

BOARD OF STUDIES
FOR
ELECTRONICS AND COMMUNICATION ENGINEERING
MINUTES OF THE MEETING

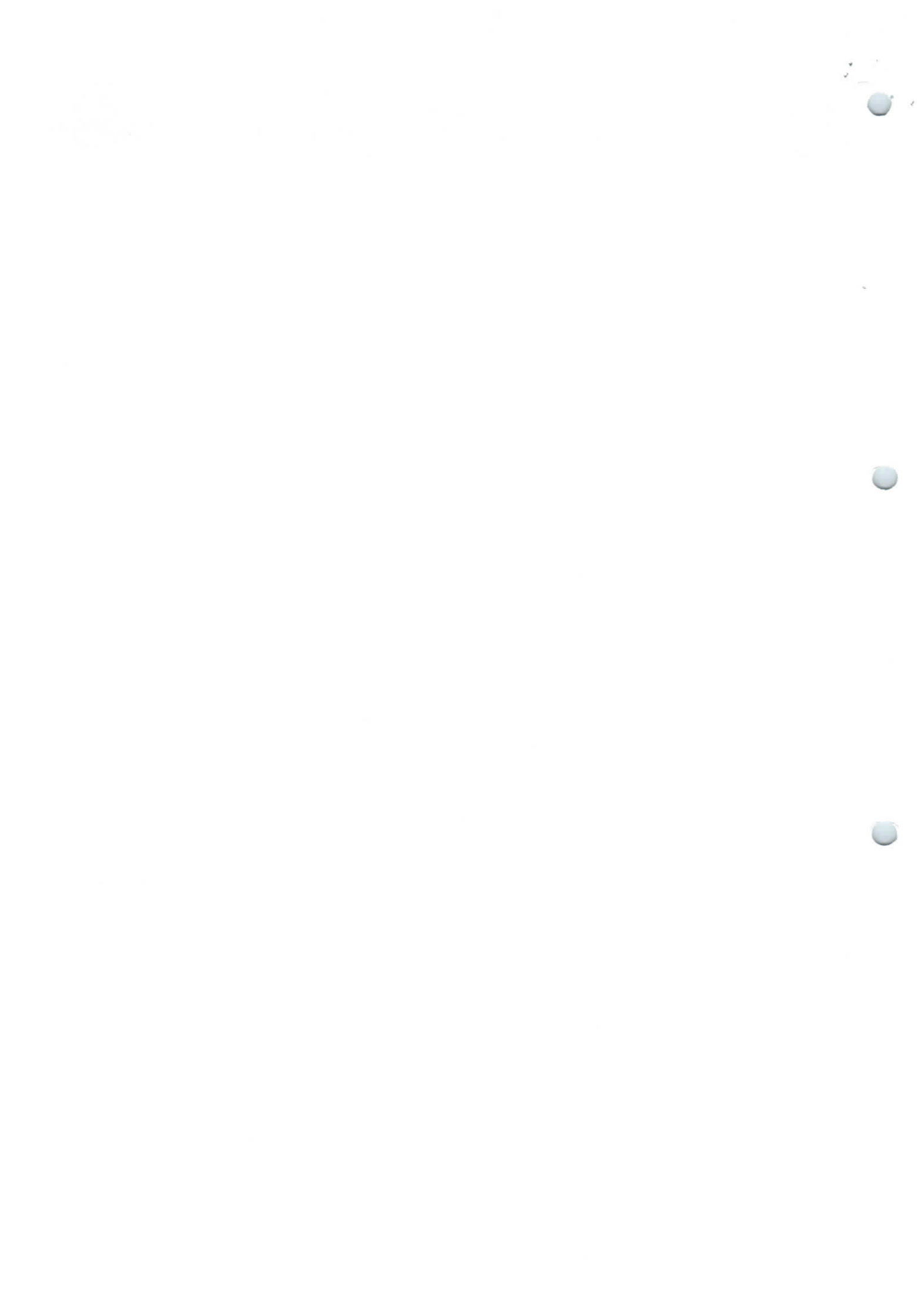
The meeting of the Board of Studies for ECE was held on **16.12.2019** at 10:00 AM at CMR Technical Campus, Kandlakoya (V), Medchal Road, Hyderabad – 501 401.

The following members attended the meeting:

S. No	Name	Designation	Role	Signature
1	Dr. A. Raji Reddy	Director, CMR Technical Campus	Special Invitee	<i>A. Raji Reddy</i> 16.12.19
2	Prof. G Srikanth	Professor & HOD of ECE, CMR Technical Campus	Chairman	<i>G. Srikanth</i> 16/12/19
3	Dr. Dhiraj Sunehra	Professor & HOD Electronics & Communication Engineering, JNTU College of Engg. Jagtial.	Univ. Nominated Member	<i>Dhiraj Sunehra</i> 16/12/19
4	Dr. T. Anil Kumar	Dean (R&D) & Professor of ECE, CMRIT, Hyderabad.	Subject Expert	<i>T. Anil Kumar</i> 16/12/19
5	Dr. Pankaj Agrawal	Professor of ECE CMR Technical Campus	Subject Expert	<i>P. Agrawal</i> 16/12/19
6	Dr. Bandi Doss	Professor of ECE, CMR Technical Campus	Subject Expert	<i>B. Doss</i> 16/12/19
7	Mr. D. Rajesh Reddy	Scientist-E, ISRO Centre, Hyderabad	Subject Expert	<i>D. Rajesh Reddy</i> 16/12/2019
8	Mr. A. Venkatesh (097R1A0403)	Oracle-Prod-Dev-Analyst, Oracle India, Pvt. Ltd.	Industry Representative	<i>A. Venkatesh</i> 26/12/19
10	Dr. M. Ahmed Ali Baig	Professor & Dean Academics, CMR Technical Campus	Special Invitee	<i>M. Ahmed Ali Baig</i> 16/12/19

Prof. G. Srikanth, Professor of ECE and Chairman, Board of Studies welcomed all the members and presented a report on the scheme & syllabus of UG & PG Programmes for **R19** (w.e.f. **A.Y. 2019-20**) & **R20** (w.e.f. **A.Y. 2020-21**). The scheme & syllabus of UG & PG Programmes of Electronics and Communication Engineering has been thoroughly discussed in detail and approved as follows:

(P.T.O.)



Basic Electrical & Electronics Engineering

B.Tech. I SEM

L	T	P	C
3	1	0	4

Course Objectives:

- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To impart the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.
- To introduce the concepts of diodes & transistors, and
- To impart the knowledge of various configurations, characteristics and applications.

Course Outcomes:

- To understand and analyze basic Electrical circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations
- To identify and characterize diodes and various types of transistors.

UNIT – I

10L

D.C. CIRCUITS: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation.

A.C. CIRCUITS: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits RL, RC, RLC series combination. Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT – II

10L

TRANSFORMERS: Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, O.C. and S.C. Tests, Three-phase transformer connections.

ELECTRICAL INSTALLATIONS: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing.

UNIT – III

10L

ELECTRICAL MACHINES: Construction and working principle of DC generators, types, emf equation, working principle of DC motors, Torque equation and Speed control of DC shunt motors, Construction and working principle of Three-phase Induction motor, Torque- slip Characteristics

UNIT – IV

08L

P-N JUNCTION AND ZENER DIODE: Principle of Operation Diode equation, Volt-Ampere characteristics, Static and dynamic resistances, Diode Capacitance-Diffusion and Transition capacitance, a Zener diode characteristics and applications.

RECTIFIERS: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier, Simple problems.

UNIT – V

10L

BIPOLAR JUNCTION TRANSISTOR (BJT): Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations, Comparison of CE, CB and CC configurations. SCR-Construction, Operation and V-I characteristic.

Setty

TEXTBOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education
3. Principles of Electrical Engineering and Electronics – V.K. Mehta, Rohit Mehta, S.Chand Publications
4. Electronic Devices and circuits – S. Salivahanan, N.Suresh Kumar, McGraw Hill

REFERENCE BOOKS:

1. Electronic Devices and Circuits – R. L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
4. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
5. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
6. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
7. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

Basic Electrical & Electronics Engineering Lab**B.Tech. I SEM**

L	T	P	C
0	0	3	1.5

SECTION A: ELECTRICAL ENGINEERING:

1. Verification of KCL and KVL.
2. Verification of Ohms Law.
3. Three-phase transformer: Verification of Relationship between voltages and currents.(Star –Star, Star – Delta, Delta – star, Delta - Delta)
4. Load Test on Single-phase transformer.
5. Brake test on DC shunt motor.
6. OC and SC tests on Single-phase transformer.
7. Brake test on 3-phase Induction motor.
8. No Load Characteristics of 3 phase Alternator.

SECTION B: ELECTRONICS ENGINEERING:

1. Study and operation of
(i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies
2. PN Junction Diode Characteristics (Forward bias, Reverse bias)
3. Zener Diode Characteristics
4. Study of CRO.
5. Transistor CE Characteristics
6. Rectifier without Filters (Full wave & Half wave)
7. Rectifier with Filters (Full wave & half wave).

Note: Total 10 experiments are to be conducted.

(Five experiments from PART-A, Five experiments from PART-B)



Basic Electrical Engineering**B.Tech. I SEM**

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To import the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.

Course Outcomes:

- To analyze and solve electrical circuits using network laws and theorems.
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations

UNIT-I: D.C. Circuits

Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT-II: A.C. Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III: Transformers

Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV: Electrical Machines

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

UNIT-V: Electrical Installations
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Text-Books/Reference-Books:

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.

2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L.S. Bobrow, Fundamentals of Electrical Engineering", Oxford University Press, 2011
4. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010
5. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989.

Basic Electrical Engineering Lab**B.Tech. I SEM**

L	T	P	C
0	0	2	1

Course Objectives:

- To analyze a given network by applying various electrical laws and network theorems
- To know the response of electrical circuits for different excitations
- To calculate, measure and know the relation between basic electrical parameters.
- To analyze the performance characteristics of DC and AC electrical machines

Course Outcomes:

- Get an exposure to basic electrical laws.
- Understand the response of different types of electrical circuits to different excitations.
- Understand the measurement, calculation and relation between the basic electrical parameters
- Understand the basic characteristics of transformers and electrical machines.

List of experiments/demonstrations:

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Transient Response of Series RL and RC circuits using DC excitation
4. Transient Response of RLC Series circuit using DC excitation
5. Resonance in series RLC circuit
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit
11. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
13. Performance Characteristics of a Three-phase Induction Motor
14. Torque-Speed Characteristics of a Three-phase Induction Motor
15. No-Load Characteristics of a Three-phase Alternator



CMR TECHNICAL CAMPUS
UGC AUTONOMOUS
B.Tech. II Year Syllabus (w. e. f. A.Y. 2019-20)

ECE

III SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	19EC301PC	Electronic Devices and Circuits	3	1	0	4
2	19EC302PC	Digital System Design	3	1	0	4
3	19EC303PC	Signals and Systems	3	0	0	3
4	19MA304BS	Probability Theory and Stochastic Processes	3	0	0	3
5	19EE305ES	Network Analysis and Transmission Lines	3	0	0	3
6	19EC306PC	Digital System Design Lab	0	0	2	1
7	19EC307PC	Electronic Devices and Circuits Lab	0	0	3	1.5
8	19EC308PC	Basic Simulation Lab	0	0	3	1.5
9	19MC309CI	Constitution of India	3	0	0	0
		Total Credits	18	2	8	21

IV SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	19MA401BS	Laplace Transforms, Numerical methods & Complex variable	3	1	0	4
2	19EC402PC	Analog and Digital Communications	3	0	0	3
3	19EC403PC	Electronic Circuit Analysis	3	0	0	3
4	19EC404PC	Electromagnetic Fields and Waves	3	0	0	3
5	19EC405PC	Linear IC Applications	3	0	0	3
6	19EC406PC	Analog and Digital Communications Lab	0	0	2	1
7	19EC407PC	Electronic Circuit Analysis Lab	0	0	3	1.5
8	19EC408PC	IC Applications Lab	0	0	3	1.5
9	19MC409GS	Gender Sensitization	0	0	2	0
		Total Credits	15	1	10	20

Signature

19EC301PC: ELECTRONIC DEVICES AND CIRCUITS**B.Tech. III SEM**

L	T	P	C
3	1	0	4

Course Objectives:

- To introduce components such as diodes, BJTs and FETs.
- To know the applications of components.
- To know the switching characteristics of components
- To give understanding of various types of amplifier circuits

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

- Know the characteristics of various components.
- Understand the utilization of components.
- Understand the biasing techniques
- Design and analyze small signal amplifier circuits.

UNIT – I

Diode and Applications: Diode - Static and Dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances, Diode Applications: Switch-Switching times.

Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers-Clipping at two independent levels, Clamper-Clamping Circuit Theorem, Clamping Operation, Types of Clampers.

UNIT – II

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 - Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diodes.

UNIT – III

Junction Field Effect Transistor (FET): Construction, Principle of Operation, Pinch-Off Voltage, Volt- Ampere Characteristic, Comparison of BJT and FET, Biasing of FET, FET as Voltage Variable Resistor. **Special Purpose Devices:** Zener Diode - Characteristics, Voltage Regulator. Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode.

UNIT – IV

Analysis and Design of Small Signal Low Frequency BJT Amplifiers: Transistor Hybrid model, Determination of h-parameters from transistor characteristics, Typical values of h-parameters in CE, CB and CC configurations, Transistor amplifying action, 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

FET Amplifiers: Small Signal Model, Analysis of JFET Amplifiers, Analysis of CS, CD, CG JFET Amplifiers. MOSFET Characteristics in Enhancement and Depletion mode, Basic

Concepts of MOS Amplifiers.

TEXT BOOKS:

1. Electronic Devices and Circuits- Jacob Millman, McGraw Hill Education
2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky,
11th Edition, 2009, Pearson

REFERENCE BOOKS:

1. The Art of Electronics, Horowitz, 3rd Edition Cambridge University Press
2. Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford.
3. Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S.
Prakash Rao, 2nd Ed., 2008, Mc GrawHill.

19EC302PC: DIGITAL SYSTEM DESIGN**B.Tech. III SEM**

L	T	P	C
3	1	0	4

Pre-Requisites: Nil**Course Objectives:**

- To understand common forms of number representation in logic circuits
- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand the concepts of combinational logic circuits and sequential circuits.
- To understand the Realization of Logic Gates Using Diodes & Transistors.

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

- Understand the numerical information in different forms and Boolean Algebra theorems
- Postulates of Boolean algebra and to minimize combinational functions
- Design and analyze combinational and sequential circuits
- Known about the logic families and realization of logic gates.

UNIT - I:

Number Systems: Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code.

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

UNIT - II:

Minimization of Boolean functions: Karnaugh Map Method - Up to five Variables, Don't Care Map Entries, Tabular Method,

Combinational Logic Circuits: Adders, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations.

UNIT - III

Sequential Circuits Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

Registers and Counters: Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers - Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

UNIT - IV

Sequential Machines: Finite State Machines, Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous

Modulo N – Counters. Finite state machine-capabilities and limitations, Mealy and Moore models.

UNIT – V

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, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tri- state outputs, CMOS transmission gate, IC interfacing- TTL driving CMOS & CMOS driving TTL.

TEXT BOOKS:

1. Switching and Finite Automata Theory - ZviKohavi& Niraj K. Jha, 3rdEdition, Cambridge, 2010.
2. Modern Digital Electronics – R. P. Jain, 3rdEdition, 2007- TataMcGraw-Hill

REFERENCE BOOKS:

1. Digital Design- Morris Mano, PHI, 4thEdition,2006.
2. Introduction to Switching Theory and Logic Design – FredriacJ. Hill, Gerald R. Peterson, 3rd Ed, John Wiley & Sons Inc.
3. Fundamentals of Logic Design- Charles H. Roth, Cengage Learning, 5th, Edition,2004.
4. Switching Theory and Logic Design – A Anand Kumar, PHI,2013.

19EC303PC: SIGNALS AND SYSTEMS**B.Tech. III SEM**

L	T	P	C
3	0	0	3

Pre-requisite: Nil**Course Objectives:**

- This gives the basics of Signals and Systems required for all Electrical Engineering related courses.
- To understand the behavior of signal in time and frequency domain.
- To understand the characteristics of LTI systems.
- This gives concepts of Signals and Systems and its analysis using different transform techniques.

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

- Differentiate various signal functions.
- Represent any arbitrary signal in time and frequency domain.
- Understand the characteristics of linear time invariant systems.
- Analyze the signals with different transform technique.

UNIT – I

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

UNIT – II

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

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

UNIT – III

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, Ideal LPF, HPF, and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time, Convolution and Correlation of Signals, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution.



UNIT – IV

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, Laplace Transform of certain signals using waveform synthesis.

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 – 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, Introduction to Band Pass Sampling.

Correlation: Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parsevals 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.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, 2013,BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2Ed.

REFERENCE BOOKS:

1. Signals and Systems – Simon Haykin and Van Veen, Wiley 2Ed.,
2. Signals and Systems – A. Rama Krishna Rao, 2008,TMH.
3. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition.
4. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, 3 Ed., 2004,PE.
5. Signals and Systems – K. Deergha Rao, Birkhauser,2018.

19MA304BS: PROBABILITY THEORY AND STOCHASTIC PROCESSES**B.Tech. III SEM**

L	T	P	C
3	0	0	3

Pre-requisite: Nil**Course Objectives:**

- This gives basic understanding of random signals and processing.
- Utilization of Random signals and systems in Communications and Signal Processing areas.
- To know the Spectral and temporal characteristics of Random Process.
- To Learn the Basic concepts of Noise sources.

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

- Understand the concepts of Random Process and its Characteristics.
- Understand the response of linear time Invariant system for a Random Processes.
- Determine the Spectral and temporal characteristics of Random Signals.
- Understand the concepts of 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 Stationary, (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, Cambridgeunipress, 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.

19EE305ES: NETWORK ANALYSIS AND TRANSMISSION LINES**B.Tech. III SEM**

L	T	P	C
3	0	0	3

Pre-Requisites: Nil**Course Objectives:**

- To understand the basic concepts on RLC circuits.
- To know the behavior of the steady states and transients states in RLC circuits.
- To understand the two port network parameters.
- 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:

- Gain the knowledge on basic RLC circuits behavior.
- Analyze the Steady state and transient analysis of RLC Circuits.
- Know the characteristics of two port network parameters.
- Analyze the transmission line parameters and configurations.

UNIT – I

Network Topology, Basic cutset and tie set matrices for planar networks, Magnetic Circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

UNIT – II

Transient and Steady state analysis of RC, RL and RLC Circuits, Sinusoidal, Step and Square responses. RC Circuits as integrator and differentiators. 2nd order series and parallel RLC Circuits, Root locus, damping factor, over damped, under damped, critically damped cases, quality factor and bandwidth for series and parallel resonance, resonance curves.

UNIT – III

Two port network parameters, Z, Y, ABCD, h and g parameters, Characteristic impedance, Image transfer constant, image and iterative impedance, network function, driving point and transfer functions – using transformed (S) variables, Poles and Zeros. Standard T, Pi, L Sections, Characteristic impedance, image transfer constants, Design of Attenuators, impedance matching network.

UNIT – IV

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, Loading - Types of Loading.

UNIT – V

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, 3rdEd., Pearson, 2016.
2. Networks, Lines and Fields - JD Ryder, PHI, 2nd Edition, 1999.

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, 5thEd., TMH.
4. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan, 2001, (Tech. India Publications), New Delhi.

19EC306PC: DIGITAL SYSTEM DESIGN LAB**B.Tech. III SEM**

L	T	P	C
0	0	3	1.5

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 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 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 2x1MUX.
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. 5 V Fixed Regulated Power Supply/ 0-5V or more Regulated Power Supply.
2. 20 MHz Oscilloscope with Dual Channel.
3. Bread board and components/ Trainer Kit.
4. Multi meter.

19EC307PC: ELECTRONIC DEVICES AND CIRCUITS LAB**B.Tech. III SEM**

L	T	P	C
0	0	3	1.5

List of Experiments (Twelve experiments to be done):

Verify any twelve experiments in H/W Laboratory:

1. PN Junction diode characteristics A) Forward bias B) Reversebias.
2. Zener diode characteristics and Zener as voltage Regulator.
3. Full Wave Rectifier with & without filters.
4. Input and output characteristics of BJT in CE Configuration.
5. Input and output characteristics of FE in CS Configuration.
6. Common Emitter Amplifier Characteristics.
7. Common Base Amplifier Characteristics.
8. Common Source amplifier Characteristics.
9. Measurement of h-parameters of transistor in CB, CE, CC configurations.
10. Switching characteristics of a transistor.
11. SCR Characteristics.
12. Types of Clippers at different reference voltages.
13. Types of Clampers at different reference voltages.
14. The steady state output waveform of clampers for a square wave input.

Major Equipment required for Laboratories:

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

19EC308PC: BASIC SIMULATION LAB**B.Tech. III SEM**

L	T	P	C
0	0	2	1

Note:

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

List of Experiments:

1. 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. 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. Convolution for Signals and sequences.
6. 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 realizability and stability properties.
9. Gibbs Phenomenon on Simulation.
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. 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. Verification of Sampling Theorem.
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 Stationary in Widesense.

Major Equipments required for Laboratories:

1. Computer System with latest specifications connected.
2. Window Xp or Equivalent
3. Simulation software-MAT Lab or any equivalent simulation software.



19MC309CI: CONSTITUTION OF INDIA**B.Tech. III SEM**

L	T	P	C
3	0	0	0

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”.

Course content

1. Meaning of the constitution law and constitutionalism.
2. Historical perspective of the Constitution of India.
3. Salient features and characteristics of the Constitution of India.
4. Scheme of the fundamental rights.
5. The scheme of the Fundamental Duties and its legal status.
6. The Directive Principles of State Policy – Its importance and implementation.
7. Federal structure and distribution of legislative and financial powers between the Union and the States.
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India.
9. Amendment of the Constitutional Powers and Procedure.
10. The historical perspectives of the constitutional amendments in India.

11. Emergency Provisions: National Emergency, President Rule, Financial Emergency.
12. Local Self Government – Constitutional Scheme in India.
13. Scheme of the Fundamental Right to Equality.
14. Scheme of the Fundamental Right to certain Freedom under Article 19.
15. Scope of the Right to Life and Personal Liberty under Article 21.

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19MA401BS: LAPLACE TRANSFORMS, NUMERICAL METHODS AND COMPLEX VARIABLES

B.Tech. IV SEM

L	T	P	C
3	1	0	4

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn

- Concept, properties of Laplace transforms.
- Solving ordinary differential equations using Laplace transforms techniques.
- Various methods to find roots of an equation.
- Concept of finite differences and to estimate the value for the given data using interpolation.
- Evaluation of integrals using numerical techniques.
- Solving ordinary differential equations using numerical techniques.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
- Expansion 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

- Use the Laplace transforms techniques for solving ODE's.
- Find the root of a given equation.
- Estimate the value for the given data using interpolation.
- Find the numerical solutions for a given ODE's.
- Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems.
- Taylor's and Laurent's series expansions of complex Function.

UNIT - I

Laplace Transforms

Laplace Transforms; Laplace Transform of standard functions; first shifting theorem; Laplace transforms of functions when they are multiplied and divided by 't'. Laplace transforms of derivatives and integrals of function; Evaluation of integrals by Laplace transforms; Laplace transforms of Special functions; Laplace transform of periodic functions. Inverse Laplace transform by different methods, convolution theorem (without Proof), solving ODEs by Laplace Transform method.

UNIT - II

Numerical Methods-I

Solution of polynomial and transcendental equations – Bisection method, Iteration Method, Newton- Raphson method and Regula-Falsi method. Finite differences- forward differences- backward differences-central differences-symbolic relations and separation of symbols; Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae; Lagrange's method of interpolation

UNIT - III**Numerical Methods-II**

Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

Ordinary differential equations: Taylor's series; Picard's method; Euler and modified Euler's methods; Runge-Kutta method of fourth order.

UNIT - IV**Complex Variables(Differentiation)**

Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), Milne- Thomson methods, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

UNIT - V**Complex Variables (Integration)**

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, Khanna Publishers, 36th Edition, 2010.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.

REFERENCE BOOKS:

1. M. K. Jain, SRK Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations, New Age International publishers.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

19EC402PC: ANALOG AND DIGITAL COMMUNICATIONS**B.Tech. IV SEM**

L	T	P	C
3	0	0	3

Prerequisite: Probability theory and Stochastic Processes**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 baseband transmissions.

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

- Analyze and design of various continuous wave and angle modulation and demodulation techniques.
- Understand the effect of noise present in continuous wave and angle modulation techniques.
- Attain the knowledge about AM, FM Transmitters and Receivers.
- Analyze and design the various Pulse Modulation Techniques.
- Understand the concepts of Digital Modulation Techniques and Baseband transmission.

UNIT – I

Amplitude Modulation: Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial side band modulation.

UNIT – II

Angle Modulation: Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Signal- Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM., Concept of Pre-emphasis and de-emphasis.

UNIT – III

Transmitters: Classification of Transmitters AM Transmitters, FM Transmitters.

Receivers: Radio Receiver -Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM

Receiver, Comparison of AM and FM Receivers.

UNIT – IV

Pulse Modulation: Types of Pulse modulation- PAM, PWM and PPM. Comparison of FDM and TDM. **Pulse Code Modulation:** PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

UNIT – V

Digital Modulation Techniques: ASK- Modulator, Coherent ASK Detector, FSK- Modulator, Non- Coherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection. Principles of QPSK, Differential PSK and QAM.

Baseband Transmission and Optimal Reception of Digital Signal: A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception, ISI, Eye Diagrams.

TEXTBOOKS:

1. Analog and Digital Communications – Simon Haykin, John Wiley, 2005.
2. Electronics Communication Systems-Fundamentals through Advanced-Wayne Tomasi, 5th Edition, 2009, PHI.

REFERENCE BOOKS:

1. Principles of Communication Systems - Herbert Taub, Donald L Schilling, Goutam Saha, 3rd Edition, McGraw-Hill, 2008.
2. Electronic Communications – Dennis Roddy and John Coolean , 4th Edition , PEA, 2004.
3. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
4. Analog and Digital Communication – K. Sam Shanmugam, Willey, 2005

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19EC403PC: ELECTRONIC CIRCUIT ANALYSIS**B.Tech. IV SEM**

L	T	P	C
3	0	0	3

Pre-requisite: Electronic Devices and Circuits**Course Objectives:**

- Learn the concepts of high frequency analysis of transistors.
- To give understanding of various types of amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers.
- To familiarize the Concept of feedback in amplifiers so as to differentiate between negative and positive feedback.
- To construct various multi vibrators using transistors and sweep circuits.

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

- Design the multistage amplifiers and understand the concepts of High Frequency Analysis of Transistors.
- Utilize the Concepts of negative feedback to improve the stability of amplifiers and positive feedback to generate sustained oscillations.
- Design and realize different classes of Power Amplifiers and tuned amplifiers useable for audio and Radio applications.
- Design Multi vibrators and sweep circuits for various applications.

UNIT – I

Multistage Amplifiers: Classification of Amplifiers, Distortion in amplifiers, Different coupling schemes used in amplifiers, Frequency response and Analysis of multistage amplifiers, Casca RC Coupled amplifiers, Cascode amplifier, Darlington pair.

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

UNIT II

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 –III

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 –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, Methods of Linearity improvement.

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. Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford.
2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11th Edition, 2009,Pearson.

19EC404PC: ELECTROMAGNETIC FIELDS AND WAVES**B.Tech. IV SEM**

L	T	P	C
3	0	0	3

Pre-requisite: Applied Physics**Course Objectives:**

- To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields and Magneto static 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 waveguides and to determine the characteristics of rectangular waveguides, micro strip lines.

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

- Get the knowledge of Basic Laws, Concepts and proofs related to Electrostatic Fields and Magnetostatic Fields.
- Distinguish between the static and time-varying fields; establish the corresponding sets of Maxwell's Equations and Boundary Conditions.
- Analyze the Wave Equations for good conductors, good dielectrics and evaluate the UPW Characteristics for several practical media of interest.
- To analyze completely the rectangular waveguides, their mode characteristics, and design waveguides for solving practical problems.

UNIT – I

Electrostatics: Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density. 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.

UNIT – II

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

UNIT – III

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 Forms, Conditions at a Boundary Surface - Dielectric-Dielectric and Dielectric-Conductor Interfaces.

UNIT – IV

EM Wave Characteristics: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definitions, Relation between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization. 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, Poynting Vector and Poynting Theorem.

UNIT – V

Waveguides: Electromagnetic Spectrum and Bands. Rectangular Waveguides – Solution of Wave Equations in Rectangular Coordinates, TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Phase and Group Velocities, Wavelengths and Impedance Relations, Equation of Power Transmission, Impossibility of TEM Mode. Microstrip Lines – Zo Relations, Effective Dielectric Constant.

TEXT BOOKS:

1. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, 8th Ed., McGrawHill, 2014
2. Principles of Electromagnetics – Matthew N.O. Sadiku and S.V. Kulkarni, 6th Ed., Oxford University Press, Asian Edition, 2015.

REFERENCE BOOKS:

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, 2nd Ed., 2000, PHI.
2. Engineering Electromagnetics – Nathan Ida, 2nd Ed., 2005, Springer (India) Pvt. Ltd., New Delhi.

19EC405PC: LINEAR IC APPLICATIONS**B.Tech. IV SEM**

L	T	P	C
3	0	0	3

Pre-requisite: Electronic Devices & Circuits**Course Objectives:** The main objectives of the course are:

- To introduce the basic building blocks of linear integrated circuits.
- To introduce the theory and applications of analog multipliers and PLL.
- To introduce the concepts of waveform generation and introduce some special function ICs.

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

- A thorough understanding of operational amplifiers with linear integrated circuits.
- Attain the knowledge of functional diagrams and applications of IC 555 and IC565
- Acquire the knowledge about the Data converters.

UNIT – I**Integrated Circuits:** Classification, chip size and circuit complexity, basic information of Op-amp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC Characteristics, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.**UNIT – II****Op-amp and Applications:** Basic information of Op-amp, instrumentation amplifier, ac amplifier, V to I and I to V converters, Sample & hold circuits, multipliers and dividers, differentiators and integrators, comparators, Schmitt trigger, Multivibrators, introduction to voltage regulators, features of 723**UNIT – III****Active Filters & Oscillators:** Introduction, 1st order LPF, HPF filters, Band pass, Band reject and all pass filters. Oscillator types and principle of operation - RC, Wien and quadrature type, waveform generators - triangular, sawtooth, square wave and VCO.**UNIT – IV****Timers & Phase Locked Loops:** Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565.**UNIT – V****D-A and A-D Converters:** Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC dual slope integration type ADC, DAC and ADC specifications.

TEXT BOOKS:

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

REFERENCES BOOKS:

1. Operational Amplifiers & Linear Integrated Circuits, R.F. Coughlin & Fredrick F. Driscoll, PHI.
2. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications, Denton J. Daibey, TMH.
3. Design with Operational Amplifiers & Analog Integrated Circuits, Sergio Franco, Mc Graw Hill.
4. Digital Fundamentals - Floyd and Jain, Pearson Education

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19EC406PC: ANALOG AND DIGITAL COMMUNICATIONS LAB**B.Tech. IV SEM**

L	T	P	C
0	0	2	1

Note:

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

List of Experiments:

1. (i) Amplitude modulation and demodulation (ii) Spectrum analysis of AM.
2. (i) Frequency modulation and demodulation(ii) Spectrum analysis of FM.
3. DSB-SC Modulator & Detector.
4. SSB-SC Modulator & Detector (Phase Shift Method).
5. Frequency Division Multiplexing & De multiplexing.
6. Pulse Amplitude Modulation & Demodulation.
7. Pulse Width Modulation & Demodulation.
8. Pulse Position Modulation & Demodulation.
9. PCM Generation and Detection.
10. Delta Modulation.
11. Frequency Shift Keying: Generation and Detection.
12. Binary Phase Shift Keying: Generation and Detection.
13. Generation and Detection (i) DPSK (ii) QPSK.

Major Equipments required for Laboratories:

1. CROs: 20MHz.
2. Function Generators: 2MHz.
3. Spectrum Analyzer.
4. Regulated Power Supplies: 0-30V.
5. MAT Lab/Equivalent Simulation Package with Communication toolbox.
6. Analog and Digital Modulation and Demodulation Trainer Kits.

19EC407PC: ELECTRONIC CIRCUIT ANALYSIS LAB**B.Tech. IV SEM**

L	T	P	C
0	0	3	1.5

Note:

- Experiments marked with * has to be designed, simulated and verified in hardware.
- Minimum of 9 experiments to be done in hardware.

Hardware Testing in Laboratory:

1. Common Emitter Amplifier(*).
2. Two Stage RC Coupled Amplifier.
3. Cascode amplifier Circuit(*).
4. Darlington Pair Circuit.
5. Current Shunt Feedback amplifier Circuit.
6. Voltage Series Feedback amplifier Circuit(*).
7. RC Phase shift Oscillator Circuit(*).
8. Hartley and Colpitt's Oscillators Circuit.
9. Class A power amplifier.
10. Class B Complementary symmetry amplifier(*).
11. Design a Mono stable Multi vibrator.
12. The output voltage waveform of Miller Sweep Circuit.

Major Equipments required for Laboratories:

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

19EC408PC: IC APPLICATIONS LAB**B.Tech. IV SEM**

L	T	P	C
0	0	3	1.5

Note: Verify the functionality of the IC in the given application

Design and Implementation of:

1. Inverting and Non-Inverting Amplifiers using Op Amps
2. Adder and Sub tractor using Op Amp.
3. Comparators using Op Amp.
4. Integrator Circuit using IC741.
5. Differentiator Circuit using Op Amp.
6. Active filter Applications-LPF, HPF (First Order)
7. IC 741 waveform Generators-Sine, Square wave and Triangular Waves.
8. Mono-Stable Multi vibrator using IC555.
9. Astable multivibrator using IC555.
10. Schmitt Trigger Circuits using IC741.
11. IC 565-PLL Applications.
12. Voltage Regulator using IC723
13. Three terminal voltage regulators-7805, 7809, 7912

Major Equipments required for Laboratories:

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

19MC409GS: GENDER SENSITIZATION
(An Activity-based Course)

B.Tech. IV SEM

L	T	P	C
0	0	2	0

COURSE DESCRIPTION

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Objectives of the Course:

- 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.

Learning 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

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, 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 and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection 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 Harassment- 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.

Note: Since it is 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.

- *Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on “Gender”.*
- **ESSENTIAL READING:** The Textbook, “*Towards a World of Equals: A Bilingual Textbook on Gender*” written by A.Suneetha, Uma Bhargubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Akademi, Telangana Government in 2015.

ASSESSMENT AND GRADING:

- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

CMR TECHNICAL CAMPUS
UGC AUTONOMOUS
B.Tech. II Year Syllabus (A.Y. 2021-22)

ECE

III SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	20EC301PC	Electronic Devices and Circuits	3	0	0	3
2	20EC302PC	Digital System Design	3	1	0	4
3	20EC303PC	Signals and Systems	3	0	0	3
4	20MA304BS	Probability Theory and Stochastic Process	3	0	0	3
5	20EE305ES	Network Analysis	3	0	0	3
6	20EC306PC	Digital System Design Lab	0	0	2	1
7	20EC307PC	Electronic Devices and Circuits Lab	0	0	3	1.5
8	20EC308PC	Basic Simulation Lab	0	0	3	1.5
9	20MC309CI	Constitution of India	3	0	0	0
Total Credits			18	1	8	20

IV SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	20MA401BS	Laplace Transforms, Numerical Methods and Complex Variables	3	1	0	4
2	20EC402PC	Analog and Digital Communications	3	0	0	3
3	20EC403PC	Electronic Circuit and Pulse Circuits	3	0	0	3
4	20EC404PC	Electromagnetic Waves and Transmission lines	3	0	0	3
5	20EC405ES	Linear IC Applications	3	0	0	3
6	20EC406PC	Analog and Digital Communications Lab	0	0	2	1
7	20EC407PC	Electronic Circuit and Pulse Circuits Lab	0	0	3	1.5
8	20EC408PC	IC Applications lab	0	0	3	1.5
9	20MC409GS	Gender Sensitization Lab	0	0	2	0
Total Credits			15	1	10	20

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20EC301PC: Electronic Devices and Circuits**B.Tech. III SEM**

L	T	P	C
3	0	0	3

Pre-requisite: Basic Electrical and Electronics Engineering**Course Objectives:**

- To introduce biasing, compensation techniques and Small Signal low frequency BJT Amplifiers.
- To analyze the multistage amplifiers of BJT and high frequency analysis of BJT.
- To know about Special purpose devices and the types of JFET, characteristics and it's applications also.
- To understand various FET amplifier circuits.
- To understand working principle of various types of feedback amplifier circuits.

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

- Understand the concepts of biasing, compensation techniques and Small Signal low frequency Amplifiers.
- Analyze the multistage amplifiers of BJT and high frequency analysis.
- Understand Special purpose devices and JFET, characteristics and its applications.
- Analyze various FET amplifiers.
- Analyze various feedback amplifier parameters and Oscillator circuits.

UNIT – I**12L**

Transistor Biasing and Stabilization: Need for biasing, DC and AC load lines, operating point, fixed bias, collector to base bias, self bias techniques for stabilization, stabilization factors (S , S' , S''), Thermal runaway and thermal stability. Bias compensation using diodes, Thermistor and Sensistor compensation.

Analysis of Small Signal low frequency Amplifiers: Transistor Hybrid model, Determination of h-parameters from transistor characteristics, Typical values of h- parameters in 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 CE Amplifier- effect of coupling and bypass capacitors.

UNIT – II**10L**

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 PI- model of Common Emitter transistor model, f_{α} , f_{β} and unity gain bandwidth, Gain-bandwidth product.

UNIT – III**08L**

Special purpose devices: Principle of operation of SCR, Tunnel Diode, Photo diode, LED and Varactor diode.

Junction Field Effect Transistor (JFET): Construction, Principle of operation, Pinch-off Voltage, Volt- Ampere Characteristics, Comparison of BJT and FET, Biasing of FET, FET as Voltage Variable Resistor.

UNIT IV**08L**

FET Amplifiers: Small Signal Model, Analysis of JFET Amplifiers, Analysis of CS, CD, CG JFET Amplifiers. MOSFET Characteristics in Enhancement and Depletion mode, Basic Concepts of MOS Amplifiers.

UNIT V**08L**

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.

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.

TEXT BOOKS:

1. Electronic Devices and Circuits- Jacob Millman, McGraw Hill Education.
2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11th Edition, 2009, Pearson.

REFERENCE BOOKS:

1. The Art of Electronics, Horowitz, 3rd Edition Cambridge University Press.
2. Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford.

20EC302PC: Digital System Design**B.Tech. III SEM**

L	T	P	C
3	1	0	4

Pre-Requisites: Nil**Course Objectives:**

- To understand common forms of number representation in logic circuits.
- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand the concepts of combinational logic circuits and sequential circuits.
- To understand the Realization of Logic Gates using Diodes & Transistors.

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

- Understand the numerical information in different forms and Boolean Algebra theorems.
- Postulates of Boolean algebra and to minimize combinational functions.
- Design and analyze combinational and sequential circuits.
- Known about the logic families and realization of logic gates.

UNIT - I:**10L**

Number Systems: Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code.

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

UNIT - II:**10L**

Minimization of Boolean functions: Karnaugh map method - up to five variables, don't care map entries, tabular method.

Combinational Logic Circuits: Adders, subtractors, comparators, multiplexers, demultiplexers, encoders, decoders and code converters, hazards and hazard free relations.

UNIT - III**12L**

Sequential Circuits Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

Registers and Counters: Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers - Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

UNIT - IV**10L**

Sequential Machines: Finite State Machines, Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N – Counters. Finite state machine-capabilities and limitations, Mealy and Moore models.

UNIT – V**08L**

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, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tri- state outputs, CMOS transmission gate, IC interfacing- TTL driving CMOS & CMOS driving TTL.

TEXT BOOKS:

1. Switching and Finite Automata Theory –ZviKohavi& Niraj K. Jha, 3rd Edition, Cambridge, 2010.
2. Modern Digital Electronics – R. P. Jain, 3rd Edition, 2007- TataMcGraw-Hill

REFERENCE BOOKS:

1. Digital Design- Morris Mano, PHI, 4th Edition, 2006
2. Introduction to Switching Theory and Logic Design – FredriacJ. Hill, Gerald R. Peterson, 3rd Ed, John Wiley & SonsInc.
3. Fundamentals of Logic Design- Charles H. Roth, Cengage Learning, 5th, Edition, 2004.
4. Switching Theory and Logic Design – A Anand Kumar, PHI, 2013

20EC303PC: Signals and Systems**B.Tech. III SEM**

L	T	P	C
3	0	0	3

Course Objectives:

- This gives the basics of Signals and Systems required for all Electrical Engineering related courses.
- To understand the behavior of signal in time and frequency domain.
- To understand the characteristics of LTI systems.
- This gives concepts of Signals and Systems and its analysis using different transform techniques.

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

- Differentiate various signal functions.
- Represent any arbitrary signal in time and frequency domain.
- Understand the characteristics of linear time invariant systems.
- Analyze the signals with different transform technique

UNIT – I**08L**

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

UNIT – II**10L**

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

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

UNIT – III**10L**

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, Ideal LPF, HPF, and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time, Convolution and Correlation of Signals, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution.

UNIT – IV**10L**

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, Laplace Transform of certain signals using waveform synthesis.

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 – V**08L**

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, Introduction to Band Pass Sampling.

Correlation: 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.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2nd Ed.

REFERENCE BOOKS:

1. Signals and Systems – Simon Haykin and Van Veen, Wiley 2nd Ed.
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH.
3. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition.
4. Signals, Systems and Transforms - C. L. Philips, J.M. Parr and Eve A. Riskin, 3rd Ed., 2004, PE.
5. Signals and Systems – K. Deerga Rao, Birkhauser, 2018.

20MA304ES: Probability Theory and Stochastic Processes**B.Tech. III SEM**

L	T	P	C
3	0	0	3

Pre-requisite: Nil**Course Objectives:**

- This gives basic understanding of random signals and processing
- Utilization of Random signals and systems in Communications and Signal Processing areas.
- To know the Spectral and temporal characteristics of Random Process.
- To Learn the Basic concepts of Noise sources.

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

- Understand the concepts of Random Process and its Characteristics.
- Understand the response of linear time Invariant system for a Random Processes.
- Determine the Spectral and temporal characteristics of Random Signals.
- Understand the concepts of Noise in Communication systems.

UNIT – I**08L**

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**12L**

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, Chebyshev'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**08L**

Random Processes – Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity,

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**08L**

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**08L**

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 University Press, 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

20EE305ES: Network Analysis**B.Tech. III SEM**

L	T	P	C
3	0	0	3

Pre-Requisites: Basic Electrical and Electronics Engineering**Course Objectives:**

- To understand the basic concepts of RLC circuits, network theorems and it's frequency domain analysis.
- To understand the basics of magnetic circuits and network topology.
- To know the behavior of the steady states and transient states in RLC circuits.
- To study the transfer function and network functions in S domain.
- To understand the two port network parameters and design of attenuator circuits.

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

- Gain the knowledge on basic RLC circuits behavior, network theorems and it's frequency domain analysis..
- Analyze magnetic circuits and network topology.
- Analyze the Steady state and transient states of RLC Circuits.
- Analyze the network functions in S domain.
- Know the characteristics of two port network parameters and design of attenuator circuits.

UNIT – I**12L**

Network theorems (AC & DC): Network reduction using star-delta conversions, Super position theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Millman's theorem, Compensation theorem.

Frequency Domain Analysis: Series and parallel Resonance - Resonance curves, Bandwidth, quality factor.

UNIT – II**10L**

Magnetic Circuits: Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

Network Topology: Definition, Incident matrix, loop matrix, Basic cut-set and tie set matrices for planar networks and network equilibrium equations.

UNIT – III**08L**

Steady state and transient analysis of RC, RL and RLC Circuits, Circuits with switches, step response, 2nd order series and parallel RLC Circuits, Root locus, damping factor, over damped, under damped, critically damped cases.

UNIT – IV**08L**

Network Analysis using Laplace transform techniques, step, impulse and exponential excitation, response due to periodic excitation, RMS and average value of periodic waveforms.

UNIT –V**10L**

Two port network parameters, Z, Y, ABCD, h and g parameters, network function, driving point and transfer functions – using transformed (S) variables, Poles and Zeros.

Attenuators: Standard T, π , L Sections, Characteristic impedance, image transfer constants, Design of Attenuators.

TEXT BOOKS:

1. Network Analysis – Van Valkenburg, 3rd Ed., Pearson, 2016.
2. Engineering Circuit Analysis – William Hayt and Jack E Kemmerly, MGH, 8th Edition, 1993.

REFERENCE BOOKS:

1. Electric Circuits – J. Edminister and M. Nahvi – Schaum's Outlines, McGraw Hill Education, 1999.
2. Networks, Lines and Fields - JD Ryder, PHI, 2nd Edition, 1999.
3. Network Analysis and synthesis – Ravish R Singh – McGraw Hill education.

20EC306ES: Digital System Design Lab**B.Tech. III SEM**

L	T	P	C
0	0	2	1

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 logic gates using universal gates
3. Generation of clock using NAND / NOR gates
4. Design a 4 – bit Adder /Sub tractor
5. Design and realization of a 4 – bit gray to Binary and Binary to 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 2x1MUX
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. 5 V Fixed Regulated Power Supply/ 0-5V or more Regulated Power Supply.
2. 20 MHz Oscilloscope with Dual Channel.
3. Bread board and components/ Trainer Kit.
4. Multi meter.

20EC306ES: Electronic Devices and Circuits Lab**B.Tech. III SEM**

L	T	P	C
0	0	3	1.5

Note:

1. Minimum of 10 experiments to be done in Hardware
2. Experiments marked with * has to be designed, simulated and verified in hardware.

List of Experiments:

1. Input and output characteristics of BJT in CB Configuration
2. Input and output characteristics of BJT in CE Configuration
3. Frequency response of Common Emitter BJT Amplifier(*)
4. Measurement of h-parameters of transistor in CB, CE, CC configurations
5. Two Stage RC Coupled Amplifier(*)
6. Cascode amplifier Circuit(*)
7. Darlington Pair Circuit
8. Frequency response of Common Source FET amplifier(*)
9. Drain and transfer characteristics of FET in CS Configuration
10. Current Shunt Feedback Amplifier Circuit(*)
11. Voltage Series Feedback Amplifier Circuit(*)
12. RC phase shift oscillator
13. Hartley and Colpitts oscillators

Major Equipment required for Laboratories:

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

20EC308PC: Basic Simulation Lab**B.Tech. III SEM**

L	T	P	C
0	0	3	1.5

Note:

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

List of Experiments:

1. 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. 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. Convolution for Signals and sequences.
6. 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 realizability and stability properties.
9. Gibbs Phenomenon Simulation.
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. 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. Verification of Sampling Theorem.
15. Removal of noise by Autocorrelation / Cross correlation.
16. Extraction of Periodic Signal masked by noise using Correlation.
17. Verification of Weiner-Khintchine Relations.
18. Checking a Random Process for Stationarity in Widesense.

Major Equipments required for Laboratories:

1. Computer System with latest specifications connected
2. Window XP or equivalent
3. Simulation software-MATLAB or any equivalent simulation software

20EC308CI: Constitution of India**B.Tech. III SEM**

L	T	P	C
3	0	0	0

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”.

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21.

20MA401BS: Laplace Transforms, Numerical Methods and Complex Variables**B.Tech. IV SEM**

L	T	P	C
3	1	0	4

Course Objectives: To learn

- Concept, Properties of Laplace transforms and inverse Laplace transforms.
- Various methods to find roots of an equation and to fit the curve.
- How to solve ordinary differential equations and integrals using numerical techniques.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem and expansion 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

- Use the Laplace transform techniques for solving ODE.
- Solve transcendental, non-linear and system of linear equations with appropriate numerical methods.
- Find numerical solutions of ordinary differential equations.
- Analyse the complex function with reference to their analyticity, Evaluate integrals using Cauchy's integral and residue theorems.
- Taylor's and Laurent's series expansions of complex function.

UNIT-I: LAPLACE TRANSFORMS**10 L**

Laplace transform of standard functions, First shifting theorem, Laplace transforms of functions when they are multiplied and divided by 't'. Laplace transforms of derivatives and integrals of function, Laplace transforms of special functions, Laplace transform of periodic functions. Inverse Laplace transform by different methods, Convolution theorem (without Proof), Solving ODEs by Laplace transform method.

UNIT-II: NUMERICAL METHODS-I**10 L**

Solution of polynomial and transcendental equations: Bisection method, Iteration method, Newton-Raphson method and Regula-False method.

Curve Fitting: Fitting a linear, second degree, exponential, power curve by method of least squares.

UNIT-III: NUMERICAL METHODS-II**8 L**

Numerical integration: Trapezoidal rule, Simpson's 1/3rd and 3/8 rules.

Numerical Solutions of Ordinary Differential Equations -Taylor's series, Picard's method, Euler and modified Euler's methods, Runge-Kutta method of fourth order.

UNIT -IV Complex Variables (Differentiation)**10 L**

Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), Milne-Thomson's method, Analytic function, Harmonic function, Finding harmonic conjugate, Elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

Complex Variables (Integration)

Line integrals, Cauchy's theorem, Cauchy's Integral formula, Cauchy's generalized Integral formula Zeros of analytic functions, singularities.

Complex Power series: Taylor's series, Laurent's series, Residues, Cauchy Residue theorem (without proof).

TEXT BOOKS :

1. Higher Engineering Mathematics, (36th Edition), B.S. Grewal, Khanna Publishers, 2010
2. Advanced Engineering Mathematics(3rd edition) by R.K. Jain & S.R.K. Iyengar, Narosa Publishing House, Delhi.
3. Introductory methods of Numerical Analysis(4th Edition), S.S. Sastry, PHI, 2005.

REFERENCE BOOKS:

1. Complex Variables and Applications (7th Edition), J. W. Brown and R. V. Churchill, Mc-Graw Hill, 2004.
2. Advanced Engineering Mathematics, (9th Edition), Erwin kreyszig, John Wiley & Sons, 2006.
3. Higher Engineering Mathematics, (11th Reprint), Ramana B.V., Tata McGraw Hill New Delhi, 2010.
4. M. K. Jain, SRK Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations , New Age International publishers.

20EC402PC: Analog and Digital Communications**B.Tech. IV SEM**

L	T	P	C
3	0	0	3

Prerequisite: Probability theory and Stochastic Processes**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 baseband transmissions.

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

- Analyze and design of various continuous wave and angle modulation and demodulation techniques
- Understand the effect of noise present in continuous wave and angle modulation techniques.
- Attain the knowledge about AM, FM Transmitters and Receivers
- Analyze and design the various Pulse Modulation Techniques.
- Understand the concepts of Digital Modulation Techniques and Baseband transmission.

UNIT – I**10L**

Amplitude Modulation: Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial side band modulation.

UNIT – II**10L**

Angle Modulation: Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Signal- Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM., Concept of Pre-emphasis and de-emphasis.

UNIT – III**08L**

Transmitters: Classification of Transmitters, AM Transmitters, FM Transmitters

Receivers: Radio Receiver - Receiver Types - Tuned radio frequency receiver, super heterodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM Receiver, Comparison of AM and FM Receivers.

UNIT – IV**10L**

Pulse Modulation: Types of Pulse modulation- PAM, PWM and PPM. Comparison of FDM and TDM. **Pulse Code Modulation:** PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

UNIT – V**10L**

Digital Modulation Techniques: ASK- Modulator, Coherent ASK Detector, FSK- Modulator, Non- Coherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection. Principles of QPSK, Differential PSK and QAM.

Baseband Transmission and Optimal Reception of Digital Signal: A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception, ISI, Eye Diagrams.

TEXTBOOKS:

1. Analog and Digital Communications – Simon Haykin, John Wiley, 2005.
2. Electronics Communication Systems-Fundamentals through Advanced-Wayne Tomasi, 5th Edition, 2009, PHI.

REFERENCE BOOKS:

1. Principles of Communication Systems - Herbert Taub, Donald L Schilling, Goutam Saha, 3rd Edition, McGraw-Hill, 2008.
2. Electronic Communications – Dennis Roddy and John Coolean , 4th Edition, PEA, 2004
3. Electronics & Communication System – George Kennedy and Bernard Davis, TMH, 2004
4. Analog and Digital Communication – K. Sam Shanmugam, Willey, 2005

20EC403PC: Electronic Circuits and Pulse Circuits**B.Tech. IV SEM**

L	T	P	C
3	0	0	3

Pre-requisite: Electronic Devices and Circuits**Course Objectives:**

- To understand concepts of various types of large signal amplifiers and tuned amplifiers.
- To understand the concepts of Linear wave shaping circuits for different signals..
- To learn the Concepts of Non-Linear wave shaping.
- To construct various multi vibrators using transistors and UJT.
- To understand the concepts of various sweep circuits.

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

- Analyze various types of large signal amplifiers and tuned amplifiers.
- Analyze the concepts of Linear wave shaping circuits for different signals.
- Analyze the Concepts of Non-Linear wave shaping circuits.
- Analyze and Design Multi vibrators for various applications.
- Understand sweep circuits operation and it's applications.

UNIT –I**10L**

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 Amplifier-Quality factor, frequency response of tuned amplifier, Concepts of Stagger Tuned and Synchronous Tuning.

UNIT –II**10L**

Linear Wave Shaping: Responses of RC-high pass circuit and low pass circuits to sinusoidal, step,pulse, square, ramp and exponential inputs, RC circuit as a differentiator and integrator, uncompensated and compensated attenuators, RLC circuits and their response for step input, ringing circuit.

UNIT III**10L**

Non-Linear Wave Shaping: Clipping circuits with diodes, clipping at two independent levels,transfer characteristics of clippers, multi-diode circuits, transient and steady state response of a diode clamping circuit, clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, transfer characteristics of clampers.

UNIT –IV**12L**

Multivibrators: Analysis and Design of Bistable, Monostable, AstableMultivibrators and Schmitt trigger using Transistors. UJT Characteristics and UJT as Relaxation oscillator.

UNIT-V**8L**

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, Methods of Linearity improvement.

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.
3. Pulse, Digital and Switching Waveforms, Jacob Millman, Herbert Taub, McGraw Hill, 3rd Edition.

REFERENCE BOOKS:

1. Pulse, Switching and Digital Circuits, David A. Bell, Oxford University Press (2015)
2. Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford.
3. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11th Edition, 2009, Pearson.
4. Electronic Devices and Circuits -Saliva Hanan, PHI

20EC404PC: Electromagnetic Waves and Transmission Lines**B.Tech. IV SEM**

L	T	P	C
3	0	0	3

Pre-requisite: Electromagnetic Waves and Transmission Lines**Course Objectives:**

- 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 study the propagation, reflection and transmission of plane waves in bounded and unbounded media.

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

- Get the knowledge of Basic Laws, Concepts and proofs related to Electrostatic Fields and Magneto static Fields.
- Distinguish between the static and time-varying fields; establish the corresponding sets of Maxwell's Equations and Boundary Conditions.
- Analyze the Wave Equations for good conductors, good dielectrics and evaluate the UPW Characteristics for several practical media of interest.
- Analyze the transmission line parameters and configurations.

UNIT – I**10L**

Electrostatics: Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density. 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.

UNIT – II**12L**

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.

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 Forms, Conditions at a Boundary Surface - Dielectric-Dielectric and Dielectric-Conductor Interfaces.

UNIT – III**08L**

EM Wave Characteristics: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definitions, Relation between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization. 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, Poynting Vector and Poynting Theorem.

UNIT – IV**08L**

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, Loading - Types of Loading.

UNIT – V**08L**

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. Principles of Electromagnetics – Matthew N.O. sadiku and S.V. Kulkarni, 6th Ed., Oxford University Press, Aisan Edition, 2015.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, 2nd Ed., 2000, PHI.
3. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan, 2001, (Tech. India Publications), New Delhi.

REFERENCE BOOKS:

1. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, 8th Ed., McGrawHill, 2014
2. Engineering Electromagnetics – Nathan Ida, 2nd Ed., 2005, Springer (India) Pvt. Ltd., New Delhi.
3. Electromagnetic field theory and transmission lines – G.Sashibhushana Rao, Wiley India, 2013.
4. Networks, Lines and Fields - JD Ryder, PHI, 2nd Edition, 1999.

20EC405ES: Linear IC Applications**B.Tech. IV SEM**

L	T	P	C
3	0	0	3

Pre-requisite: Linear IC Applications**Course Objectives:** The main objectives of the course are:

- To introduce the basic building blocks of linear integrated circuits.
- To introduce the theory and applications of analog multipliers and PLL.
- To introduce the concepts of waveform generation and introduce some special function ICs.

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

- A thorough understanding of operational amplifiers with linear integrated circuits.
- Attain the knowledge of functional diagrams and applications of IC 555 and IC565
- Acquire the knowledge about the Data converters.

UNIT – I**10L**

Integrated Circuits: Classification, chip size and circuit complexity, basic information of Op-amp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC Characteristics, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

UNIT – II**10L**

Op-amp and Applications: Basic information of Op-amp, instrumentation amplifier, ac amplifier, V to I and I to V converters, Sample & hold circuits, multipliers and dividers, differentiators and integrators, comparators, Schmitt trigger, Multi vibrators, introduction to voltage regulators, features of 723

UNIT – III**08L**

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

UNIT – IV**08L**

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

UNIT – V**08L**

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

TEXT BOOKS:

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

REFERENCES BOOKS:

1. Operational Amplifiers & Linear Integrated Circuits, R.F. Coughlin & Fredrick F. Driscoll, PHI.
2. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications, Denton J. Daibey, TMH.
3. Design with Operational Amplifiers & Analog Integrated Circuits, Sergio Franco, McGrawHill.
4. Digital Fundamentals - Floyd and Jain, Pearson Education.

20EC406PC: Analog and Digital Communications Lab**B.Tech. IV SEM**

L	T	P	C
0	0	2	1

Note:

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

List of Experiments:

1. (i) Amplitude modulation and demodulation (ii) Spectrum analysis of AM
2. (i) Frequency modulation and demodulation(ii) Spectrum analysis of FM
3. DSB-SC Modulator &Detector
4. SSB-SC Modulator & Detector (Phase Shift Method)
5. Frequency Division Multiplexing & De multiplexing
6. Pulse Amplitude Modulation &Demodulation
7. Pulse Width Modulation &Demodulation
8. Pulse Position Modulation &Demodulation
9. PCM Generation and Detection
10. Delta Modulation
11. Frequency Shift Keying: Generation and Detection
12. Binary Phase Shift Keying: Generation and Detection
13. Generation and Detection (i) DPSK (ii)QPSK

Major Equipments required for Laboratories:

1. CROs:20MHz
2. Function Generators:2MHz
3. Spectrum Analyzer
4. Regulated Power Supplies:0-30V
5. MAT Lab/Equivalent Simulation Package with Communication toolbox
6. Analog and Digital Modulation and Demodulation Trainer Kits.

20EC407PC: Electronic Circuits and Pulse Circuits Lab**B.Tech. IV SEM**

L	T	P	C
0	0	3	1.5

List of Experiments:

1. RC high pass circuit as differentiator (Square wave input)
2. RC low pass circuit as integrator (Square wave input)
3. Types of Clippers at different reference voltages
4. Types of Clampers at different reference voltages
5. Transistor as a switch
6. Class A Power Amplifier
7. Class B Complementary & Symmetry Power Amplifiers
8. Design a Monostable Multivibrator
9. Design an Astable Multivibrator
10. The output voltage waveform of Miller Sweep Circuit

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

20EC407PC: IC Applications Lab**B.Tech. IV SEM**

L	T	P	C
0	0	3	1.5

Note: Verify the functionality of the IC in the given application

Design and Implementation of:

1. Inverting and Non-Inverting Amplifiers using Op Amps
2. Adder and Sub tractor using Op Amp.
3. Comparators using Op Amp.
4. Integrator Circuit using IC741.
5. Differentiator Circuit using Op Amp.
6. Active filter Applications-LPF, HPF (First Order)
7. IC 741 waveform Generators-Sine, Square wave and Triangular Waves.
8. Mono-Stable Multi vibrator using IC555.
9. A stable multi vibrator using IC555.
10. Schmitt Trigger Circuits using IC741.
11. IC 565-PLL Applications.
12. Voltage Regulator using IC723
13. Three terminal voltage regulators-7805, 7809, 7912

Major Equipments required for Laboratories:

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



20MC409GS: Gender Sensitization Lab**B.Tech. IV SEM**

L	T	P	C
0	0	2	0

COURSE DESCRIPTION

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Objectives of the Course:

- 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.

Learning 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

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitude towards Gender-Construction of Gender-Socialization: Making Women, 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 and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection 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 Harassment- 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.

Note: Since it is 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.

- *Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on “Gender”.*

Skelly

- **ESSENTIAL READING:** The Textbook, “*Towards a World of Equals: A Bilingual Textbook on Gender*” written by A.Suneetha, Uma Bhargubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Akademi, Telangana Government in 2015.

ASSESSMENT AND GRADING:

- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

The Chairman concluded the meeting and thanked all the members for attending and sharing their views.



Chairman,
Board of Studies,
Department of ECE,
CMR Technical Campus.

