VIGNANA BHARATHI Institute of Technology

(An UGC Autonomous Institution, Approved by AICTE, Affiliated by JNTUH, Accredited by NBA & NAAC)

Department of Electronics and Communication Engineering
B.TECH. ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE & SYLLABUS (R19)

Applicable From 2019-20 Admitted Batch

II YEAR I SEMESTER

S.No	Course Code	Course Title	Category	L	T	P	Credits
1	19EC2111	Electronic Devices and Circuits	PC	3	1	0	4
2	19EC2112	Digital Logic Design	PC	3	0	0	3
3	19EC2113	Probability Theory and Stochastic Processes	PC	3	0	0	3
4	19EC2114	Signals and Systems	PC	3	1	0	4
5	19EC2115	Network Theory and Transmission Lines	PC	3	0	0	3
6	19EC2151	Electronic Devices and Circuits Lab	PC	0	0	3	1.5
7	19EC2152	Digital Logic Design Lab	PC	0	0	2	1
8	19EC2153	Signals and Stochastics Lab	PC	0	0	3	1.5
9	19MC0001	Gender Sensitization Lab	MC	0	0	2	0
		Total Credits		**15**	**2**	**10**	**21**

II YEAR II SEMESTER

S.No	Course Code	Course Title	Category	L	T	P	Credits
1	19EC2211	Control Systems	ES	3	0	0	3
2	19EC2212	Analog Circuits	PC	3	1	0	4
3	19EC2213	Electromagnetic Theory	PC	3	0	0	3
4	19EC2214	Digital System Design using Verilog	PC	3	0	0	3
5	19EC2215	Analog and Digital Communications	PC	3	1	0	4
6	19EC2251	Analog and Digital Communications Lab	PC	0	0	2	1
7	19EC2252	Digital System Design Lab	PC	0	0	3	1.5
8	19EC2253	Analog Circuits Lab	PC	0	0	3	1.5
9	19MC0004	NSS/NCC	MC	0	0	2	0
		Total Credits		**15**	**2**	**10**	**21**

ELECTRONIC DEVICES AND CIRCUITS

	L	T	P	C
B.Tech. II Year I Sem.				
Course Code: 19EC2111	**3**	**1**	**0**	**4**

Course Objectives:

1. Introduce basic semiconductor devices, their characteristics.
2. Understand the applications of diodes.
3. To impart knowledge about various transistor configurations and their characteristics
4. Introduce small signal amplifier circuits
5. Study of JFET, MOSFET and their characteristics
6. Understand the design of rectifiers, regulators and amplifiers.

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 amplifier circuits

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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: Transistor Hybrid model, Determination of h-parameters from transistor characteristics, h- parameter analysis of CE, CB and CC configurations, Transistor 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 4^{th} edition,2015
2. Electronic Devices and Circuits theory– Robert L. Boylestad, Louis Nashelsky, 11^{th} Edition, 2009, Pearson**.**
3. Pulse, Digital and switching waveforms –J. Millman, H. Taub, Suryaprakash Rao Mothiki. Mc Graw Hill, 3^{rd} edition.

REFERENCE BOOKS:

1. Integrated Electronics, Millman & Halkias, Tata McGraw-Hill, 2^{nd} edition.
2. Electronic Devices and Circuits, David A. Bell – 5^{th} Edition, Oxford.

DIGITAL LOGIC DESIGN

B.Tech. II Year I Sem.	L	T	P	C
Course Code: 19EC2112	3	0	0	3

Course Objectives:

The main objectives are:

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 and the design of combinational logic circuits**
3. **Understand various memory elements and their applications in sequential circuits**
4. **Understand and learn the concepts of Mealy and Moore finite state machines for the design of sequential circuits**
5. **Understand 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 design of various combinational circuits by simplifying Boolean expressions using K-Maps**
3. **Understand the design of flip-flops, their applications in data transfer, shift registers and counters .**
4. **Analyze the design of sequential circuits using the concepts of Mealy and Moore FSM models.**
5. **Understand the concepts of various 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, The Karnaugh Map Method-Up to Five variable K-Maps with Don't care conditions(Tabular method). Simplification of Sum of products and Product of Sums,

Design of Combinational circuits: Design of Adders, Subtractors, comparators, Multiplexers, Demultiplexers, Decoders, Encoders and Code converters, Hazards and Hazard Free Realizations.

UNIT – III

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, Operation of Shift Registers, Shift Register Configuration, Bidirectional Shift Registers, Applications of Shift Registers, Design and Operation of Ring and Twisted Ring Counter, Operation Of Asynchronous And Synchronous Counters.

UNIT – IV

Finite state Machines: Introduction to Mealy and Moore models of finite state machines, State Diagram, Analysis of Synchronous Sequential Circuits: Serial Binary Adder, Sequence Detector, Design of Asynchronous Counters, Design of Synchronous Modulo N –Counters.

UNIT – V

Logic families and ICs: Realization of Logic Gates Using Diodes & Transistors: AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL, CML and CMOS Logic Families and its Comparison.

Classification of Integrated circuits, comparison of various logic families, standard TTL NAND Gate-Analysis & characteristics.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

PROBABILITY THEORY AND STOCHASTIC PROCESSES

B.Tech. II Year I Sem.	**L**	**T**	**P**	**C**
Course Code: 19EC2113	**3**	**0**	**0**	**3**

Course Objectives:

1. To give students an introduction to elementary probability theory, in preparation forcourses on statistical analysis, random variables and stochastic processes.
2. To mathematically model the random phenomena with the help of probability theoryconcepts.
3. To introduce the important concepts of random variables and stochastic processes.
4. To known the Spectral and temporal characteristics of Random Process.
5. To 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 their Properties.

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 Input and 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-Hartley law; 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. Unnikrishna 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: 19EC2114	3	1	0	4

Course Objectives:

1. To know the standard signals and its characteristics, orthogonality concept
2. To know the spectral analysis of periodic and aperiodic signals using Fourier methods
3. To analyze and characterize the signals and systems in frequency domain using LT and discrete signals and DT systems through Z-transform
4. To understand the concept of convolution, correlation
5. To convert CT signal into Discrete time signal
6. To 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. Represent any arbitrary signal in frequency domain using Fourier series and FT.
3. Explain the ROC, and analyze and characterize CT and DT systems using LT and ZT respectively.
4. Evaluate the convolution, and correlation between two signals. To convert CT signal into Discrete time signal
5. Explain sampling and 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 from Noise 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 less transmission 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,2009, OXFORD
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 2 Ed.,2007
2. Singals and Systems – A Anand Kumar , 3rd Ed, PHI
3. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition.,

NETWORK THEORY AND TRANSMISSION LINES

B.Tech. II Year I Sem.	L	T	P	C
Course Code: 19EC2115	3	0	0	3

Course Objectives:

1. To Understand the network theorems of A.C &D.C
2. To Understand the various network topologies and magnetic circuits
3. To know the analysis of the steadystates and transients states in RLC circuits.
4. To understand the two port network parameters.
5. To study the propagation, reflection and transmission of plane waves in bounded 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.
NetworkTheorems: 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 various parameters,

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, Image Parameters, 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. λ/4, λ/2, λ/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.Chakrabarhty, Dhanipat Rai & Sons.
3. Networks, Lines and Fields - JD Ryder, PHI, 2nd Edition, 1999.
4. Network analysis and Transmission Lines -Roy Chowdhury

REFERENCE BOOKS:

1. Electric Circuits – J. Edminister and M. Nahvi – Schaum's Outlines, Mc Graw Hills Education,1999.
2. Engineering Circuit Analysis – William Hayt and Jack E Kemmerly, MGH, 8th Edition, 1993.
3. Electromagnetics with Applications – JD. Kraus, 5th Ed., TMH
4. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan, 2001, (Tech. India Publications), New Delhi.

ELECTRONIC DEVICES AND CIRCUITS LAB

	L	T	P	C
B.Tech. II Year I Sem.				
Course Code: 19EC2151	**0**	**0**	**3**	**1.5**

Course outcomes

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

- Understand the P-N diode and Zener diode characteristics
- Explain the applications of P-N diode and zener diode.
- Acquire knowledge about various configurations of transistor like CE, CB and its h-parameter analysis and its applications.
- Analyze the FET operation, common source FET amplifiers and observe its frequency response.
- Design of clippers, clampers and analyze their characteristics.
- Acquire knowledge about the concepts of unipolar junction transistor and observe its characteristics.

List of Experiments (Twelve experiments to be done):

Verify any twelve experiments in H/W Laboratory

Design 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

B.Tech. II Year I Sem. **L T P C**
Course Code: 19EC2152 **0 0 2 1**

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

- Simplify the Boolean expressions and design digital circuits using gates
- Understand the use of universal gates for various digital circuits design.
- Implement combinational circuits using ICs.
- Use flip-flops for designing shift registers
- Design and implement the counters using flipflops.
- Understand FSM and design sequence detector.

Note: Implement using digital ICs, all experiments to be carried out.

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 grayto Binary and Binaryto Gray Converter
6. Design and realization of an 8 bit parallel load and serial out shift register using flip-flops.
7. Design and realization of a Synchronous and Asynchronous counter using flip-flops
8. Design and realization of Asynchronous counters using flip-flops
9. Design and realization of 8x1 MUX using 2x1 MUX
10. Design and realization of 4 bit comparator
11. 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: 19EC2153 **0 0 3 1.5**

Note:

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

Course Objectives:

- To learn basic Operations on Matrices
- To generate various signals on signals.
- To simulate operations on signals/sequences.
- To simulate characteristics and response of systems
- To simulate FS and FT
- To simulate various random variables and processes.

Course Outcomes:

After going through this course the student will be able to

i. Perform various operations on the signals including Time shifting, Scaling, Reversal, Amplitude Scaling
ii. Determine the correlation & Convolution between Signals and sequences.
iii. Determine a given system is linear or not and Time variant or Time invariant anddetermine system response for unit step and sinusoidal signals
iv. Simulation and verification of Gibbs phenomenon.
v. Verification of Weiner-khinchine relations i.e., autocorrelation function Rxx and PowerSpectral Density are FT pair.
vi. Generation of Gaussian noise (Real and Complex), Computation of its mean,
vii. M.S. Value and its Skew

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 realiazability 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 Stationarity.

GENDER SENSITIZATION

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

Course Code: 19MC0001 **0 0 2 0**

Course Objectives:

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

Course Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students 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.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT - I

UNDERSTANDING GENDER Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1) **Socialization:** Making Women, Making Men (*Towards a World of Equals*: Unit -2) Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT - II GENDER AND BIOLOGY: Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4) Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)Two or Many? Struggles with Discrimination.

UNIT - III

GENDER AND LABOUR Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3) "My Mother doesn't Work." "Share the Load."

Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7) Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT-IV

ISSUES OF VIOLENCE Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6) Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*

Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8) Is Home a Safe Place?

-When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice. Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11) Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT - V

GENDER: CO - EXISTENCE Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12) Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

TEXTBOOK

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**.

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

REFERENCE BOOKS:

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: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

CONTROL SYSTEMS

B.Tech. II Year II Sem.	L	T	P	C
Course Code: 19EC2211	3	0	0	3

Course objectives:

1. To Analyse closed-loop control systems for stability and steady-state performance
2. To learn the type of System, dynamics of physical systems, classification of control system,analysis and design objective
3. To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response To assess the system performance using time domain analysis and methods for improvingit
4. To assess the system performance using frequency domain analysis and techniques for improving the performance
5. To 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 system
2. Formulate mathematical model for physical systems
3. Simplify representation of complex systems using reduction techniques
4. Use standard test signals to identify performance characteristics of first and second-order systems.
5. Apply root locus technique for stability analysis.
6. 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 controlsystems, 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/*.

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 Nyquist criterion 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, New Age International (P) Limited, Publishers, 5th edition, 2009
2. Automatic Control Systems, B. C. Kuo, John wiley and sons, 8th edition, 2003.

Reference Books:

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

ANALOG CIRCUITS

B.Tech. II Year II Sem. **LT PC**

Course Code: 19EC2212 **3 1 0 4**
Pre-requisite: Electronic Devices and Circuits

Course Objectives:

1. To familiarize the Concept of Negative feedback in Amplifiers .
2. To familiarize the Concept of Positive feedback and Design of various oscillatorcircuits
3. To give understanding of various types of amplifier circuits such as small signal,cascaded, large signal and tuned amplifiers
4. To Learn the concepts of high frequency analysis of transistors.
5. To construct various Multivibrators using transistors and sweep circuits.
6. To apply and analyze various amplifiers and Multivibrators circuits for variousapplications.

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 feed back to generate sustained oscillations
3. Design and Analysis of Multistage amplifiers .
4. Understand the concepts of High Frequency Analysis of Transistors.
5. Design and realize different classes of Power Amplifiers and tuned amplifiers for audio and Radio applications.
6. Design and analyze various Multivibrators and Sweep circuits for various applications.

UNIT I

Feedback Amplifiers: Concepts of feedback – Classification of feedback amplifiers – General characteristics 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 coupling schemes 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, $f\alpha$, $f\beta$ 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, McGraw Hill Education.
2. Electronic Devices Conventional and current version -Thomas L. Floyd 2015, Pearson.

REFERENCE BOOKS:

1. Milliman's Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2 nd Edition 2008, McGraw Hill.
2. Electronic Devices and Circuits theory– Robert L. Boylestad, Louis Nashelsky, 11th Edition, 2009, Pearson

ELECTROMAGNETIC THEORY

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

Course Code: 19EC2213 **3 0 0 3**

Course Objectives:

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

- Understand the coordinate system and vector calculus
- To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields and Magnetostatic Fields, and apply them to solve physics and engineering problems.
- To distinguish between static and time-varying fields, and understand the significance and utility of Maxwell's Equations and Boundary Conditions, and gain ability to provide solutions to communication engineering problems.
- To analyze the characteristics of Uniform Plane Waves (UPW), determine their propagation parameters and estimate the same for dielectric and dissipative media.
- To conceptually understand the Poynting Theorem and behavior of UPW in different mediums and apply them for practical problems.
- To theoretically understand the Reflection and Refraction concepts of a UPW at different incidence angle and leads to understand the concept of Total Internal Reflection.

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

- Visualize the concept of Coordinate geometry and understand the importance of mathematical operator (Del), and its applications like Curl, Divergence etc.
- Analyze the generation of Electric Field and electric field due various charge distributions.
- Analyze the generation of Magnetic field in terms of Scalar and Magnetic Potentials.
- Distinguish between the static and time-varying fields, establish the corresponding sets of Maxwell's Equations and Boundary Conditions, and use them for solving engineering problems.
- Analyze the Wave Equations for good conductors and good dielectrics, and evaluate the UPW Characteristics for several practical media of interest.
- Establish the proof of poynting theorem and estimate the polarization features, reflection and transmission coefficients for UPW propagation, distinguish between Brewster and Critical Angles, and acquire knowledge of their applications.

UNIT – I Introduction to Co-ordinate System – Rectangular – Cylindrical and Spherical Co- ordinate System – Introduction to line, Surface and Volume Integrals –

Definition of Curl, Divergence and Gradient – Meaning of Stokes theorem and Divergence theorem

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

UNIT – II

Electrostatics II: Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

UNIT – III

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

UNIT – IV

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

UNIT – V

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

Digital System Design using Verilog

B.Tech. II Year II Sem.	**L**	**T**	**P**	**C**
Course Code:19EC2214	**3**	**0**	**0**	**3**

Course Objectives:

- To introduce Verilog HDL, Features, Syntax and Modelling styles.
- To understand Dataflow Level and Gate Level Modeling.
- To understand of Behavioral Level and Switch Level Modeling.
- To impart knowledge in verifying and synthesizing RTL Models of combinational logic modules using Verilog HDL.
- To provide knowledge in designing of Sequential logic modules, FSMs using Verilog HDL and verification.
- To provide extended knowledge of digital logic circuits in the form of state model approach.

Course Outcomes:

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

- Design and simulate digital circuits.
- Develop Dataflow Level and gate level models of digital circuits.
- Design and simulate Switch Level models of Circuits and verify Behavioral models.
- Develop Register Transfer Level (RTL) models of digital circuits.
- Gain skills to design Finite state machine (FSM) models.
- Gain the knowledge of 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: Combinational Circuit Design: Full adders, Ripple carry adders, carry look ahead adders, pipelined adders, Two's complement binary numbers, Subtractor, decoder, Encoder, multiplier, comparator, Barrel shifters, ALU, MAC design and its Verilog implementation.

UNIT V. Sequential Circuit Design: Finite state machine (FSM) models, state diagram, analysis and synthesis of sequential circuits, Verilog implantation of sequential circuits. Registers, shift registers, counters, SRAM, FIFO's, RTL design.
State graphs for control circuits: Scoreboard Controller, shift and add multiplier, Array multiplier, Keypad Scanner, Binary divider, dice game controller.

TEXT BOOKS:
1. T.R. Padmanabhan, B Bala Tripura Sundari, Design Through Verilog HDL, Wiley 2009.
2. Zainalabdien Navabi, Verliog Digital System Design,TMH, 2nd Edition.
3. Fundamentals of Logic Design – Charles H. Roth, 5th ed., Cengage Learning.

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

ANALOG AND DIGITAL COMMUNICATION

B.Tech. II Year II Sem.	**L**	**T**	**P**	**C**
Course Code: 19EC2215	**3**	**1**	**0**	**4**

Prerequisite: Probability theoryand Stochastic Processes, Signals and Systems

Course Objectives:

- To develop ability to analyze system requirements of analog and digital communication systems
- To understand the generation, detection of various analog and digital modulation techniques.
- To acquire theoretical knowledge of each block in AM, FM transmitters and receivers.
- To understand the concepts of pulse modulation techniques
- To understand the concepts of baseband transmissions.
- To understand the various modulation techniques in different environments.

Course Outcomes:

Upon completing this course, the student will be able to

- Analyze and design of various amplitude modulation and demodulation techniques.
- Analyze and design of various angle modulation and demodulation techniques.
- Attain the knowledge about AM, FM Transmitters and Receivers.
- Analyze and design the various pulse modulation techniques.
- Analyze various digital modulation techniques and baseband transmission.
- Apply and analyze the various modulation techniques in different environments.

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, Noise in AM and FM

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, Comparison of 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, Second edition, Wiley Publications, 2014
2. K. Sam Shanmugam, Digital and Analog Communication Systems, Wiley Publications, 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, 4/e, Oxford University Press, 2017.
3. Electronics & Communication System – George Kennedy and Bernard Davis, TMH Electronic Communications – Dennis Roddyand John Coolean , 4th Edition , PEA, 2004

Digital System Design LAB

B.Tech. II Year II Sem.	L	T	P	C
Course Code:19EC2252	0	0	2	1

Course Objectives:

- Familiarize with the CAD tool to write HDL programs.
- Understand simulation and synthesis of digital design.
- Know the difference between synthesizable and non-synthesizable code.
- Understand the differences between three modeling styles.
- Understand logic verification using Verilog simulation.
- Program FPGAs/CPLDs to synthesize the digital designs

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

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

- Programming can be done using XILINX or any complier.
- Down load the programs on FPGA/CPLD boards.
- Minimum 12 experiments should be conducted:

List of Experiments:

1. Verify all the logic gates using HDL code and implement it to FPGA/CPLD boards.
2. Write the HDL code for decoder and encoder and implement it to FPGA/CPLD 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 it to FPGA/CPLD boards
   a) 8-to-1 multiplexer.
   b) 1-to-8 demultiplexer.
5. Design and simulate the HDL code for the following code converters.

a) 4- Bit binaryto graycode converter.
b) 4- Bit gray to binary code converter.

6. Design and simulate the HDL code for 16-bit comparator.
7. Design and simulate the HDL code for Full adder and Full subtractor using three modeling styles.
8. Design and simulate the HDL code for flip flops: SR, D, JK, T.
9. Write the HDL code for 4-bit binary, BCD counters (synchronous/ asynchronous reset).
10. Design of dice game controller.
11. Design of 4-bit Array multiplier.
12. Design and simulate the HDL code to implement 8-bit ALU functionality.
13. Write the HDL code to detect the sequence 1010101.
14. Design and simulate the HDL code for FSM: traffic light controller.
15. Design and simulate the HDL code for 12 x 8 MAC (Multiplier Accumulator).

ANALOG AND DIGITAL COMMUNICATIONS LAB

B.Tech. II Year II Sem. **L T P C**
Course Code: 19EC2251 **0 0 3 1.5**

Course Objectives:

- To generate and demodulate amplitude modulation schemes.
- To generate and demodulate frequency modulation scheme,
- To studyspectral characteristics of amplitude and frequency modulation schemes using spectrum analyzer.
- To generate and demodulate pulse analog modulation schemes.
- To apply and verify digital modulation schemes.
- To analyze the time division multiplexing technique.

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

- Design and analyze the different amplitude modulation schemes.
- Design and analyze the frequency modulation scheme.
- Visualize spectra of amplitude and frequency modulation schemes using spectrum analyzer.
- Design and analyze the different pulse modulation schemes.
- Apply different digital shift keying techniques.
- 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/MAT Lab/Equivalent Simulation Package with Communication tool box
6. Analog and Digital Modulation and Demodulation Trainer Kit

ANALOG CIRCUITS LAB

B.Tech. II Year II Sem.	**L**	**T**	**P**	**C**
Course Code: 19EC2253	**0**	**0**	**3**	**1.5**

Course Outcomes:

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

Note:

- Experiments marked with ***** has to be designed, simulated and verified in 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-Multisim or anyequivalent simulation software
4. Regulated Power Supply, 0-30V
5. 20 MHz, Dual Channel Cathode RayOscilloscopes.
6. Functions Generators-Sine and Square wave signals
7. Multi meters
8. Electronic Components