ELECTRONIC DEVICES AND CIRCUITS

B.Tech. II Year I Sem. **L T P C**
Course Code: 21EC2111 Course **3 0 0 3**

Objectives

The main objectives of the course is to
1. Introduce basic semiconductor devices, their characteristics.
2. Understand the applications of diodes.
3. Impart knowledge about various transistor configurations and their characteristics
4. Introduce small signal amplifier circuits
5. Study of JFET, MOSFET and their characteristics

Course Outcomes: Upon completion of the Course, the students will be able to:

1. Understand the basic semiconductor devices such as diodes and their characteristics
2. Analyze the applications of diodes.
3. Understand various configurations of transistors and realize the importance of biasing and compensation techniques
4. Design and analyze various small signal amplifier circuits.
5. Understand the concepts of FET and analyze the FET, MOSFET amplifier circuits

UNIT - I
Semiconductor Diodes: P-type and N- type semiconductors, energy band diagrams. P-N Junction Diode, Volt ampere characteristics, Static and Dynamic resistance, Equivalent circuit, Load line Analysis, Diffusion and Transition Capacitance. Zener Diode - Characteristics, Voltage Regulator. Principle of operation - LED, Tunnel diode, UJT Relaxation oscillator, Varactor Diode.

UNIT – II
Applications of Diode: Diode as Switch-Switching times, Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters. Clippers, Clipping at two independent levels, Clamping operation, Clamping theorem, types of Clampers.

UNIT - III
Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing techniques–Fixed bias, collector to base bias and voltage divider bias, Bias Stability, Bias Compensation using Diodes.

UNIT-IV
Small Signal Low Frequency BJT Amplifiers: Trnasistor Hybrid model, Determination of h-parameters from transistor characteristics, h-parameter analysis of CE, CB and CC configurations, Transistors as an amplifier, Analysis of CE, CC, CB amplifiers and CE amplifier with emitter resistance low frequency response of BJT amplifiers, effect of coupling and bypass capacitors on CE amplifier

UNIT – V
Field Effect Transistors (FET): JFET Construction, Principle of Operation, Pinch-Off Voltage, Volt-Ampere Characteristics, Comparison of BJT and FET, Biasing of FET, FET as Voltage Variable Resistor, Introduction to MOSFET, MOSFET Characteristics in Enhancement and Depletion mode,

FET Amplifiers: Small Signal Model, Analysis of JFET Amplifiers, Analysis of CS, CD, CG JFET Amplifiers. Basic concepts of MOS Amplifiers.

TEXT BOOKS:

1. Electronic Devices and Circuits- Jacob Millman, C. Halkias, Satyabrata jit, McGraw Hill Education 4th edition,2015
2. Electronic Devices and Circuits theory– Robert L. Boylestad, Louis Nashelsky,11th Edition,Pearson**,** 2009.

REFERENCE BOOKS:

1. Integrated Electronics, Millman & Halkias, 2nd edition, Tata McGraw-Hill, 2009.
2. Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford, 2008.
3. Pulse, Digital and switching waveforms –J. Millman, H. Taub, Suryaprakash RaoMothiki. Mc Graw Hill, 3rd edition, 2011.

DIGITAL LOGIC DESIGN

B.Tech. II Year I Sem. **L T P C**
Course Code: 21EC2112 **3 0 0 3**

Course Objectives:

The main objectives of the course is to

1. Review of various number representations, understand fundamental concepts of code conversions, Boolean theorems, various logic gates, error detecting and correcting codes.
2. Understand the minimization of switching functions using k-maps.
3. Understand the design of combinational circuits.
4. Understand various memory elements and their applications in sequential circuits
5. Understand and learn the concepts of melay and moore FSMs for the design of sequential circuits, logic families and ICs

Course Outcomes: Upon completion of the course, students should be able to:

1. Have a thorough knowledge about number representations, logic gates and realization of logic gates using Boolean theorems, error detecting and correcting codes.
2. Understand the k-map simplification with SOP and POS forms
3. Understand the design of Combinational circuits .
4. Understand the design of flip-flops, their applications in data transfer, shift registers and counters .
5. Analyze the design of sequential circuits using the concepts of Mealy and Moore FSM models,logic families and Ics

UNIT – I

Number System, Boolean algebra And Switching Functions: Review of number systems: Binary Numbers, octal and hexadecimal numbers, Complements of Numbers, Codes: gray code, Binary Coded Decimal Code, excess-3 code and its Properties, Unit Distance Codes, Error Detecting and Correcting Codes.

Boolean Algebra: Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT - II

Gate level Minimization: Introduction, The Minimization of switching functions using Karnaugh Map Method including Don't care conditions and QM method. Simplification of Sum of products and Product of Sums, and conversion from one form to other.

UNIT – III

Design of Combinational circuits: Introduction to adders and subtractors, RCA, CLA, BCD adder, Parallel Adder/subtractor, comparators, Multiplexers, Demultiplexers, Decoders, Encoders and Code converters, Hazards and Hazard Free Realizations.

UNIT – IV

Design of Sequential Circuits: Introduction to Sequential circuits, memory elements: Latches and Flip Flops-SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Tables, Design of a Clocked Flip-Flop, excitation tables and conversion of Flip-Flops.

Registers and Counters: Shift Registers, Data Transmission in Shift Registers, Bidirectional Shift Registers, Applications of Shift Registers: Design and Operation of Ring and Twisted Ring Counter. Asynchronous and Synchronous Counters, Modulo N –Counters.

UNIT – V

Finite state Machines: Introduction to Mealy and Moore models, State diagram, state reduction and minimization, design and analysis of flip flops, counters, Serial Binary Adder, Sequence Detector (overlapping and non-overlapping).

Logic families: RTL, DTL,TTL, ECL, CMOS logic families and comparison of logic families**.**

TEXT BOOKS:

1. Switching and Finite Automata Theory- Zvi Kohavi & Niraj K. Jha, 3rd Edition,Cambridge, 2010.
2. Digital Design- Morris Mano, 5th Edition, Pearson, 2013.

REFERENCE BOOKS:

1. Modern Digital electronics- RP Jain 4th Edition, McGraw Hill, 2010.
2. Switching Theory and Logic Design – A. Anand Kumar, 3rd Edition, PHI, 2013.

PROBABILITY THEORY AND STOCHASTIC PROCESSES

	L	T	P	C
B.Tech. II Year I Sem.				
Course Code: 21EC2113	**3**	**0**	**0**	**3**

Course Objectives:

The main objectives of the course is to

1. Give students an introduction to elementary probability theory, in preparation for courses on statistical analysis, random variables and stochastic processes.
2. Mathematically model the random phenomena with the help of probability theory concepts.
3. Introduce the important concepts of random variables and stochastic processes.
4. Know the Spectral and temporal characteristics of Random Process.
5. Introduce the types of noise, modeling of noise sources and source coding.

Course Outcomes

Upon completing this course, the student will be able to

1. Understand the concepts of basic probability and random variables.
2. Understand the concepts of Random Process and its Characteristics.
3. Understand the response of linear time Invariant system for a Random Processes.
4. Determine the Spectral and temporal characteristics of Random Signals.
5. Apply the concept of random process to noise in Communication systems

.

UNIT - I Probability & Random Variable:

Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events, *Random Variable*- Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and theirProperties.

UNIT – II

Operations on Single & Multiple Random Variables – Expectations:

Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic and Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable. Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence. Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions. Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties,Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT – III Random Processes – Temporal Characteristics:

The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationary and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationary, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Inputand Output.

UNIT – IV Random Processes – Spectral Characteristics:

The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

UNIT – V Noise Sources & Information Theory:

Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties. Entropy, Information rate, Source coding: Huffman coding, Shannon Fano coding, Mutual information, Channel capacity of discrete channel, Shannon-Hartleylaw; Trade -off between bandwidth and SNR**.**

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH,4th Edition, 2001.
2. Principles of Communication systems by Taub and Schilling (TMH),2008

REFERENCE BOOKS:

1. Random Processes for Engineers-Bruce Hajck, Cambridge unipress,2015
2. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S.Unni krishna Pillai, PHI, 4th Edition, 2002.
3. Probability, Statistics & Random Processes-K. Murugesan, P. Guruswamy, Anuradha Agencies, 3rd Edition, 2003.
4. Signals, Systems & Communications - B.P. Lathi, B.S. Publications, 2003.
5. Statistical Theory of Communication – S.P Eugene Xavier, New Age Publications, 2003

SIGNALS AND SYSTEMS

B.Tech. II Year I Sem.	**L**	**T**	**P**	**C**
Course Code: 21EC2114	**3**	**0**	**0**	**3**

Course Objectives:

The main objectives of the course is to

1. Know the standard signals and its characteristics, orthogonality concept.
2. Know the spectral analysis of periodic and aperiodic signals using Fourier methods.
3. Analyze and characterize the signals and systems in frequency domain using LT and Discrete signals and DT systems through Z-transform.
4. Understand the concept of convolution, correlation.
5. Convert CT signal into Discrete time signal and analyze LTI systems.

Course Outcomes:

Upon completing this course, the student will be able to

1. Differentiate various signal functions and able to explain the concept of orthogonality.
2. By the end of this course students should be able to apply Fourier series (FS) and Fourier Transform (FT) to represent any arbitrary signal in frequency domain.
3. Apply Laplace Transform (LT) and Z Transform (ZT) to analyze and characterize Continuous Time (CT) and Discrete Time (DT) systems.
4. Apply the convolution and correlation between two signals.
5. Apply sampling theorem and also able to evaluate characteristics of LTI systems

UNIT – I

Standard Signals: Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function. Classification of Signals.

Signal Analysis: Analogy between vectors and signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions,

UNIT – II

Fourier series: Representation of Fourier series, Continuous time periodic signals, Dirichlet's conditions, Properties of Fourier Series, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum**.**

Fourier Transforms: Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signals, standard signals, Periodic Signals. Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.

UNIT – III

Laplace Transforms: Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal.

Z–Transforms: Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

UNIT – IV

Convolution and Correlation of Signals: Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution. Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parseval's Theorem, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Relation between Convolution

and Correlation, Detection of Periodic Signals in the presence of Noise by Correlation, Extraction of Signal fromNoise by Filtering

UNIT – V

Sampling theorem: Graphical and analytical proof for Band limited Signals, Impulse Sampling,Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing.

Signal Transmission through Linear Systems: Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion lesstransmission through a system, Signal bandwidth, System Bandwidth, LPF, HPF, and BPF characteristics, Causality and Paley-Wiener criterion for physical realization

TEXT BOOKS:

1. Principles of Linear Systems and Signals - B.P. Lathi, 2 Ed, Oxford, 2009.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2 Ed, 2003.

REFERENCE BOOKS:

1. Signals and Systems – Simon Haykin and Van Veen, Wiley 2nd Ed.,2007.
2. Signals and Systems – A Anand Kumar, 3rd Ed, PHI, 2013.
3. Fundamentals of Signals and Systems - Michel J. Robert, MGH International Edition, 2008

NETWORK THEORY AND TRANSMISSION LINES

B.Tech. II Year I Sem. **L T P C**
Course Code: 21EC2115 **3 0 0 3**

Course Objectives:
The main objectives of the course is to
1. Understand the network theorems of A.C & D.C.
2. Understand the various network topologies and magnetic circuits.
3. Know the analysis of the steady states and transients states in RLC circuits.
4. Understand the two port network parameters.
5. Study the propagation, reflection and transmission of plane waves inbounded and unbounded media.

Course Outcomes: Upon successful completion of the course, students will be able to:
1. Solve Different problems Of AC and DC networks using Different applications of network theorems.
2. Understand the magnetic circuits and to demonstrate the electrical network response by using network topology concepts.
3. Solve Different problems on transient analysis of AC and DC networks using Differential analysis and Laplace transforms.
4. Analyze various types of two port network parameters.
5. Analyze the transmission line parameters and configurations

UNIT – I:
Network Theorems: Tellegen's, Reciprocity, Maximum Power Transfer, Milliman's and Compensation theorems for D.C excitations.
Network Theorems: Tellegen's Superposition Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Milliman's and Compensation theorems for A.C excitations.

UNIT – II:
Network Topology: Definitions, Graph, Tree, Basic cut set and Basic tie set matrices for planar networks, Duality& Dual networks.
Magnetic Circuit: Faraday's law of electromagnetic induction, Self and Mutual inductances, dot convention, coefficient of coupling, composite magnetic circuit, Analysis of series and parallel magnetic circuits.
UNIT – III:
Transient analysis: Transient response of RL, RC and RLC Circuits for DC and Sinusoidal, Initial Conditions, Solution using Differential Equations approach and Laplace Transform Method.
Locus diagrams - series R-L, R-C, R-L-C and parallel combination with variation of variousparameters,

UNIT – IV

Two Port Networks: Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission (ABCD) Parameters, g-parameters, Conversion of one of Parameter to another, Conditions for Reciprocity and Symmetry, Inter Connection of Two Port networks in series, Parallel and Cascaded configurations, Illustration problems, driving point and transfer functions – using transformed (S) variables, Poles and Zeros. Attenuators (qualitative treatment)

UNIT – V:

Transmission Lines - I: Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Equivalent Circuit, Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless / Low Loss Characterization, Types of Distortion, Condition for Distortion less line, Minimum Attenuation.

Transmission Lines – II: Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines – Impedance Transformations, Smith Chart – Configuration and Applications, Single Stub Matching.

TEXT BOOKS:

1. Network Analysis – Van Valkenburg, 3rd Ed., Pearson, 2016.
2. Electric Circuits - A.Chakrabarthy, Dhanipat Rai & Sons, 2018
3. Networks, Lines and Fields - JD Ryder, PHI, 2nd Edition, 1999.
4. Networks and Systems- D Roy Choudhury, 2nd Edition, 2018.

REFERENCE BOOKS:

1. Electric Circuits – J. Edminister and M. Nahvi, 7th Edition, Schaum's Outlines, Mc Graw Hill Education, 2017.
2. Engineering Circuit Analysis – William Hayt and Jack E Kemmerly, MGH, 8th Edition,1993.
3. Electromagnetics with Applications – JD. Kraus, 5th Ed., TMH, 2017.
4. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan, 3rd Edition Tech. India Publications, New Delhi, 2010.

ELECTRONIC DEVICES AND CIRCUITS LAB

	L	T	P	C
B.Tech. II Year I Sem.				
Course Code: 21EC2151	**0**	**0**	**3**	**1.5**

Course Objectives:

The main objectives of the course is to

1. Study basic electronic components.
2. Observe characteristics of electronic devices.
3. Study rectifier characteristics and other diode circuits.
4. Observe BJT and FET amplifiers in different configurations.
5. Gain knowledge of SCR and Relaxation oscillators.

Course outcomes:

Upon the completion of EDC Lab, the student will be able to:

1. Understand the P-N diode and Zener diode characteristics
2. Acquire knowledge about various configurations of transistor like CE, CB and its h-parameter analysis and its applications.
3. Analyze the FET operation, common source FET amplifiers and observe itsfrequency response.
4. Analyze the characteristics of clippers, clampers.
5. Acquire knowledge about the concepts of Uni-Junction Transistor and observe itscharacteristics.

List of Experiments (Twelve experiments to be done):

Verify any twelve experiments in H/W LaboratoryDesign and verification of

1. PN Junction diode V-I characteristics A) Forward bias B) Reverse bias.
2. Zener diode V-I characteristics and voltage Regulator
3. Full Wave Rectifier with & without filters
4. Input and output characteristics of Transistor CB configuration
5. Input and output characteristics of BJT in CE configuration
6. Frequency response of Common Emitter amplifier
7. Input and output characteristics of FET in CS configuration
8. Frequency response of Common Source FET amplifier
9. Measurement of h-parameters of transistor in CE configurations
10. Switching characteristics of a transistor
11. SCR Characteristics.
12. Clippers at different reference voltages and square wave input.
13. Clampers at different reference voltages
14. UJT Relaxation Oscillator.

Major Equipment required for Laboratories:

1. Regulated Power Suppliers, 0-30V
2. 20 MHz, Dual Channel Cathode Ray Oscilloscopes.
3. Functions Generators-Sine and Square wave signals
4. Multimeters
5. Electronic Components

DIGITAL LOGIC DESIGN LAB

	L	T	P	C
B.Tech. II Year I Sem.				
Course Code: 21EC2152	**0**	**0**	**2**	**1**

Course Objectives:

The main objectives of the course is to

1. Provide practical experience with the implementation of basic and universal gates using ICs.
2. Design the code converters using digital ICs.
3. Design the combinational circuits using ICs.
4. Design the sequential circuits using ICs.
5. Realize the design of sequence detector using FSM.

Course outcomes: After the completion of laboratory the student will be able to,

1. Simplify the Boolean expressions and design digital circuits using gates
2. Understand the use of universal gates for various digital circuits design.
3. Implement combinational circuits using ICs.
4. Use flip-flops for designing shift registers
5. Implement the counters using flip-flops.
6. Understand FSM and design sequence detector.

Note: Implement using digital ICs, any 12 experiments.

List of Experiments –

1. Realization of Boolean Expressions using Gates.
2. Design and realization of logic gates using universal gates.
3. Generation of clock using NAND / NOR gates.
4. Design a 4 – bit Adder / Subtractor.
5. Design and realization of a 4 – bit Gray to Binary and Binary to Gray Converter.
6. Design and realization of 4 bit comparator.
7. Design and realization of 8x1 MUX using 2x1 MUX.
8. Design and realization of a 3 to 8 decoder.
9. Design and Realization of an 8 to 3 priority encoder
10. Design and realization of JK flip-flop
11. Design and realization of T flip-flop.
12. Design and realization of a 4 bit parallel load and serial out shift register using flip-flops.
13. Design and realization of a Synchronous counter using flip-flops.
14. Design and realization of Asynchronous counters using flip-flops.
15. Design and Realization of a sequence detector-a finite state machine.

Major Equipments required for Laboratories:

1. 20 MHz Oscilloscope with Dual Channel.
2. Bread board and components/ Trainer Kit.
3. Multimeter.

SIGNALS AND STOCHASTICS LAB

B.Tech. II Year I Sem. **L T P C**
Course Code: 21EC2153 **0 0 3 1.5**

Course Objectives:

The main objectives of the course is to

1. Learn basic Operations on Matrices
2. Simulate operations on signals/sequences.
3. Simulate characteristics and response of systems
4. Simulate FS and FT
5. Simulate various random variables and processes.

Course Outcomes:

After going through this course the student will be able to

1. Perform various operations on the signals
2. Determine the correlation & Convolution between Signals and sequences.
3. Determine a given system is linear or not and Time variant or Time invariant and determine system response for unit step and sinusoidals
4. Verification of Weiner-khinchine relations i.e., autocorrelation function Rxx and Power Spectral Density are FT pair.
5. Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S. Value and its Skew

Note:

- All the experiments are to be simulated using MATLAB or equivalent software
- Minimum of 15 experiments are to be completed

List of Experiments:

1. Perform basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Perform Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Perform Convolution for Signals and sequences.
6. Perform Auto Correlation and Cross Correlation for Signals and Sequences.
7. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
8. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realize ability and stability properties.
9. Verification of Gibbs Phenomenon.
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. Perform Waveform Synthesis using Laplace Transform.
12. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transfer function.
13. Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S. Value and its Skew, Kurtosis, and PSD, Probability Distribution Function.
14. Sampling Theorem Verification.
15. Removal of noise by Autocorrelation / Cross correlation.
16. Extraction of Periodic Signal masked by noise using Correlation.
17. Verification of Weiner-Khinchine Relations.
18. Checking a Random Process for Wide sense Stationary.

UNIVERSAL HUMAN VALUES - II

B.Tech–II-I Sem **LTPC**
Course Code: 21HS2117 **2 0 0 2**
Pre-requisites: Universal Human Values 1 (desirable)

Course Objective: The objective of the course is four fold:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcomes: By the end of the course, students

1. Are expected to become more aware of themselves, and their surroundings (family, society, nature).
2. Would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. Would have better critical ability.
4. Would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
5. Would be able to apply, what they have learnt, to their own self in different day-to-day settings.

UNIT - I: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance'and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basicrequirements for fulfilment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfill the above human aspirations: understanding and living inharmony at various levels.

Include practice sessions to discuss natural acceptance in human being as theinnate acceptance for living with responsibility (living in relationship, harmonyand co-existence) rather than as arbitrariness in choice based on liking-disliking

UNIT - II: Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer andenjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in makingmaterial goods available to me. Identifying from one's own life. Differentiatebetween prosperity and accumulation. Discuss program for

ensuring health vsdealing with disease

UNIT - III: Understanding Harmony in the Family and Society- Harmony in Human - Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nineuniversal values in relationships) and program for its fulfilment to ensure mutualhappiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect anddifferentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension offamily):Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and instituteas extended family, real life examples, teacher-student relationship, goal ofeducation etc. Gratitude as a universal value in relationships. Discuss withscenarios. Elicit examples from students' lives

UNIT - IV: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
- Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT - V: Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics:
  a. Ability to utilize the professionalcompetence for augmenting universal human order
  b. Ability to identify the scopeand characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and managementpatterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order:
  a. At the level of individual: as socially and ecologically responsible engineers,technologists and managers
  b. At the level of society: as mutually enrichinginstitutions and organizations
- Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

TEXT BOOKS

1. RRGaur, R Asthana, G P Bagaria,"A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. RRGaur, R Asthana, G P Bagaria,"Teachers'Manual for A Foundation Course in HumanValues and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019.ISBN978-93-87034-53-2

REFERENCE BOOKS

1. Jeevan Vidya: E k Parichaya, A Nagaraj, Jeevan VidyaPrakashan, Amarkantak, 1999.
2. A.N.Tripathi,"HumanValues",New Age Intl.Publishers,NewDelhi,2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. E. F Schumacher. "Small is Beautiful"
6. "Slow is Beautiful"–Cecile Andrews
7. J C Kumarappa "Economy of Permanence"
8. PanditSunderlal"Bharat Mein Angreji Raj"
9. Dharampal,"Rediscovering India"
10. Mohandas K. Gandhi, "Hind Swarajor Indian Home Rule"
11. "India Wins Freedom"-Maulana Abdul Kalam Azad
12. Vivekananda-Romain Rolland(English)
13. Gandhi-Romain Rolland(English)

ENVIRONMENTAL SCIENCE / SRUJANA

B.Tech. II Year I Sem. **L T P C**
Course Code: 21MC0003 **3 - - -**

Course Objectives:

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

Course Outcomes:

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

UNIT - I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and functionof an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Bio geo chemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Fieldvisits.

UNIT - II

Natural Resources: Classification of Resources: Living and Non-Living resources. **Water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT - III

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

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Waste water Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions /Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981,Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan(EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA),Low carbon life style.

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.

2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

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

NUMERICAL TECHNIQUES, SPECIAL FUNCTIONS AND COMPLEX VARIABLES

B.Tech. II Year II Sem	**L T P C**
Course Code: 21BS2214	**3 0 0 3**

Pre-requisites: Mathematics courses of first year of study.

Course Objectives: To learn

1. Evaluation of integrals using numerical techniques and Solving the problems under curve fitting.
2. Solving ordinary differential equations using numerical techniques
3. Solutions for Legendre and Bessel differential equations, analyzing the properties of Legendre and Bessel polynomials..
4. Differentiation, Analyticity of Complex valued functions and Harmonic functions.
5. Evaluation of Integrals using Cauchy's integral formula, Cauchy's residue theorem and Expansions of complex functions using Taylor's and Laurent's series.

Course Outcomes: After learning the contents of this paper the student must be able to

1. Evaluate the integrals using numerical techniques and approximate a linear and non-linear equation to the given data by the method of least squares also Understand curve fitting
2. Apply the numerical methods to solve a given ODE's.
3. Solve Legendre and Bessel's equation under special conditions including properties of Legendre and Bessel polynomials.
4. Analyse the Analyticity of the complex functions.
5. Evaluate the integration of complex functions using Cauchy's integral and residue theorems and expand complex function using Taylor's and Laurent's series expansion

UNIT -I: Numerical integration & Curve Fitting (10L)

Numerical integration

Newtons- Cotes Quadrature Formula (General Quadrature Formula), Trapezoidal rule , Simpson's 1/3rd and 3/8 rules.

Curve Fitting: Fitting a straight line; Second degree curve; exponential curve; power curve by method of least squares.

UNIT-II: Numerical Solution of Ordinary Differential equations (10L)

Solution of ordinary differential equations by Taylor's series; Picard's method of successive Approximation; Euler and modified Euler's methods; Runge-Kutta methods.

UNIT-III: Special Functions:(12L)

Legendre polynomials, Generating function, properties, Rodrigue's formula, Recurrence relations, Orthogonality. Bessel functions, Generating function, properties, Recurrence relations, Orthogonality.

UNIT-IV: Functions of Complex Variables:(12L)

Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), analytic functions, harmonic functions, finding harmonic conjugate, Milne- Thomson method.

UNIT-V: Complex Integration:(12L)
Line integrals, Cauchy's theorem, Cauchy's Integral formula, Liouville's theorem, Maximum-Modulus theorem (All theorems without proof); zeros of analytic functions, singularities, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem (without proof).

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, 36th Edition, Khanna Publishers, 2010.
2. M. K. Jain, SRK Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations, 8th Edition, New Age International publishers, 2022.
3. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
4. J.W.Brown and R.V. Churchill, Complex variables and Applications, 7th Ed.,Mc-Graw Hill,2004.

REFERENCE BOOKS:

1. Curtis F. Gerald and Patrick O. Wheatley, "Applied Numerical Analysis", 7th Edition, Pearson Education, 2004.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

ANALOG AND DIGITAL COMMUNICATIONS

B.Tech. II Year II Sem.	**L**	**T**	**P**	**C**
Course Code: 21EC2211	**3**	**0**	**0**	**3**

Prerequisite: Probability theory and Stochastic Processes, Signals and Systems

Course Objectives:

The main objectives of the course is to

1. To develop ability to analyze system requirements of analog and digital communicationsystems
2. To understand the generation, detection of various analog and digital modulationtechniques.
3. To acquire theoretical knowledge of each block in AM, FM transmitters and receivers.
4. To understand the concepts of pulse modulation techniques
5. To understand the concepts of baseband transmissions.

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Course Outcomes:

Upon completing this course, the student will be able to

1. Analyze and design of various amplitude modulation and demodulation techniques.
2. Analyze and design of various angle modulation and demodulation techniques.
3. Attain the knowledge about AM, FM Transmitters and Receivers.
4. Analyze and design the various pulse modulation techniques.
5. Analyze various digital modulation techniques and baseband transmission.

UNIT-I:

Amplitude Modulation: Modulation, Amplitude Modulation, Limitations and Modifications of Amplitude Modulation-switching modulator, detection of AM waves: envelope detector, DSB- SC modulation- Time and frequency domain description, Balanced modulators, Synchronous Detector, Costas Receiver, Quadrature Carrier Multiplexing, SSB modulation Generation - frequency and phase discrimination methods , Detection methods, VSB modulation, generation and detection method

UNIT-II:

Angle Modulation: Angle modulation, FM, PM, Relationship between FM and PM, NBFM, WBFM, Transmission bandwidth of FM waves, Generation of FM: Direct, Indirect Demodulation of FM signals : Balanced slope detector, PLL

UNIT III:

Transmitters & Receivers: AM Transmitters, FM Transmitters, Radio Receivers-types, RF Section and Characteristics, Mixer, IF section, AGC, Frequency Tracking , RF receivers

Pulse Modulation: PAM, Pulse time modulation –PWM and PPM, Generation and detection,Time Division Multiplexing.

UNIT–IV

Digital Modulation: Block diagram of Digital communication system, Advantages of Digital Communication Systems, PCM Generation and Reconstruction, Quantization, Quantization Noise,Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM

UNIT-V

Digital Carrier Modulation Schemes: ASK, FSK, PSK –Modulator and detector, Comparisonof digital carrier modulation schemes, M-ary Signaling Schemes, QAM.

Baseband Transmission: Signal Receiver, Probability of error-ASK, FSK, PSK, Optimum Receiver, Coherent reception, ISI, Eye Diagrams

Text Books:

1. Simon Haykin, Introduction to Analog & Digital Communications, 2nd Edition,Wiley Publications, 2014
2. K. Sam Shanmugam, Digital and Analog Communication Systems, Wiley Publications Indian Edition, 2007

Reference Books:

1. Principles of Communication Systems - Herbert Taub, Donald L Schiling, Goutam Saha, 3rd Edition, Mcgraw-Hill, 2008.
2. B.P.Lathi, Modern Digital and Analog Communication Systems, 4th Edition, Oxford University Press, 2017.
3. Electronics & Communication System – George Kennedy and Bernard Davis, 5th Edition, TMH, 2015
4. Electronic Communications – Dennis Roddy and John Coolean , 4th Edition , PEA, 2004

ANALOG CIRCUITS

B.Tech. II Year II Sem. **LT PC**
Course Code: 21EC2212 **3 0 0 3**

Pre-requisite: Electronic Devices and Circuits

Course Objectives:
The main objectives of the course is to

1. Familiarize the Concept of Negative feedback in Amplifiers .
2. Familiarize the Concept of Positive feedback and Design of variousoscillator circuits
3. Give understanding of various types of amplifier circuits such as smallsignal, cascaded, large signal and tuned amplifiers
4. Learn the concepts of high frequency analysis of transistors.
5. Construct various Multi vibrators using transistors and sweep circuits and also to apply and analyze various amplifiers and Multi vibrators circuits for various applications.

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

1. Utilize the Concepts of negative feedback to improve the stability of amplifiers.
2. Understand the concepts of positive feedback to generate sustained oscillations
3. Design and Analysis of Multistage amplifiers and Transistor circuits at high frequencies.
4. Design and realize different classes of Power Amplifiers and tuned amplifiers foraudio and Radio applications.
5. Understand various Multivibrators and Sweep circuits for various applications.

UNIT I
Feedback Amplifiers: Concepts of feedback – Classification of feedback amplifiers – Generalcharacteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics
– Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations –
Simple problems.

UNIT –II
Oscillators: Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators, Frequency and amplitude stability of Oscillators, Crystal Oscillator.

UNIT – III
Multistage Amplifiers: Classification of Amplifiers, Distortion in amplifiers, Different couplingschemes used in amplifiers, Frequency response and Analysis of multistage amplifiers, Cascade RC Coupled amplifiers, Cascode amplifier, Darlington pair.

Transistor at High Frequency: Hybrid - Π model of Common Emitter transistor model, f_α, f_β and unity gain bandwidth, Gain-bandwidth product.

UNIT -IV
Large Signal Amplifiers: Class A Power Amplifier- Series fed and Transformer coupled, Conversion Efficiency, Class B Power Amplifier- Push Pull and Complimentary Symmetry configurations, Conversion Efficiency, Principle of operation of Class AB and Class –C Amplifiers.
Tuned Amplifiers: Introduction, single Tuned Amplifiers – Q-factor, frequency response of tuned amplifiers, Concept of stagger tuning and synchronous tuning.

UNIT –V

Multivibrators: Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

Time Base Generators: General features of a Time base Signal, Methods of Generating Time Base Waveform, concepts of Transistor Miller and Bootstrap Time Base Generator.

TEXT BOOKS:

1. Integrated Electronics, Jacob Millman, Christos C Halkias, 2nd edition, Tata McGraw-Hill, 2009.
2. Electronic Devices Conventional and current version -Thomas L. Floyd, Pearson, 2015.

REFERENCE BOOKS:

1. Milliman's Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 3rd Edition, McGraw Hill, 2011.
2. Electronic Devices and Circuits theory– Robert L. Boylestad, Louis Nashelsky,11th Edition, Pearson, 2009.

DIGITAL SYSTEM DESIGN USING VERILOG

B.Tech. II Year II Sem. **L T P C**
Course Code: 21EC2213 **3 0 0 3**

Pre-requisites: Digital Logic Design

Course Objectives:

The main objectives of the course is to

1. Introduce Verilog HDL, Features, Syntax and Modelling styles.
2. To understand Dataflow Level and Gate Level Modeling.
3. To understand of Behavioral Level and Switch Level Modeling.
4. To impart knowledge in verifying and synthesizing RTL Models of combinational logic modules using Verilog HDL.
5. To provide knowledge in designing of Sequential logic modules, FSMs using Verilog HDL and verification.

Course Outcomes:

After studying this course the students would be able to use the knowledge of Verilog to

1. Design and simulate digital circuits.
2. Develop Dataflow Level and gate level models of digital circuits.
3. Design and simulate Switch Level models of Circuits and verify Behavioral models.
4. Develop Register Transfer Level (RTL) models of digital circuits.
5. Gain skills to design Finite state machine (FSM) models and state graphs for control circuits.

UNIT –I:

Introduction to Verilog HDL: Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Function Verification, System Tasks, Programming Language Interface, Module, Simulation and Synthesis Tools **Language Constructs and Conventions:** Introduction, Keywords, Identifiers, White Space, Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Operators.

UNIT - II:

Modeling at Dataflow Level: Introduction, Continuous Assignment Structure, Delays and Continuous Assignments, Assignment to Vector, Operators.

Gate Level Modeling: Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tristate Gates, Array of Instances of Primitives, Design of Flip-Flops with Gate Primitives, Delay, Strengths and Construction Resolution, Net Types, Design of Basic Circuit.

UNIT - III:

Behavioral Modeling: Introduction, Operations and Assignments, Functional Bifurcation, 'Initial' Construct, Assignments with Delays, 'Wait' Construct, Multiple Always Block, Designs at Behavioral Level, Blocking and Non-Blocking Assignments, The 'Case' Statement, Simulation Flow, 'If' and 'if-Else' Constructs, 'Assign- De-Assign' Constructs, 'Repeat' Construct, for loop, 'The Disable' Construct, 'While Loop', Forever Loop, Parallel Blocks, Force-Release, Construct, Event.

Switch Level Modeling: Basic Transistor Switches, CMOS Switches, Bidirectional Gates, Time Delays with Switch Primitives, Instantiation with 'Strengths' and 'Delays' Strength Contention with Trireg Nets.

UNIT – IV: Verilog implementation of Combinational circuits: Full adders, Full subtractor, Ripple carry adders, carry look ahead adders, 4 bit parallel adder/subtractor, pipelined adders, Decoder, Encoder, Array multiplier, Comparator, Barrel shifters, ALU, MAC design.

UNIT V: Verilog Implementation and synthesis of sequential circuits: Flip-flops, shift registers, counters, SRAM, FIFO using FSM models.
State graphs for control circuits: Serial binary adder, binary divider, shift and add multiplier, sequence detector, traffic light controller, Dice game controller.

TEXT BOOKS:

1. T.R. Padmanabhan, B Bala Tripura Sundari, Design Through Verilog HDL, Wiley Indian Edition, John Wiley & Sons, 2009.
2. Zainalabdien Navabi, Verliog Digital System Design, 2nd Edition, TMH, 2006.
3. Fundamentals of Logic Design – Charles H. Roth, 7th ed., Cengage Learning, 2021.

REFERENCE BOOKS:

1. Switching and Finite Automata Theory – Z. Kohavi , 2nd ed., McGraw Hill, 2001.
2. Digital Design – Morris Mano, M.D.Ciletti, 4th Edition, Pearson, 2006.
3. Fundamentals of Digital Logic with Verilog Design - Stephen Brown, Zvonkoc Vranesic, 3rd Edition, TMH, 2014.

CONTROL SYSTEMS

	L	T	P	C
B.Tech. II Year II Sem.				
Course Code: 21EC2215	**3**	**0**	**0**	**3**

Pre-requisites: Signals and Systems

Course objectives:

The main objectives of the course is to

1. Analyze closed-loop control systems for stability and steady-state performance
2. Learn the type of System, dynamics of physical systems, classification of control system, analysis and design objective.
3. Understand the different ways of system representations such as Transferfunction representation and state space representations and to assess the system dynamic response and assess the system performance using time domain analysis.
4. Assess the system performance using frequency domain analysis and techniques for improving the performance
5. Design various controllers and compensators to improve system performance

Course Outcomes: At the end of this course, students will demonstrate the ability to

1. Identify open and closed loop control systems.
2. Formulate mathematical model for physical systems
3. Use standard test signals to identify performance characteristics of first and second-order systems.
4. Apply root locus technique for stability analysis.
5. Analyze performance characteristics of system using Frequency response methods

UNIT-I:

Introduction: Concepts of Control Systems- Open loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back characteristics, Effects of feedback. Mathematical models – Differential equations - Impulse Response and transfer functions – Electrical systems. Block diagram algebra and system representations – Signal flow graphs - Mason's gain formula. Introduction of Servo motors.

UNIT-II:

Time Response Analysis: Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems, PID system

UNIT-III:

Stability Analysis: The concept of stability - Routh stability criterion – qualitative stability and conditional stability. Root Locus Technique: The root locus concept - construction of root locus-Root locus analysis.

Frequency domain Analysis: Introduction, Frequency domain specifications-Bode diagrams- Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

UNIT-IV:

Stability Analysis In Frequency Domain: Polar Plots, Nyquist Plots and applications of Nyquistcriterion to find the stability - Effects of adding poles and zeros to G(s)H(s) on the shape of the Nyquist diagrams.

Compensation techniques – Lag, Lead, and Lead Lag Controllers design in frequency Domain.

UNIT-V:

State Space Analysis of Continuous Systems: Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and its Properties. Controllability and Observability.

Text Books:

1. Control Systems Engineering, I. J. Nagrath and M. Gopal, 5th edition, New Age International (P) Limited, Publishers, 2009.
2. Automatic Control Systems, B. C. Kuo, 8th edition, John wiley and sons, 2003.

Reference Books:

1. Control Systems, N. K. Sinha, 3rd Edition, New Age International (P) Limited Publishers, 1998.
2. Problems and solutions of control systems with essential theory, A.K Jairath, 5th Edition, CBS Publishers & Distributors, 2015.

ANALOG AND DIGITAL COMMUNICATIONS LAB

B.Tech. II Year II Sem. **L T P C**
Course Code: 21EC2251 **0 0 3 1.5**

Course Objectives:
The main objectives of the course is to

1. Generate and demodulate amplitude modulation schemes.
2. Generate and demodulate frequency modulation scheme,
3. Study spectral characteristics of amplitude and frequency modulation schemes usingspectrum analyzer.
4. Generate and demodulate pulse analog modulation schemes.
5. Apply and verify digital modulation schemes.
6. Analyze the time division multiplexing technique.

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

1. Design and analyze the different amplitude modulation schemes.
2. Design and analyze the frequency modulation scheme.
3. Visualize spectra of amplitude and frequency modulation schemes using spectrumanalyzer.
4. Design and analyze the different pulse modulation schemes.
5. Apply different digital shift keying techniques.
6. Analyze the performance of various modulation techniques using simulation tool.

Minimum 12 experiments should be conducted:
All these experiments are to be simulated first either using OCTAVE/MATLAB/COMSIM or any other simulation package and then to be realized in hardware

List of Experiments:
Simulation and realization of

1. Amplitude Modulation and Demodulation with spectrum analysis
2. DSB-SC Modulation and Demodulation
3. SSB-SC Modulation and Demodulation
4. Frequency Modulation and Demodulation with spectrum analysis
5. Verification of Sampling theorem
6. Pulse Amplitude Modulation and Demodulation
7. Pulse Width Modulation and Demodulation
8. Pulse Position Modulation and Demodulation
9. Generation and detection (i) PCM (ii)DPCM
10. Delta Modulation
11. Generation and detection (i) FSK (ii)PSK
12. Generation and detection DPSK
13. Generation and detection QPSK
14. Time Division Multiplexing

Major Equipments required for Laboratories:

1. CROs: 20MHz
2. Function Generators: 2MHz
3. Spectrum Analyzer
4. Regulated Power Supplies: 0-30V
5. OCTAVE/MATLAB/Equivalent Simulation Package with Communication tool box
6. Analog and Digital Modulation and Demodulation Trainer Kit

DIGITAL SYSTEM DESIGN LAB

B.Tech. II Year II Sem.	**L**	**T**	**P**	**C**
Course Code: 21EC2252	**0**	**0**	**2**	**1**

Course Objectives:

The main objectives of the course is to

1. Familiarize with the CAD tool to write HDL programs.
2. Understand simulation and synthesis of digital design.
3. Know the difference between synthesizable and non-synthesizable code.
4. Understand the differences between three modeling styles.
5. Understand logic verification using Verilog simulation.

Course Outcomes: At the end of this course, students should be able to:

1. Write the Verilog programs to simulate and synthesize Digital Circuits.
2. Design Combinational circuits in Dataflow, Behavioral and Gate level Abstractions.
3. Describe sequential circuits in Behavioral description and obtain simulation waveforms.
4. Synthesize Register Transfer Level (RTL) models of digital circuits.
5. Gain the knowledge to verify Digital Circuits functionality using FPGA/ Zed Boards.

Note:

- Programming can be done using XILINX or any complier.
- Synthesize Register Transfer Level (RTL) models of digital circuits.
- Download the programs on Xilinx FPGA/Zed boards.
- Minimum 12 experiments should be conducted:

List of Experiments:

1. Verify all the logic gates using HDL code and implement using FPGA/Zed boards.
2. Write the HDL code for decoder and encoder and implement using FPGA/ Zed boards.
   a. 3 to 8 Decoder.
   b. 8 to 3 Encoder (With priority and without priority).
3. Write the HDL code for multiplexer and demultiplexer and implement using FPGA/Zed boards.
   a. 8-to-1 multiplexer.
   b. 1-to-8 demultiplexer.
4. Design and simulate the HDL code for the following code converters.
   a. 4- Bit binary to gray code converter.
   b. 4- Bit gray to binary code converter.
5. Design and simulate the HDL code for 16-bit comparator.
6. Design and simulate the HDL code for Full adder and Full subtractor usingthree modeling styles.
7. Design and simulate the HDL code for carry look ahead adder.
8. Design and simulate the HDL code for 4-bit Array multiplier.
9. Design and simulate the HDL code to implement 8-bit ALU functionality.
10. Design and simulate the HDL code for flip flops: SR, D, JK, T.
11. Design and simulate the HDL code for Shift registers: SISO, PIPO using D Flip-Flops.
12. Design and simulate the HDL code for 12 x 8 MAC (Multiplier Accumulator).
13. Design and simulate the HDL code for 4-bit binary, BCD counters (synchronous/ asynchronous reset).
14. Design and simulate the HDL code to detect the sequence 1010101.
15. Design and simulate the HDL code for FSM: traffic light controller.

ANALOG CIRCUITS LAB

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

Course Code: 21EC2253 **0 0 3 1.5**

Course Objectives:

The main objectives of the course is to

1. Study and design various feedback amplifiers.
2. Familiarize the design of multistage amplifiers.
3. Familiarize various oscillator circuits.
4. Introduce Class A and Class B power amplifiers.
5. Introduce different multivibrators and sweep circuits.

Course Outcomes:

1. To design and verify the outputs of Current Shunt Feedback amplifier and Voltage SeriesFeedback amplifier
2. To design and verify the working, testing and analysis of different classes of amplifiers.
3. To design and verify the outputs of tuned and power amplifiers.
4. To design various oscillators such as Wien Bridge Oscillator , RC phase shift oscillator,Hartley, and Colpitts's Oscillator for different frequencies.
5. To design Multivibrators for various applications, synchronization techniques.
6. To provide experience on design, testing and analysis of Schmitt Trigger circuit for loopgain less than and greater than one

Note:

- Experiments marked with ***** has to be designed, simulated and verifiedin Hardware.
- Minimum of 12 experiments to be done in hardware.

Design and verification of

1. Current Shunt Feedback amplifier Circuit
2. Voltage Series Feedback amplifier Circuit **(*)**
3. Two Stage RC Coupled Amplifier **(*)**
4. Cascode amplifier Circuit **(*)**
5. Darlington Pair Circuit
6. RC Phase shift Oscillator Circuit **(*)**
7. Hartley and Colpitt's Oscillators Circuit
8. Class A power amplifier
9. Class B Complementary symmetry amplifier **(*)**
10. Frequency response of single Tuned voltage amplifier
11. Monostable Multivibrator **(*)**
12. Bistable Multivibrator
13. Characteristics of Schmitt Trigger Circuit
14. Output voltage waveform of Miller Sweep Circuit

Major Equipments required for Laboratories:

1. Computer System with latest specifications connected
2. Windows XP or equivalent
3. Simulation software-Multi sim or any equivalent simulation software
4. Regulated Power Supply, 0-30V
5. 20 MHz, Dual Channel Cathode Ray Oscilloscopes.
6. Functions Generators-Sine and Square wave signals
7. Multi meters
8. Electronic Components

SOFT SKILLS FOR PROFESSIONAL SUCCESS

B.Tech. II Year II Sem. **LT P C**
Course Code: 21HS2254 **0 0 2 1**

Objectives of the Course

1. To enable students understand the nature and the scope of communication, and overcome the barriers for effective communication.
2. To empower students understand the correlation between communication and building social relations.
3. To enhance the team building and leadership qualities.
4. To make the students realize the significance of goal setting.
5. To impart interpersonal communication skills and life skills required for students' professional success.

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

1. Communicate effectively in academic and social contexts.
2. Understand about themselves with reference to self-discovery and self-awareness.
3. Nurture social behavior, responsibility and accountability leading to the ability to work in teams with diverse groups of people.
4. Apply their creative and critical thinking skills for problem solving and decision making.
5. Identify their short-term and long-term goals; apply emotional intelligence to enhance leadership skills and professionalism.

UNIT 1

Art of Communication – Communication Cycle – Barriers to Communication – Effective Communication - Assertiveness - Reading a Story/Passage loudly with more focus on meaningful pauses and Accent Neutralization - Inter-Personal Communication - Social and Professional Networking.

Activity/ies: Role Plays/Telephonic Conversations - Introducing Oneself and Others – Greetings – Making Requisitions and Apologies.

UNIT 2

Self-Discovery - Self-Awareness – SWOT - Self Esteem - Self and Professional Discipline –Procrastination - Time Management – Professional Behavior and Attitude.

Activity/ies: Situations/Case Studies related to Self-Awareness, Self Esteem, Time Management, Behavior and Attitude.

UNIT 3

Motivation – Cooperation and Coordination – Team Building – Creative Thinking – Problem Solving - Decision Making – Accountability and Social Responsibility.

Activity/ies: Situations/Case Studies related to Motivation, Cooperation and Coordination, Team Building and Decision Making

UNIT 4

Emotional Intelligence (EQ) – Critical Thinking - Bonding – Trust Building - Etiquette (Social, Professional and Email)

Activity/ies: Situations/Case Studies related to Trust Building/Etiquette/Film Critiquing

UNIT 5

Leadership - Organizational Skills - Entrepreneurial Skills - Goal Setting - Long-term and Short- term Goals.

Activity/ies: Situations/Case Studies related to Leadership, Organizational Skills, and Goal Setting.

TEXT BOOKS/REFERENCES

1. Raju, Yadava B, B T Sujatha & C. Murali Krishna. *English for Better Performance*. Orient Blackswan, Pvt., Ltd, 2014.
2. Rajan. *I Love Living*. Mumbai: Jaico Publishers, 2013.
3. Sundararajan, Francis. *Basics of Communication in English: Soft Skills for Listening, Speaking, Reading and Writing*. New Delhi: Macmillan Publishers India Ltd., 2021.
4. Tulgan, Bruce. *Bridging the Soft Skills Gap - How to Teach the Missing Basics to Today's Young Talent*. Jossey-Bass; 1 edition. September 15, 2015.

GENDER SENSITIZATION

(**An Activity-based Course**)

B.Tech. II Year II Sem. **L T P C**
Course Code: 21MC0004 **3 0 0 0**

Course Objectives

1. To develop students sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work and help them reflect critically on gender violence.
5. To expose students to more egalitarian interactions between men and women.

Course Outcomes

By the end of the course, students

1. Will have developed a better understanding of important issues related to gender such as gender discrimination in our society and how to counter it.
2. Will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Will acquire insight into the gendered division of labour and its relation to politics and economics enablingstudents and professionals to work and live together as equals.
4. Will develop a sense of appreciation of women in all walks of life.
5. Will be empowered to understand and respond to gender violence by familiarizing them with the studies and movements as well as the new laws that provide protection and relief to women, the textbook.

UNIT - I

Understanding Gender: Introduction- Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: MakingWomen, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

UNIT - II

Gender Roles and Relations: Two or Many? -Struggles with Discrimination-Gender Roles andRelations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex election and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary.

UNIT - III

Gender and Labour: Division and Valuation of Labour-Housework: The Invisible Labor-"My

Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and unaccounted work-Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

UNIT - IV

Gender Based Violence: The Concept of Violence- Types of Gender- based Violence - Gender-

Based Violence from a Human Rights Perspective-Sexual Harassment: Say No! - Sexual Harassment, not Eve-teasing - Coping with Everyday Harassmen t - Further Reading: "*Chupulu".*

Domestic Violence: Speaking Out Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

UNIT - V

Gender and Culture: Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues- Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

TEXT BOOKS:

1. All the five Units in the Textbook, "Towards a World of Equals: A Bilingual Textbook on Gender" written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by Telugu Akademi, Hyderabad,Telangana State in the year 2015.

REFERENCES:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. "I Fought For My Life…and Won."Available online at:
3. http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal.