke, Tata McGraw Hill Publication, Third Edition.
2. Introduction to Database Management Systems by Kahate.

Course Title: Database Management Systems **Semester : V**
Course Code : **25UCS507P** **Course Category:MDM**
Teaching Scheme: L – T – P **Total Credits: 3**
0 – 0 –2

Prerequisites: 23UFY1B3T Programming for Problem Solving
23UFY225T Basic of Computation

Course Objective(s)

1 To understand the practical applicability of database management system concepts

2 Working on existing database systems, designing of database, creating relational database, analysis of table design.

3 To provide practical knowledge to understand advanced database concepts such as Datamining and Big Data Analysis.

Course Outcomes

After successful completion of this course the student will be able to:

CO1 Design and create relational database systems.

CO2 Implement various advanced queries such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL.

CO3 Design and implement Query processing, optimization, pipeline and materialization.

List of Experiments

1. Implement the basic SQL DDL,DML,DCL Commands.
2. Identify and implement different queries based on GROUPBY, HAVING and ORDERBY clause.
3. Execute queries using aggregate functions and built in functions.
4. Construct the JOINS((Natural join, Outer join ,left, right and full join) in Oracle.
5. Execute the sub-queries and nested queries.
6. Implement to Create ,update and delete Views.
7. Implement the concept of triggers.
8. Design queries of Rollback, Commit and Save point.
9. Apply the concept of Procedures in databse.
10. Implement Database Backup & Recovery commands.
11. Demonstrate the different types of constraints in DBMS.
12. Apply PL/SQL commands to implement databases.
13. Evaluate the performance of different indexing strategy.
14. Analyse the object-oriented database management system (ODBMS) concepts.

Books Recommended:

1. An introduction to Database Systems, C J Date, A. Kannan, S. Swamynathan –Eight Edition.
2. Database System Concepts by Avi Silberschatz, Henry F. Korth, S. Sudarshan, Tata McGraw Hill, Fifth Edition.

Suggested Self Readings:

1. Database Management Systems - by Raghu Ramakrishnan and Johannes Gehrke, Tata McGraw Hill Publication, Third Edition.
2. Introduction to Database Management Systems by Kahate.

Note: Above list is indicative for all Experiments.

Course Title: Python for Data Science | **Semester: V**
Course Code : 25UCT506T | **Course Category:MDM**
Teaching Scheme: L – T – P | **Total Credits: 3**
3 – 0 – 0

Prerequisites : Knowledge of Programming Language

Course Objectives:

1.To introduce the basics of Python programming and its applications in Data Science.
2.To equip learners with foundational skills in data manipulation, analysis, and visualization using Python.
3.To prepare learners for advanced topics in Data Science and Machine Learning.

Course Outcomes:

By the end of the course, learners will be able to:
1.Write and execute basic Python programs for Data Science applications.
2.Use Python libraries like NumPy, Pandas, and Matplotlib for data manipulation and visualization.
3.Perform basic data cleaning and preprocessing tasks.
4.Analyze and interpret data using Python.
5.Create basic data visualizations to communicate insights effectively.
6.Develop a foundation for advanced Data Science and Machine Learning concepts.

Course Content:

UNIT I

[7 Hours]

Introduction to Python and Data Science

Overview of Python and its applications in Data Science,Setting up Python environment Anaconda, Jupyter Notebook),Basic Python syntax, variables, and data types,Introduction to Data Science and its workflow.

UNIT II

[8 Hours]

Python Programming Fundamentals

Control structures (if-else, loops),Functions and modules,File handling in Python,Introduction to Python libraries (NumPy, Pandas, Matplotlib)

UNIT III

[7 Hours]

Inheritance and Polymorphism

Introduction to Pandas and DataFrames,Data loading and exploration,Data cleaning and preprocessing,Basic data operations (filtering, sorting, grouping)

UNIT IV

[8 Hours]

Data Analysis with NumPy and Pandas

Introduction to NumPy arrays and operations,Statistical analysis using Pandas,Handling missing data,Data aggregation and summarization

UNIT V

[7 Hours]

Data Visualization with Matplotlib and Seaborn

Introduction to Matplotlib and Seaborn,Creating basic plots (line, bar, scatter, histogram) Customizing visualizations,Communicating insights through visualizations.

UNIT VI

[8 Hours]

Introduction to Advanced Topics and Real-World Applications

Overview of Machine Learning and its applications,Introduction to Scikit-learn library, Real-world case studies and applications

Textbooks:

1."Python for Data Science" by Dr. R. P. Singh
2."Data Science with Python: A Practical Approach" by S. K. Gupta
3."Python Programming for Beginners" by P. N. Roy

Reference books:

1. "Python for Data Analysis" by Wes McKinney
2. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron
3. "Data Science from Scratch" by Joel Grus

Course Title: Python for Data Science **Semester: V**
Course Code : 25UCT506P **Course Category:MDM**
Teaching Scheme: L – T – P **Total Credits: 3**
0 – 0 – 2

Prerequisites : Knowledge of Programming Language

Course Outcomes:

After successful completion of this course the student will be able to:

		BT
1	To Develop Proficiency in Python Programming for Data Science Tasks	**3**
2	To Build Skills in Data Cleaning, Manipulation, and Analysis	**4**
3	To Enhance Data Visualization and Communication Skills.	**6**

Lab Experiments will be based on following topics:

Sr. No.	Topic
1	Data Loading and Exploration
2	Data Cleaning and Preprocessing
3	Data Manipulation with Pandas
4	Data Visualization with Matplotlib and Seaborn
5	Basic Statistical Analysis

Department of Electronics and Telecommunication Engineering

Course Title: Information and Communication Technologies in Rural Sector

Semester: V
Course Code: 25UOE543T **Course Category: OE**
Teaching Scheme: L – T – P **Total Credits: 02**
2 – 0 – 0

Course Objectives:

The objective of this course is to provide students with understanding of

1. The need of development in rural sector.
2. Scope of Electronic Communication to develop the rural sector.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Recognize of Information technology for rural development.
2. Interpret the scope of mobile communication & significance of Computer networks in rural areas.
3. Respond to smart things and automation in rural agriculture.
4. Summarize rural broadband project and schemes.

Course Content:

UNIT I

[07 Hours]

Introduction to Information and Communication Technologies in Rural :

Need of rural development, need of present world, the role of Electronic and Communication in the rural sector, Basic communication model, Line telephony, Line telegraphy, Facsimile exchange, Development of electronic telephone, Caller ID, WLL.

UNIT II

[08 Hours]

Cellular Telephone Systems & Computer Communication Network:

Digital cellular telephone, Role of mobile communication, mobile hotspot and mobile applications related to rural development,Introduction to LAN, MAN, WAN, Intranet & Internet system, Role of Computer networks, broadband, ISDN.

UNIT III

[08 Hours]

Building & Agricultural Infrastructures:

Smart schools, Hospitals, Public Distribution System (PDS),ATM Systems, Smart Transport System, Geographic information system (GIS),Solar Pump Systems, , Google earth mechanism, Digital surveillance system, Soil health testing, Weather report, Radio & Television Broadcasting, Unmanned Arial Vehicles (UAV).

UNIT IV

[07 Hours]

Rural Broadband Projects and Schemes:

e-Seva, eNAM (National Agriculture Market), Mahatma Gandhi National Rural Employment Guarantee Scheme, (MGNREGS), Digital India Land Records Modernization Program (DILRMP), BHARATNET – The world‟s largest rural broadband project.

Text Books:

1. Telecommunication Switching systems & Networks: Vishwanathan, 3rd Edition, PHI.
2. Wireless Communication – Principles and practice: T S. Rappaport, Prentice Hall PTR, 2 Edition, 2007.
3. Mobile Communications – Design fundamentals: William C. Y. Lee, John Willey, 2 Edition, 2010

Reference books:

1. Computer Communication Networks: Frouzan, 4th Edition, Tata Mc-Graw Hill..
2. .J. E. Flood, “Telecommunications Switching, Traffic and Networks”, Pearson Education

Department of Electronics and Telecommunication Engineering

Course Title: Soft Computing **Semester V**
Course Code : **24UOE544T** **Course Category:Open Elective II**
Teaching Scheme: L – T – P **Total Credits: 2**
2 – 0 – 0

Prerequisites : Basic Knowledge of Artificial Intelligence

Course Objectives:
The objective of this course is to provide students with understanding of
1. To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing .
2. To introduce the ideas of fuzzy sets,fuzzy logic and use of heuristics based on human experience.
3. To get familiarize with genetic algorithms.

Course Outcomes:
Upon completion of this course, students will demonstrate the ability to:
1. Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
2. Apply genetic algorithms to combinatorial optimization problems.
3. Apply neural networks to pattern classification and regression problems.
4. Apply learning algorithms to Neuro Fuzzy modeling with Neuro Fuzzy Spectrum.

Course Content:

UNIT I

[7 Hours]

Fuzzy Logic & Fuzzy Rules

Fuzzy Logic: Fuzzy Set Theory: Basic Definition and Terminology, Set Theoretic Operations, MF Formulation and Parameterization, MF of two dimensions, Fuzzy Union, Intersection and Complement.Fuzzy Rules and Fuzzy Reasoning: Extension Principles and Fuzzy Relations.

UNIT II

[7 Hours]

Genetic Algorithms:

Genetic Algorithms: Fundamentals of Genetic Algorithms: Basic Concepts Creation, Offspring's Encoding, Fitness functions, Reproduction, Genetic Modelling: Inheritance Operators, Cross over, In version and detection, Mutation operator, Bitwise operators.

UNIT III

[7 Hours]

Artificial Neural Networks

Artificial Neural Networks: Introduction, Architecture, Back Propagation and feed Forward Networks, Offline Learning, Online Learning.Supervised Learning of Neural Networks: Introduction, Perceptrons, Adaline Back Propagation Multilayer Perceptrons, Back Propagation Learning Rules, Methods of Speeding. Radial Basis Fu nction Networks, Functional Expansion Networks.

UNIT IV

[7 Hours]

Neuro-FuzzyM odeling:

Adaptive Neuro- Fuzzy 1nferen *ce* Systems - Architecture — Hybrid Learning Algorithm Learning Methods that Cross-fertilize ANFIS an d RBPN — Coactive Neuro Fuzzy Modelin— Framework Neuron Functions for Adaptive Networks - Neuro Fuzzy Spectrum.

Textbooks:

1. Neuro-Fuzzy and Soft Computing by J.S.R.Jang,C.T.Sun and E.Mizutani ,PHI
2. T,J.Ross "Fuzzy Logic with Engineering Applications" TMH,New York,1997
3. D.E.Goldberg,Genetic Algorithms in Search Optimization and machine Learning,Addison Wesley,3rd edition.
4. B.Kosko,Neural Network and Fuzzy Systems,PHI,2006
5. Neuro-Fuzzy Architectures and Hybrid Learning, , Danuta Rutkowska, Springer, 2002

Reference books:

1. Neural Networks and Deep Learning: A Textbook" by Charu C. Aggarwal, Springer, July 2023.
2. Introduction to Artificial Neural Systems, Jacek M. Zurada, West, 1992
3. Neural Networks, Fuzzy Logic and Genetic Algorithms, S. Rajasekaran, G.A. Vijayalaksmi Pai, pHI Publication, 2012
4. Principles of Soft Computing , S.N.Sivanandam & S.N.Deepa, John Wiley & Sons, 2007

Web links:

1. https://link.springer.com/
2. https://thesai.org/Publications

Continuous Assessment (Internal Marks) evaluation guidelines:

1. A total mark allotted for internal marks is 20.
2. 20 marks can be based on continuous tests/ examinations, assignments etc.as per internal mark policy of the institute.

Department of Electronics & Telecommunication Engineering

Course Title: Computer Architecture **Semester V**
Course Code : **25UOE545T** **Course Category:OE**
Teaching Scheme: L – T – P **Total Credits:02**
2 – 0 – 0

Course Objective:

1. Discuss the basic concepts and structure of computers.
2. Understand the concepts of register transfer logic and arithmetic operations.
3. Understand the concept of memory management and virtual memory.
4. To identify and compare different methods for computer I/O.

Course Outcomes:
Upon completing the course, students will be able to:
1. Explain the fundamental concepts and structure of computers
2. Analyze and demonstrate register transfer logic and arithmetic operations
3. Comprehend memory management and virtual memory concepts
4. Identify and compare different computer I/O methods

Course Content:

UNIT I

[07 Hours]

BASIC STRUCTURE OF COMPUTERS
Functional units, Basic operational concepts, Bus structures, performance, multiprocessors and multicomputers, Addressing modes, subroutines: parameter passing, Instruction formats, expanding opcodes method.

UNIT II

[08 Hours]

BASIC PROCESSING UNIT
Bus architecture, Three bus architectureExecution of a Complete Instruction, sequencing of control signals,Hardwired control, Micro programmed Control and microinstruction format

UNIT III

[08 Hours]

ARITHMETIC OPERATIONS & MEMORY SYSTEM
Number representations and their operations, Design of Fast Adders, Signed multiplication,Bit-pair recoding, Integer Division, Floating point number representation Some basic concepts of memory,Types of RAM and ROM Memories, Associative Memory, Cache memory, Virtual Memory.

UNIT IV

[07 Hours]

INPUT/OUTPUT ORGANIZATION

I/O mapped I/O and memory mapped I/O, interrupts and interrupts handling mechanisms,vectored interrupts, synchronous vs. asynchronous data transfer, Direct Memory Access COMPUTER PERIPHERALS: I/O devices such as magnetic disk, magnetic tape, CDROM systems.

TEXT BOOKS:

1. V. C. Hamacher, Z. G. Vranesic and S. G. Zaky, Computer Organisation, McGraw Hill, 5th ed, 2002.

2.Computer Architecture & Organization III Ed- J.P.Hayes.

3.A.S.Tanenbaum,"Structured computer Organization"4 th Edition Pearson Education

REFERENCES BOOKS:

1. MMano,"Computer System and Architecture", PHI, 1993.W. Stallings, "Computer Organization & Architecture", PHI, 2001.