# B.TECH. - ELECTRONICS & COMMUNICATION ENGINEERING

## Course Structure R-22

## SEMESTER III

| S. No. | Course Classification | Course Code | Name of the Subject | L | T | P | C | I | E | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **BS** | D3BSM4 | Complex Analysis and Vector Calculus | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 2 | **ES** | D3ESDLD | Digital Logic Design | 2 | 0 | 0 | 2 | 40 | 60 | 100 |
| 3 | **ES** | D3ESNT | Network Theory | 2 | 0 | 0 | 2 | 40 | 60 | 100 |
| 4 | **PC** | D43PC1 | Electronic Circuit Analysis | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 5 | **PC** | D43PC2 | Signals and Systems | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 6 | **ES** | D3ESDLL | Digital Logic Design Lab | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 7 | **PC** | D43PC3 | Electronic Circuit Design Lab | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 8 | **PC** | D43PC4 | Electronic Circuit Simulation Lab | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 9 | **PC** | D43PC5 | Basic Simulation Lab | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 10 | **MC** | MC002 | Constitution of India * | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | TOTAL | 13 | 3 | 8 | 20 | 360 | 540 | 900 |

# B.TECH. - ELECTRONICS & COMMUNICATION ENGINEERING

## Course Structure R-22

## SEMESTER IV

| S. No. | Course Classification | Course Code | Name of the Subject | L | T | P | C | I | E | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **PC** | D44PC6 | Probability Theory and Stochastic Processes | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | **PC** | D44PC7 | Analog and Digital Communications | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | **PC** | D44PC8 | Pulse and Digital Circuits | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | **PC** | D44PC9 | Linear and Digital IC Applications | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | **PC** | D44PC10 | Electromagnetic Theory and Transmission Lines | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | **PC** | D44PC11 | Analog and Digital Communications Lab | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 7 | **PC** | D44PC12 | Pulse and Digital Circuits Lab | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 8 | **PC** | D44PC13 | Linear and Digital IC Applications Lab | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 9 | **PC** | D44PC14 | Real Time Based Projects | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 10 | **MC** | MC003 | Intellectual Property Rights * | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | TOTAL | 15 | 0 | 10 | 20 | 360 | 540 | 900 |

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

## COMPLEX ANALYSIS AND VECTOR CALCULUS (D3BSM4)

**B.Tech. III Semester** **L/T/P/C**
**3/1/0/4**

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

**COURSE OBJECTIVE:**

Students should learn Differentiation and integration of complex valued functions, Evaluation of integrals using Cauchy's integral formula and residue theorem, Evaluation of integrals using Residues, The physical quantities involved in engineering field related to vector valued functions, The basic properties of vector valued functions and their applications to line-surface and volume integrals.

**COURSE OUTCOMES:** Upon completion of the Course, the students will be able to

1. Analyze the complex functions with reference to their analyticity. L4
2. Evaluate Integration using Cauchy's integral theorem, formula and finding the Taylor and Laurent's series expansion of complex functions. L5
3. Solve problems on Residues using different methods. Evaluation of real integrals. L5
4. Solve problems to compute derivatives of vector valued functions, gradient functions. L3
5. Evaluate the line-surface and volume integrals and converting them from one to another. L5

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C201.1 | 3 | 2 | | | | | | | | | | |
| C201.2 | 2 | 2 | 2 | | | | | | | | | |
| C201.3 | 2 | 2 | 2 | | | | | | | | | |
| C201.4 | 3 | 3 | 3 | | | | | | | | | |
| C201.5 | 2 | 2 | | | | | | | | | | |

**UNIT-I: Functions of a Complex Variable:** Introduction, Continuity, differentiability, analyticity, properties, Cauchy Riemann equations in Cartesian and polar co-ordinates, harmonic and conjugate harmonic functions, Milne Thompson method.

**UNIT-II: Complex Integration:** Line integral, Cauchy integral theorem, Cauchy integral formula, generalized Cauchy integral formula. Power series -Taylor's series, Laurent series. Singular points, isolated singular points, pole of order m, essential singularity.

**UNIT-III: Residues**, **Evaluation of Integrals:** Residue, Cauchy residue theorem, Types of real integrals Improper real integrals

a) $\int_{-\infty}^{\infty} f(x)dx$ b) $\int_{c}^{c+2\Pi} f(cos\Theta, sin\Theta)dx$

**UNIT-IV: Vector Differentiation:** Vector point functions and scalar point functions- Gradient - Divergence and Curl. Directional Derivatives -Tangent plane and normal line- Vector Identities - Scalar potential functions. Solenoidal and Irrotational vectors.

**UNIT-V: Vector Integration:** Line integral-Surface integral and Volume Integrals- Vector integral theorems –Green theorem- Gauss theorem and Stokes theorem (without proofs) and their applications.

**TEXT BOOKS:**


1. Engineering Mathematics by TKV Iyengar, B. Krishna Gandhi, S. Chand and publications
2. Ramana B.v.- Higher Engineering Mathematics- Tata Mc Graw Hill NewDelhi- 11th Reprint-2010.
3. Complex variables and applications by James ward Brown and Ruel V. Churchill – Eighth Edition–Mc-Graw HillHigher Education.


**REFERENCE BOOKS:**


1. Erwin Kreyszig –Advanced Engineering Mathematics- 10th Edition- Wiley - 2021
2. N.P.BaliandManishGoyal-AtextbookofengineeringMathematics-LaxmiPublications-Reprint-2008.
3. B.S. Grewal –Higher Engineering Mathematics- Khanna Publishers- 40th Edition-2015.
4. Advanced Engineering Mathematics by S.R.K. Iyengar R.K. Jain–Narosa Publications
5. Fundamentals of complex Analysis by Saff ,E.B. and A.D.Snider, Pearson

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

## DIGITAL LOGIC DESIGN (D3ESDLD)

**B.Tech. III Semester** **L/T/P/C**
**2/0/0/2**

**COURSE OBJECTIVES:**

1. To learn basic techniques for the design of logic gates and to understand common forms of number representation.
2. To implement simple Logical operations using Combinational Logic Circuits, concepts of Sequential Circuits and to implement them using basic gates.

**COURSE OUTCOMES:**

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

1. Analyze the Conversion of numeric information of different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD. L3
2. Analyze the Realized simple Boolean expressions and to minimize Combinational Functions. L4
3. Design and analyze of combinational functions/building blocks for building complex circuits. L5
4. Design of various sequential circuits like latches and flip flops. L5
5. Design and analyze sequential circuits like Registers and counters. L5

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C202.1 | 3 | 3 | | | | | | | | | | |
| C202.2 | 3 | 3 | | | | | | | | | | |
| C202.3 | 3 | 2 | 2 | | | | | | | | | |
| C202.4 | 3 | 2 | 2 | | | | | | | | | |
| C202.5 | 3 | 3 | 3 | | | | | | | | | |

**UNIT-I: Number System and Switching Functions:** Number Systems, Base Conversion Methods, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Unit Distance Codes, Error Detecting and Correcting Codes.

**UNIT-II: Boolean Algebra:** Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations.
**Minimization of Boolean Functions:** Introduction, The Minimization with theorem, The Karnaugh Map Method, Tabular Method.

**UNIT-III: Combinational Circuits:** Introduction, Adders, Subtractors, Multiplexers, Demultiplexers, Encoders, Decoders, Code Converters, Comparators and Hazards.

**UNIT-IV: Sequential Circuits-I:** Introduction, Basic Differences between Combinational and Sequential circuits, the Binary Cell, Latch, Flip-Flop-Types, and Race around condition, Excitation tables and characteristic equations. Conversion from one type of Flip-Flop to another, preset and Clear inputs, Timing and Triggering Consideration, Clock Skew.

**UNIT-V: Sequential Circuits-II**: Introduction, Register-Types, Counter–Types, Design of Ripple (mod-N) Counter, Ring Counter.

**TEXT BOOKS:**


1. Morris Mano, "Digital Design", PHI, 3rd Edition.
2. Zvi Kohavi & Niraj, K. Jha, "Switching and Finite Automata Theory", 3rd Edition, Cambridge.


**REFERENCE BOOKS:**


1. Anand Kumar, "Switching Theory and Logic Design" PHI, 2008
2. Charles H. Roth, "Fundamentals of Logic Design" Thomson Publications, 5th Edition, 2004.

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

# NETWORK THEORY (D3ESNT)

**B.Tech. III Semester** **L/T/P/C**
**2/0/0/2**

**Prerequisite:** Mathematics, Fundamentals of Electrical Engineering.

## COURSE OBJECTIVES:

1. To understand Network Topology.
2. To analyze transients in Electrical systems.
3. To evaluate Network parameters of given Electrical network
4. To design basic filter configurations.

## COURSE OUTCOMES:

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

1. Apply basic cut –set and Tie- set technique to find the circuit response L3
2. Analyze the solutions of first and second-order networks under various excitations to determine their behavior and response characteristics.L4
3. Analyze circuit behavior using Laplace transforms to solve complex circuit problems in both time and frequency domains.L4
4. Apply evaluation techniques to assess the performance and functionality of two-port networks.L3
5. Design and Evaluate the network filters.L5

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C203.1 | 3 | 3 | 3 | 3 | | | | | | | | 3 |
| C203.2 | 3 | 3 | 3 | 3 | | | | | | | | 3 |
| C203.3 | 3 | 3 | 3 | 3 | | | | | | | | 3 |
| C203.4 | 3 | 3 | 3 | 3 | | | | | | | | 3 |
| C203.5 | 3 | 3 | 3 | 3 | | | | | | | | 3 |

**UNIT-I: Network Topology:** Definitions– Graph – Tree, Basic cut set and Basic Tie set matrices for planar networks – Loop and Nodal methods of analysis of Networks with dependent & independent voltage and current sources - Duality & Dual networks.

**UNIT-II: Solution of First and Second Order Networks:** Solution of first and second order differential equations for Series and parallel R-L, R-C, R- L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response.

**UNIT-III: Electrical Circuit Analysis using Laplace Transforms:** Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, Application of Laplace Transforms to RL, RC and RLC (series) for impulse and step.

**UNIT-IV: Two Port Network and Network Functions:** Network functions driving point and transfer impedance function networks, necessary conditions for driving point functions and for transfer function, Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks.

**UNIT-V: Introduction to Filters:** Introduction to filters –single tuned and double tuned filters - low pass – high pass and band pass, Band rejection filter – RC, RL, filters- constant K and m derived filters and composite filter design.

**TEXT BOOKS:**


1. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998.
2. W.H. Hayt and J.E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.


**REFERENCE BOOKS:**


1. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004.
2. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.
3. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
4. Schaum's outlines on "Electric Circuits".
5. V.C. Natesan, Parkersmith, "Problems & Solutions in Electrical Engineering".

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

## ELECTRONIC CIRCUIT ANALYSIS (D43PC1)

**B.Tech. III Semester** **L/T/P/C**
**3/1/0/4**

**Prerequisite:** Electronic Devices and Circuits.

**COURSE OBJECTIVE:**

To give understanding of various types of amplifier such as small signal, Cascaded, Large Signal, tuned or un tuned circuits and to know the concept of feedback in amplifiers and Oscillators.

**COURSE OUTCOMES:**

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

1. Analyse Small signal Analysis of different transistor amplifier circuits such as single stage or multistage amplifiers using hybrid parameters. L4
2. Analyse the high frequency response of transistor circuits. L4
3. Analyse the gain of JFET and MOSFET amplifier using small signal model. L4
4. Design various Feedback Amplifiers and Oscillator circuits. L5
5. Analyze and Compare the efficiency and distortion of various Power Amplifiers. L4

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C204.1 | 3 | 3 | 3 | | | | | | | | | |
| C204.2 | | 3 | | | | | | | | | | |
| C204.3 | 3 | 3 | | | | | | | | | | |
| C204.4 | | 3 | 3 | | | | | | | | | |
| C204.5 | | 3 | | | | | | | | | | |

**UNIT-I: Analysis and Design of Small Signal Low Frequency BJT Amplifiers:** Classification of Amplifiers, h-parameter analysis, small signal equivalent circuit of a transistor, Analysis of CE, CB, CC amplifiers. Distortion in amplifiers, Miller's theorem, Analysis of CE, CC, and CB Amplifiers, CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors, Design of single stage RC coupled amplifier, Different coupling schemes used in amplifiers, Analysis of Cascaded RC Coupled amplifiers, Cascode Amplifier, Darlington pair.

**UNIT-II: Transistor at High Frequency:** Logarithms, Decibels. The Hybrid-pi ($\pi$)– Common Emitter transistor model, CE short circuit current gain, current gain with resistive load, Single stage CE transistor amplifier response, Gain-bandwidth product.

**UNIT-III: FET Amplifiers:** Analysis of JFET Amplifiers, Analysis of CS, CD, CG JFET Amplifiers, comparison of performance with BJT Amplifiers, Basic Concepts of MOS amplifiers, MOS Small signal model, Common source amplifier with resistive load, Diode connected and Current source loads, Source follower, Common Gate Stage amplifier.

**UNIT-IV: Positive & Negative Feedback in 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 and LC type Oscillators–Frequency and amplitude stability of oscillators–Generalized analysis of LC oscillators, Quartz, Hartley, and Colpitts Oscillators RC-phase shift and Wien-bridge oscillators.

**UNIT-V: Large Signal Amplifiers:** Class A Power Amplifier, Maximum Value of Efficiency of Class–A power Amplifier, Transformer Coupled Class A Power Amplifier, Class B Power Amplifier, Class B Push-Pull and Complimentary Symmetry Power Amplifiers. Distortion in amplifiers, Crossover distortion and harmonic distortion. Transistor Power Dissipation, Heat Sinks.
**Tuned Amplifiers:** Introduction, Q-Factor, Small Signal Tuned Amplifier, Single Tuned Amplifier (Capacitive coupling & Inductive Coupling).

**TEXT BOOKS:**


1. David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford Press.
2. Robert L. Boylestead and Louis Nashelsky, "Electronic Devices and Circuit Theory", 11th Edition, 2009, Pearson Publications.
3. Jacob Millman, Christos C Halkias, "Integrated Electronics", McGraw Hill Education.


**REFERENCE BOOKS:**


1. S. Salivahanan, N. Suresh Kumar, AVallvaraj, "Electronic Devices and Circuits", 5th Edition, McGraw Hill Education.
2. Md. H Rashid, "Electronic Circuits and Applications", Cengage Learning, 2014.

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

## SIGNALS AND SYSTEMS (D43PC2)

**B.Tech. III Semester** **L/T/P/C**
**3/1/0/4**

**Prerequisite:** Integration and Differentiation

**COURSE OBJECTIVE:**
This subject gives the basics of Signals and Systems required for all Electronics and Electrical Engineering related courses, different transform techniques and systems encountered in Communications and Signal Processing areas.

**COURSE OUTCOMES:**
Upon completion of the Course, the students will be able to

1. Apply knowledge of various signals and systems to perform operations, Orthogonality. L3
2. Analyze Fourier representation of continuous time periodic and aperiodic signals. L4
3. Analyze various signals and their properties using Laplace transform, Sampling theorem. L4
4. Relate the concepts of convolution and correlation w.r.t signals and sequences also understand Energy and Power density spectrums. L4
5. Relates the signal transmission through linear systems finding system reliability, transfer function using state space. L3

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C205.1 | 3 | | | | | | | | | | | |
| C205.2 | 3 | 3 | | | | | | | | | | |
| C205.3 | 2 | 3 | | | | | | | | | | |
| C205.4 | 2 | 3 | | | | | | | | | | |
| C205.5 | 3 | 3 | | | | | | | | | | |

**UNIT-I: Introduction to Signals & Systems:** Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function, Signum function and ramp function.

**Signal Analysis:** Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions.

**UNIT-II: Fourier Representation of Continuous Time Signals:**

**Periodic Signals - Fourier Series**: Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirchilet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum.

**Non-Periodic Signals - Fourier Transform:** Deriving Fourier Transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function, Introduction to Hilbert Transform.

**UNIT-III: Laplace Transform:** Concept of Region of Convergence (RoC) for Laplace Transforms, Constraints on RoC for various classes of signals, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis., Inverse Laplace Transform, Partial fraction method and long division method, Laplace transforms methods in circuit analysis, the transfer function. Analysis and characterization of LTI system using Laplace transform.

**Sampling:** Sampling theorem – Graphical and analytical proof for Band Limited Signals, Types of Sampling - Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass sampling.

**UNIT-IV: Convolution and Correlation of Signals:** Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution, Convolution property of Fourier Transforms, Cross Correlation and Auto Correlation of functions, Properties of Correlation function, Energy density spectrum, Parseval's Theorem, Power density spectrum, Relation between Auto Correlation function and Energy/Power spectral density function, Relation between Convolution and Correlation, Detection of periodic signals in the presence of Noise by Correlation, Extraction of signal from noise by filtering.

**UNIT-V: 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 characteristics of Linear Systems, 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.

**State Space Representation of Systems:** Introduction to state space analysis, State model, Derivation of Transfer Function from State model, State Transition Matrix and its Role.

**TEXT BOOKS:**


1. B.P. Lathi, "Signals, Systems & Communications", BS Publications, 2013.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", 2nd Ed., PHI.
3. Anand Kumar, "Signals and Systems", PHI.


**REFERENCE BOOKS:**


1. Simon Haykin and Van Veen, Wiley, "Signals & Systems", 2nd Edition.
2. Iyer and K. Satya Prasad, "Signals and Signals", Cengage Learning.

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

# DIGITAL LOGIC DESIGN LAB (D3ESDLL)

**B.Tech. III Semester** **L/T/P/C**

**0/0/2/1**

**COURSE OBJECTIVES:**

1. To study the sequential logic circuits design both in synchronous and Asynchronous modes for various complex logic and switching devices, their minimization techniques , realizations and methods for analysis of combinational and sequential circuits.
2. To study the applications of 74XX combinational and sequential series IC's.

**COURSE OUTCOMES:**

Upon completion of the Lab, the students will be able to

1. Construct Boolean functions using logic gates, Understand the pin configuration of various digital ICs used in the lab. L3
2. Demonstrate and verify the properties of various logic circuits. L4
3. Describe and verify the truth tables of different Combinational circuits. L4
4. Analyze various Sequential circuits. L4

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C206.1 | 3 | 3 | 3 | | | | | | | | | |
| C206.2 | 2 | 2 | 2 | | | | | | | | | |
| C206.3 | 3 | 3 | 3 | | | | | | | | | |
| C206.4 | 3 | 3 | 3 | | | | | | | | | |

**NOTE:**

1. To perform any 10 Experiments.
2. Verify the functionality of the IC in the given application.

**LIST OF EXPERIMENTS:**

1. Study of logic gates.
2. Deign a 4-bit Gray to Binary and Binary to Gray Converter.
3. Design a 16 bit Adder/ Subtractor using 4-bit Adder / Subtractor IC's.
4. Design a 3*8 Decoder.
5. Design a16x4 priority encoder using two 8x3 priority encoder.

6. Design a 16*1 multiplexer using 8x1 multiplexer.
7. Design a 16bit comparator using 4 bit comparators.
8. Study of flip flops.
9. Design an 8 bit parallel load and serial out shift register using two 4 bit shift register.
10. Design an 8 bit serial in and serial out shift register using two 4 bit shift register.
11. Design a Ring counter and twisted ring counter using a 4-bit shift register.

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

# ELECTRONIC CIRCUIT DESIGN LAB (D43PC3)

**B.Tech. III Semester** **L/T/P/C**
**0/0/2/1**

## COURSE OBJECTIVE:

To develop the students ability in conducting and analysing experiments with the applications of Bipolar Junction Transistor (BJT) and Field Effect Transistor FET.

## COURSE OUTCOMES:

Upon completion of the Lab, the students will be able to

1. Design single and multi-stage amplifier for required gain. L5
2. Analyze the power and tuned amplifier for required efficiency and resonant frequency respectively. L4
3. Analyze various oscillator circuits for different frequencies. L4
4. Design FET amplifier for required gain. L5

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C207.1 | | | | | 2 | | | 3 | 3 | 3 | | |
| C207.2 | | | | | 2 | | | 3 | 3 | 3 | | |
| C207.3 | | | | | 2 | | | 3 | 3 | 3 | | |
| C207.4 | | | | | 2 | | | 3 | 3 | 3 | | |

**NOTE:** Minimum 10 Experiments are to be done in hardware

## LIST OF EXPERIMENTS:

1. Plot the frequency response of Common Emitter Amplifier and estimate Bandwidth.
2. Plot the frequency response of Common Source amplifier estimate Bandwidth.
3. Plot the frequency response of Two stage RC Coupled Amplifier and estimate Bandwidth
4. Plot the frequency response of Current Shunt Feedback Amplifier and estimate Bandwidth
5. Plot the frequency response of Voltage Series Feedback Amplifier and estimate Bandwidth
6. Analyze Wien Bridge Oscillator using Transistors.
7. Analyze RC Phase Shift Oscillator using Transistors.
8. Analyze Class A Power Amplifier (Transformer less) and draw its output waveforms

9. Analyze the Efficiency of Class B Push Pull Amplifier and draw its output waveforms
10. Analyze Hartley Oscillator.
11. Analyze Colpitt's Oscillator.
12. Plot the frequency Response of Single Tuned Voltage Amplifier and identify Resonant Frequency.

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

# ELECTRONIC CIRCUIT SIMULATION LAB (D43PC4)

**B.Tech. III Semester** **L/T/P/C**
**0/0/2/1**

**COURSE OBJECTIVE:**

To develop the students ability in conducting and analysing experiments and to initiate the students to understand the concepts of Multisim or P-spice or Equivalent Simulation software is used for circuit design.

**COURSE OUTCOMES:**

Upon completion of the Lab, the students will be able to

1. Design and simulate single stage amplifier for required gain. L4
2. Design and simulate power and tuned amplifier for required efficiency and resonant frequency respectively. L4
3. Design and simulate feedback amplifier and oscillator circuits. L4
4. Design and simulate FET amplifier for required gain. L4

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C208.1 | | | | | 2 | | | 3 | 3 | 3 | | |
| C208.2 | | | | | 2 | | | 3 | 3 | 3 | | |
| C208.3 | | | | | 2 | | | 3 | 3 | 3 | | |
| C208.4 | | | | | 2 | | | 3 | 3 | 3 | | |

**NOTE:** Minimum 10 Experiments are to be simulated using Multisim or P-spice or Equivalent Simulation

**LIST OF EXPERIMENTS:**

1. Design of Common Emitter Amplifier.
2. Design of Two Stage RC Coupled Amplifiers.
3. Design of Current Shunt Feedback Amplifier.
4. Design of Voltage Series Feedback Amplifier
5. Design of Wien Bridge Oscillator using Transistors.
6. Design of RC Phase Shift Oscillator using Transistors.
7. Design of Class A Power Amplifier (Transformer less).
8. Design of Class B Complementary Symmetry Amplifier.
9. Design of Hartley Oscillator.
10. Design of Colpitt's Oscillator.
11. Design of Single Tuned Voltage Amplifier.

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

# BASIC SIMULATION LAB (D43PC5)

**B.Tech. III Semester** **L/T/P/C**
**0/0/2/1**

**COURSE OBJECTIVES:**

1. To provide background and fundamentals of MATLAB for the analysis and processing of signals to generate various continuous and discrete time signals and to determine the Fourier Transform of signals, to convert a continuous time signal to discrete.
2. To apply convolution and correlation for continuous time signal.
3. To use Laplace transforms for analyzing continuous time signals and systems.

**COURSE OUTCOMES:** Upon completion of the Lab, the students will be able to

1. Acquaint with MATLAB commands, functions and programming, Generate various signals and sequences to perform operations on them. L3
2. Determine the Convolution and Correlation between Signals and Sequences. L4
3. Verify the Gibb's, Sampling theorem and Weiner-Khintchine Relations. L4
4. Determine the Laplace and Fourier Transform of the given signal, Determine LTI system response. L4

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C209.1 | | | | | 3 | | | | | | | 3 |
| C209.2 | | | | | 3 | | | | 2 | | | |
| C209.3 | | | | | 3 | | | | | | | 3 |
| C209.4 | | | | | 3 | | | | 2 | | | 2 |

**NOTE:**

1. All the experiments are to be simulated using MATLAB or equivalent software
2. Minimum of 12 experiments is to be completed

**LIST OF EXPERIMENTS (MATLAB PROGRAMS):**

1. Perform basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Perform operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.

4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Compute convolution between Signals/Sequences.
6. Compute Auto Correlation and Cross Correlation between Signals/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 reliability and stability properties.
9. Verification of Gibbs Phenomenon.

10. For the given poles and zeros, find the transfer function and plot the Pole-Zero maps in S-plane, also find the stability of the system.
11. Sampling Theorem Verification.
12. Removal of noise by Autocorrelation / Cross correlation.
13. Extraction of Periodic Signal masked by noise using Correlation.
14. Verification of Weiner-Khintchine Relations.

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

## PROBABILITY THEORY AND STOCHASTIC PROCESSES (D44PC6)

**B.Tech IV Semester** **L/T/P/C**
**3/0/0/3**

**COURSE OBJECTIVES:**

1. Understand the elementary aspects of probability theory of random signals and utilization of random signals in Communications and Signal processing areas.
2. To know the Temporal and Spectral Characteristics of random processes.

**COURSE OUTCOMES:** Upon completion of the Course, the students will be able to

1. Calculate probabilities for simple and compound events and apply Baye's theorem in probability calculations. L3
2. Analyse and apply various probability distributions of random variables. L4
3. Calculate probabilities and moments for multiple random variables. L3
4. Analyse the temporal characteristics of stochastic process. L4
5. Analyze the spectral characteristics of stochastic process. L4

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C210.1 | 3 | 3 | | | | | | | | | | |
| C210.2 | 3 | 3 | | | | | | | | | | |
| C210.3 | 3 | 3 | | | | | | | | | | |
| C210.4 | 3 | 3 | 3 | | | | | | | | | |
| C210.5 | 3 | 3 | 3 | | | | | | | | | |

**UNIT-I: Probability and Random Variable: Probability:** Probability introduced through Sets and Relative Frequency, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events.
**Random Variable:** Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables.

**UNIT -II: Distribution & Density Functions:** Distribution and Density functions and their Properties - Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and Conditional

Distribution, methods of defining Conditional Event, Conditional Density, and Properties.
**Operation on One Random Variable – Expectations:** Introduction, 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 Transformations for a Continuous Random Variable, Non- monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable.

**UNIT-III: Multiple Random Variables:** Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, 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.
**Operations on Multiple Random Variables:** Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables, and Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, and Linear Transformations of Gaussian Random Variables.

**UNIT-IV: Stochastic Processes - Temporal Characteristics:** The Stochastic 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, Nth 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 and its Properties, Linear System Response of Mean and Mean-squared Value, Autocorrelation Function, Cross-Correlation Functions, Gaussian Random Processes, Poisson Random Process.

**UNIT-V: Stochastic Processes – Spectral Characteristics:** Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, 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 Spectral Density of Input and Output of a Linear System. Noise-White and colored Noise

**TEXT BOOKS:**


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


**REFERENCE BOOKS:**


1. Athanasios Papoulis and S.Unnikrishna Pillai, "Probability, Random Variables

and Stochastic Processes", 4th Edition, TMH.
2. Pradip Kumar Gosh, "Theory of Probability and Stochastic Processes", University Press
3. Henry Stark and John W. Woods, "Probability and Random Processes with Application to Signal Processing", 3rd Edition.

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

# ANALOG AND DIGITAL COMMUNICATIONS (D43PC7)

**B.Tech. IV Semester** **L/T/P/C**
**3/0/0/3**

## COURSE OBJECTIVE:

To develop an ability to analyze system requirements of analog and digital communication systems for generation, detection of various analog and digital modulation techniques and acquire knowledge in AM, FM transmitters, receivers , concepts of baseband transmission.

## COURSE OUTCOMES:

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

1. Analyse various amplitude modulation and demodulation techniques. L4
2. Illustrate the concept of angle modulation and demodulation techniques. L3
3. Contrast the knowledge on functioning of various AM, FM transmitter and receiver. L3
4. Analyse various Pulse modulation and demodulation Techniques and study of Noise. L4
5. Illustrate the concept of digital modulation techniques and errors in various modulation techniques. L3

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C211.1 | 3 | 3 | | | | | | | | | | |
| C211.2 | 3 | 3 | | | | | | | | | | |
| C211.3 | 2 | 2 | | | | | | | | | | |
| C211.4 | 3 | 3 | | | | | | | | | | |
| C211.5 | 3 | 3 | | | | | | | | | | |

**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, 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: 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.

**TEXT BOOKS:**


1. Simon Haykin, "Analog and Digital Communications", John Wiley, 2005.
2. Wayne Tomasi, "Electronics Communication Systems", 5th Edition, PHI, 2009.


**REFERENCE BOOKS:**


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

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

## PULSE AND DIGITAL CIRCUITS (D43PC8)

**B.Tech. IV Semester** **L/T/P/C**
**3/0/0/3**

**COURSE OBJECTIVES:**

1. To explain the complete response of R-C and R-L-C transient circuits, clippers, clampers, switching characteristics of transistors and sampling gates.
2. To construct various multivibrators using transistors, design of sweep circuits, sampling gates and realization of logic gates using diodes and transistors.

**COURSE OUTCOMES:**

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

1. Analyze the response of RLC circuits excited by linear signals. L4
2. Design Non Linear wave shaping circuits. L4
3. Illustrate the working of time base generators with help of nonlinear switching devices. L3
4. Analysis and design of various Multi-vibrators. L4
5. Realize of logic gates in various logic families. L4

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C212.1 | 3 | 3 | | | | | | | | | | |
| C212.2 | 3 | 3 | | | | | | | | | | |
| C212.3 | 2 | 2 | | | | | | | | | | |
| C212.4 | 3 | 3 | | | | | | | | | | |
| C212.5 | 3 | 3 | | | | | | | | | | |

**UNIT-I: Linear Wave Shaping:** High pass and low pass RC circuits and their response for Sinusoidal, Step, Pulse, Square, & Ramp inputs, High pass RC network as Differentiator, Low pass RC circuit as an Integrator, Attenuators and its application as a CRO Probe, RL and RLC Circuits and their response for Step Input, Ringing circuit, Illustrative Problems

**UNIT-II: Non-Linear Wave Shaping:** Diode clippers, Transistor clippers, Clipping at two independent levels, Emitter coupled clipper, Comparators, Applications of Voltage comparators. Clamping Operation, Clamping circuit taking Source and Diode resistances into account, Clamping Circuit Theorem, Practical Clamping circuits, effect of Diode characteristics on

Clamping Voltage.

**UNIT-III: Switching Characteristics of Devices:** Diode as a Switch, Piecewise Linear Diode Characteristics, Diode Switching times, Transistor as a Switch, Transistor switching times.
**Time Base Generators:** General features of a Time base Signal, Methods of Generating Time Base Waveform, Transistor Miller Time Base generator, Transistor Bootstrap, Time Base Generator, Transistor Current Time Base Generators.

**UNIT-IV: Multivibrators:** Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using transistors, Commutating Capacitor, Monostable Multivibrator (collector Coupled only), Astable Multivibrator (collector Coupled only) and Applications of Multivibrators.

**UNIT-V: Realization of Logic Gates:** AND, OR and NOT gates using Diodes and transistors, DCTL, RTL, DTL, TTL, CML (ECL) and CMOS Logic Families and its Comparison, Sampling Gates.

**TEXT BOOKS:**


1. J. Millman, H. Taub and Mothiki S. Prakash Rao, "Pulse Digital and Switching Waveforms", 3 rd Edition, McGraw Hill, 2017.
2. David A. Bell, "Pulse, Switching and Digital Circuits", 5th Edition, Oxford University Press, 2015.


**REFERENCE BOOKS:**


1. Venkata Rao K, Rama Sudha K, Manmadha rao G, "Pulse and Digital Circuits", Pearson Education, 2010.
2. A. Anand Kumar, "Pulse and Digital Circuits", 2nd Edition, PHI, 2011.

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

## LINEAR AND DIGITAL IC APPLICATIONS (D43PC9)

**B.Tech. IV Semester** **L/T/P/C**
**3/0/0/3**

**Prerequisite:** Concepts of Digital Logic Design

**COURSE OBJECTIVE:**
To introduce the basic building blocks of linear integrated circuits, linear and non-linear applications of operational amplifiers, analog multipliers, ADC and DAC and to implement the concept of basic digital circuits.

**COURSE OUTCOMES:**
Upon completion of the Course, the students will be able to

1. Analyse the various nonlinear applications of op amp (741). L4
2. Design and analyse various filters and multivibrators circuits using OP AMP. L5
3. Construct various Data Converters & PLL. L3
4. Apply knowledge of digital ICs in designing combinational logic applications. L3
5. Design various sequential logic circuits using sequential ICs and study of memories. L4

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C213.1 | 3 | 2 | 2 | | | | | | | | | |
| C213.2 | 3 | 2 | 3 | | | | | | | | | |
| C213.3 | 3 | 2 | 2 | | | | | | | | | |
| C213.4 | 3 | 2 | | | | | | | | | | |
| C213.5 | 3 | 2 | | | | | | | | | | |

**UNIT-I: Operational Amplifier:** IC packages, Study of differential op-amp, Ideal and Practical Op-Amp, Op-Amp Characteristics-DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Adder, Differential Amplifier (Subtractor), Differentiators and Integrators, Instrumentation Amplifier, Comparators, Schmitt Trigger, Introduction to Voltage Regulators-Three Terminal Voltage Regulators.

**UNIT-II: Op-Amp & IC-555 Applications:** Introduction to Active Filters, Characteristics and Analysis of $1^{st}$ order Low Pass, High Pass, Band Pass, Band Reject and All Pass filters, waveform Generators - Triangular, Sawtooth, Square wave, IC555 Timer - Functional

Diagram, Monostable and Astable Operations, Applications.

**UNIT-III: PLL & Data Converters:** IC565 PLL - Block Schematic, Description of Individual Blocks, Applications.
**ADC & DAC:** Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

**UNIT-IV: Digital Integrated Circuits:** Classification of Integrated Circuits, Comparison of Various Logic Families, CMOS Transmission Gate, IC interfacing. TTL Driving CMOS & CMOS Driving TTL, Combinational Logic ICs - Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs – Binary to Gray, Gray to Binary & BCD to Binary Code Converters, Decoders, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Magnitude Comparators.

**UNIT-V: Sequential Logic IC's and Memories:** Familiarity with commonly available 74XX & CMOS 40XX Series ICs - All types of Flip-flops, Shift Registers, Synchronous Counters, Decade Counters.
**Memories** - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

**TEXT BOOKS:**


1. Ramakanth A Gayakwad, "OP-Amp and Linear ICs ", 4th Edition, PHI, 2015.
2. D. Roy Chowdhury, "Linear Integrated Circuits", New Age International (p) Ltd., 5th Edition, 2020.
3. John F. Wakerly, "Digital Design Principles& Practices", Pearson Education Asia, 4th Edition, 2012.


**REFERENCE BOOKS:**


1. K. Lal Kishore, "Op-Amp Linear Integrated Circuits Application", Pearson 1st Edition, 2007.
2. RP Jain, "Modern Digital Electronics", 4th Ed., McGraw Hill Education, 2009.
3. Sergio Franco, "Design with operational amplifiers & Analog Integrated circuits", McGraw Hill Education, 3rd Edition, 2017.

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

## ELECTROMAGNETIC THEORY AND TRANSMISSION LINES (D43PC10)

**B.Tech. IV Semester** **L/T/P/C**
**3/0/0/3**

**COURSE OBJECTIVES:**

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

1. To explain the basics of electrostatic and magneto static concepts and show the time varying electromagnetic fields as applied to high frequency circuit design.
2. To interpret the electromagnetic wave characteristics at interface of different boundaries.
3. To illustrate the importance of transmission line theory and applications of it to circuit design with the help of Smith chart.
4. To understand the basic concepts of guided waves.

**COURSE OUTCOMES:**

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

1. Contrast the basic mathematical concepts related to electromagnetic vector fields. L4
2. Apply the principles of electrostatics on electric field and electric potential, boundary conditions and electric energy density. L4
3. Apply the principles of magneto statics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density. L3
4. Adapt the concepts related to Faraday‘s law, induced emf and Maxwell‘s equations. L3
5. Apply Maxwell‘s equations to solutions of problems relating to transmission lines and uniform plane wave propagation. L4

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C214.1 | 3 | 3 | | | | | | | | | | |
| C214.2 | 3 | 2 | | | | | | | | | | |
| C214.3 | 3 | 2 | | | | | | | | | | |
| C214.4 | 3 | 3 | | | | | | | | | | |
| C214.5 | 3 | 3 | 2 | | | | | | | | | |

**UNIT-I: Electrostatics**: Introduction to coordinate systems and Vector analysis. 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, Illustrative Problems.

**UNIT-II: Magnetostatics:** 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.

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

**UNIT-III: EM Wave Characteristics - I:** Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves - Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics-Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Depth of penetration, Polarization of uniform Plane wave.
**EM Wave Characteristics - II:** Reflection and Refraction of Plane Waves - Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem - Application.

**UNIT-IV: Transmission Lines - I:** Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Infinite Line Concepts, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Lossless, Distortion less and High Frequency Transmission Lines, Condition for Minimum Attenuation, Line Distortion, Loading - Types of Loading.

**UNIT-V: Transmission Lines - II**: Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements, $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines - Impedance Transformations, Significance of $Z_{min}$ and $Z_{max}$ , Single and Double Stub Matching, Smith Chart - Configuration and Applications, Illustrative Problems.

**TEXT BOOKS:**


1. Matthew N.O. Sadiku and S.V. Kulkarni, "Principles of Electromagnetics", 6th Edition, Oxford University Press, Asian Edition, 2015.
2. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, PHI, 2000.
3. Umesh Sinha, SatyaPrakashan, "Transmission Lines and Networks", Tech. India Publications, New Delhi, 2000.

**REFERENCE BOOKS:**


1. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics" 8th Edition, McGraw Hill Education, 2014.
2. John D. Ryder, "Networks, Lines and Fields", 2nd Edition, PHI, 1999.

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

# ANALOG AND DIGITAL COMMUNICATIONS LAB (D43PC11)

**B.Tech. IV Semester** **L/T/P/C**
**0/0/2/1**

## COURSE OBJECTIVES:

1. To understand modulation, demodulation techniques used in communication system, and to develop the modulation techniques used in both time and frequency domains.
2. To gain the knowledge on pulse amplitude, width, and position modulations, to analyze various digital modulation techniques like ASK, FSK, PSK, DPSK and QPSK, fundamentals of PLL, VCO.

## COURSE OUTCOMES:

Upon completion of the Lab, students will be able to

1. Implement modulation and demodulation techniques of AM, FM. L3
2. Explore digital communication techniques including pulse modulation. L4
3. Investigate signal sampling and reconstruction. L4
4. Implement digital modulation and demodulation. L3

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C215.1 | | | | | 3 | | | 2 | 3 | 3 | | |
| C215.2 | | | | | 3 | | | 2 | 3 | 3 | | |
| C215.3 | | | | | 3 | | | 2 | 3 | 3 | | |
| C215.4 | | | | | 3 | | | 2 | 3 | 3 | | |

## NOTE:

1. Minimum 12 experiments should be conducted.
2. Experiments are to be simulated first either using MATLAB or any other simulation software tools then testing to be done in hardware.

## LIST OF EXPERIMENTS:

**CYCLE-I:**

1. Amplitude modulation and demodulation to calculate the modulation index by varying the amplitude of the signal.
2. Frequency modulation and demodulation to observe the depth of modulation by varying the modulating voltage.
3. DSB-SC Modulator & Detector to observe frequency doubling.
4. SSB-SC Modulator & Detector (Phase Shift Method) to observe phase shift between the

side bands.

5. Frequency Division Multiplexing & De multiplexing to transmit different frequency signals over a communication channel.
6. Pulse Amplitude Modulation & Demodulation to study the effect of Amplitude variation of modulating signal on the output.
7. Pulse Width Modulation & Demodulation to study the effect of Amplitude and Frequency of Modulating Signal on PWM output.
8. Pulse Position Modulation & Demodulation to study the effect of Amplitude and the frequency of modulating signal on its output.
9. Study of spectrum analyzer and Measurement of frequency spectrum of AM and FM Signals.

**CYCLE-II**:

1. PCM Generation and Detection to convert an analog signal into a pulse digital signal.
2. Delta Modulation to compare the present signal with the previous signal of the given modulating signal.
3. Frequency Shift Keying: Generation and Detection to check the shift with respect to given clock signal.
4. Binary Phase Shift Keying: Generation and Detection to check carrier modulation with phase.
5. Generation and Detection (i) DPSK (ii) QPSK to generate the bit streams at different frequencies.
6. Generate FSK modulated signal using PLL to obtain FSK signal at ease with minimal components.

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

## PULSE AND DIGITAL CIRCUITS LAB (D43PC12)

**B.Tech. IV Semester** **L/T/P/C**
**0/0/2/1**

**COURSE OBJECTIVE:**
Ability to design an Integrator & Differentiator using R, L & C circuits, Clipping, Clamping, Multivibrator, Time Base Generators, switching characteristics of devices and realization of Logic Gates using Diodes and Transistors.

**COURSE OUTCOMES:**
Upon completion of the Lab, students will be able to

1. Analyse the responses of RC low pass and high pass filters. L4
2. Analyse and design various multi vibrator circuits using transistors. L5
3. Analyse the responses of various time-base generators. L4
4. Design of logic gates. L5

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C216.1 | 3 | 3 | 3 | | | | | | | | | |
| C216.2 | 3 | 3 | 3 | | | | | | | | | |
| C216.3 | 3 | 3 | 3 | | | | | | | | | |
| C216.4 | 3 | 2 | 3 | | | | | | | | | |

**NOTE:** Minimum 10 Experiments to be conducted
**LIST OF EXPERIMENTS:**

1. Linear wave Shaping
   a. Design RC Low Pass Circuit for different time constants
   b. Design RC High Pass Circuit for different time constants
2. Non-linear wave shaping
   a. Study various clipping circuits for different reference voltages and to verify the responses and its Transfer characteristics.
   b. Study various clamping circuits for different reference voltages and verify the responses.
3. Study the Switching characteristics of a transistor
4. Design a Bistable Multivibrator and observe its waveforms
5. Design an Astable Multivibrator and observe its waveforms
6. Design a Monostable Multivibrator and observe its waveforms

7. Design a Schmitt trigger circuit and observe the waveforms for a given UTP & LTP Values.
8. Design a bootstrap sweep circuit and observe its output waveforms.
9. Design a Miller sweep circuit and observe its output waveforms.
10. Study the Response of a transistor Current sweep circuit.
11. Study the different types of Sampling gates.
    a. Response of Unidirectional gate
    b. Response of Bidirectional gate using transistors
12. Study of Logic Gates and verify its truth table

# B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

## LINEAR AND DIGITAL IC APPLICATIONS LAB (D43PC13)

**B.Tech. IV Semester** **L/T/P/C**
**0/0/2/1**

**COURSE OBJECTIVE:**
Linear and non-linear applications of operational amplifiers using IC 741, IC 555 and IC 565, Voltage regulators using 78XX and 79XX, 74XX combinational and sequential series IC's.

**COURSE OUTCOMES:**
Upon completion of the Lab, students will be able to

1. Explore feedback mechanisms in operational amplifiers and design amplifier circuits. L4
2. Ability to design and analyse circuits using Op-Amp, TIMER ICs. L3
3. Gain hands-on experience in operating voltage regulators. L4
4. Explore the applications of digital ICs. L3

| COURSE CODE-CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C217.1 | | | 3 | | | | | 3 | 3 | 2 | | |
| C217.2 | | | 3 | | | | | 3 | 3 | 2 | | |
| C217.3 | | | 3 | | | | | 3 | 3 | 2 | | |
| C217.4 | | | 3 | | | | | 3 | 3 | 2 | | |

**NOTE**: Minimum of 8 Experiments should be completed

**LIST OF EXPERIMENTS:**
**PART-I:**

1. To verify the functionality of Adder, Subtractor using IC 741Op-Amp.
2. Design a Comparator using IC 741Op-Amp.
3. Design an Integrator using IC741Op-Amp.
4. Design a Differentiator using IC741Op-Amp.
5. Design a Schmitt Trigger circuit using IC 741.
6. To verify the functionality of Three Terminal Voltage Regulators-7805, 7809, and 7912.
7. Design an Active Low Pass & High Pass filters (first order).
8. Design a Monostable multivibrator using IC 555 timer.
9. Design an Astable multivibrator using IC 555 timer.

10. Design a PLL using IC 565.

**PART-II:**

**NOTE**: Minimum of 4 Experiments to be conducted

1. Design a Ring counter using a 4-bit shift register.
2. Design a twisted ring counter using a 4-bit shift register.
3. Design a  decade counter
4. Design a modulo counter using two decade counters
5. Design a 4 digit hex counter using synchronous one digit hex counter.
6. Design a 4 digit hex counter using Asynchronous one digit hex counter.
7. Design a 4 bit pseudo random sequence generator using 4-bit ring counter.