VIDYA JYOTHI
INSTITUTE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION
AccreditedbyNAAC,ApprovedbyAICTENewDelhi&PermanentlyAffiliatedtoJNTUH)
AzizNagarGate,C.B.Post,Hyderabad-500075
DepartmentofElectronicsandCommunicationEngineering
(AccreditedbyNBA)

R-25
COURSE STRUCTURE
&
SYLLABUS

For the
II Year
Bachelor of Technology
(B. Tech)

With effect from the Academic Year 2025-26

IB.Tech. I Semester

S. No	Course Code	Course Title	L	T	P	Credits
1	A251002	Mathematics-I(Matrices & Calculus)	3	1	0	4.0
2	A251003	AdvancedEngineeringPhysics	3	0	0	3.0
3	A251503	ProgrammingforProblem Solving	3	0	0	3.0
4	A251201	BasicElectrical Engineering	2	0	0	2.0
5	A251001	EnglishforSkillenhancement	3	0	0	3.0
6	A251082	AdvancedEngineeringPhysicsLab	0	0	2	1.0
7	A251583	Programmingfor Problem SolvingLab	0	0	2	1.0
8	A251081	EnglishLanguage&CommunicationSkills Lab	0	0	2	1.0
9	A251281	BasicElectricalEngineeringLab	0	0	2	1.0
		InductionProgram				
Total			**14**	**01**	**08**	**19**

I B.Tech. II Semester

S. No	Course Code	Course Title	L	T	P	Credits
1	A252002	Mathematics–II(OrdinaryDifferential Equations & Vector Calculus)	3	0	0	3.0
2	A252004	EngineeringChemistry	3	0	0	3.0
3	A252502	DataStructuresEssentials	3	0	0	3.0
4	A252503	PythonProgramming	3	0	0	3.0
5	A252402	NetworkAnalysis &Synthesis	3	0	0	3.0
	A252381	EngineeringWorkShop	0	0	2	1.0
6	A252302	EngineeringDrawingandComputerAided Drafting	2	0	2	3.0
7	A252083	EngineeringChemistryLab	0	0	2	1.0
8	A252582	DataStructuresEssentials Lab	0	0	2	1.0
9	A252584	AppliedPythonprogrammingLab	0	0	2	1.0
Total			**17**	**0**	**10**	**22**

`

IIB.Tech. ISemester

S. No	Course Code	Course Title	L	T	P	Credits
1	A253402	ProbabilityTheoryand StochasticProcesses	3	0	0	3
2	A253403	SignalsandSystems	3	0	0	3
3	A253401	ElectronicDevicesand Circuits	3	0	0	3
4	A253404	DigitalLogicDesign	3	0	0	3
5	A253405	Control Systems Engineering	2	0	0	2
6	A253005	Innovationand Entrepreneurship	2	0	0	2
7	A253482	Modellingand SimulationLab	0	0	2	1
8	A253481	ElectronicDevicesandCircuitsLab	0	0	2	1
9	A253483	DigitalLogicDesignLab	0	0	2	1
10	A253581	Linux andShellScripting	0	0	2	1
11	A253105	EnvironmentalScience	1	0	0	1
Total			**17**	**0**	**8**	**21**

II B.Tech. II Semester

S. No	Course Code	Course Title	L	T	P	Credits
1	A254002	NumericalMethodsand ComplexVariables	3	0	0	3
2	A254402	ElectromagneticFieldsandTransmission Lines	3	0	0	3
3	A254403	AnalogandDigitalCommunications	3	0	0	3
4	A254404	ElectronicCircuit Analysis	3	0	0	3
5	A254405	LinearandDigitalICApplications	3	0	0	3
6	A254081	ComputationalMathematics Lab	0	0	2	1
7	A254483	AnalogandDigitalCommunicationsLab	0	0	2	1
8	A254484	ElectronicCircuitAnalysisLab	0	0	2	1
9	A254485	LinearandDigitalICApplications Lab	0	0	2	1
10	A254581	Weband Mobile Applications	0	0	2	1
Total			15	0	10	**20**

PROBABILITYTHEORYANDSTOCHASTICPROCESSES

II B.Tech I Semester (ECE)
Course Code: A253402

L	T	P	C
3	0	0	3

Pre-requisite: Mathematics

CourseObjectives:

1. Understandthe conceptofrandomvariableanditsclassification
2. Comprehendthe significanceofdistribution anddensityfunctions of random variable.
3. Interpretthe principleof jointrandomvariablesandcomputationoftheirstatisticalparameters.
4. Realizetheconceptofarandomprocessanditsanalysisinbothtimeandfrequencydomain.
5. Understandthe effectof anLTIsystemonitsrandomexcitationand Noise

CourseOutcomes:

Aftergoingthroughthiscoursethestudentcan

1. DeterminetheapplicationsofvariousrandomvariablesbasedonindividualCumulative Distribution Function and Probability Density Function.
2. Compute the various statistical averages of single/multiple random variables and enumerate their significance.
3. Analyzearandomvariableasafunctionoftime,withreferencetoitstemporalandspectral characteristics.
4. Determine the effect of an LTI system on the time domain and frequency domain characteristics ofthe random excitation.
5. Analyze anoise invariousbasicElectricalandCommunication System

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	-	2	-	-	-	-	-	-	-	3	-
CO2	3	3	-	2	-	-	-	-	-	-	-	3	-
CO3	3	3	3	2	-	-	-	-	-	-	-	3	-
CO4	3	3	3	2	-	-	-	-	-	-	-	3	-
CO5	3	3	3	3								3	-

UNIT-I

Probability: 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 Variables: 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 Random Variable: 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 and Discrete Random Variable, Generation of aRandom Variable of a given PDF/CDF.

UNIT-III

Multiple random variables and Operations on Multiple random variables: Vector Random Variables, JointDistributionFunctionanditsProperties,Marginal Distributionand Density Functions,ConditionalDistributionand Density Functions, Statistical Independence, Sum of Two and more Random Variables, Central Limit Theorem, Equal and Unequal Distribution (Proof notexpected).

Expected Value of a Function of Random Variables- Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, JointlyGaussian Random Variables: Two Random Variables case, N Random Variable case, Properties.

UNIT-IV

Random Processes–Temporal characteristics: The Random Process Concept, Classification ofProcesses, 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 Stationary, Definitions of The 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-V

Random processes – Spectral characteristics: The Power Spectrum: Properties, Relationshipbetween 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.

Noise sources: Resistive / Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Basic Definitions of Narrow Band noise , Quadrature representation of narrow band noise.

TEXTBOOKS:

1. PeytonZ.Peebles-Probability,RandomVariables&RandomSignalPrinciples -TMH,4th Edition
2. MurrayRSpiegel,JohnSchiller,RAluSrinivasan. –ProbabilityandStatistics–Schaum's Outlines, 2nd Edition, TMH

REFERENCEBOOKS:

1. PRamesh Babu -ProbabilityTheoryandRandomProcesses– McGrawHill Education
2. AthanasiosPapoulisandS.UnnikrishnaPillai-Probability,RandomVariablesandStochastic Processes – McGraw Hill Education, 4th Edition
3. K.N.HariBhat,K.AnithaSheelaandJayantGanguly-ProbabilityTheoryandStochastic Processes for Engineers - Pearson, 1st Edition, 2011
4. Tauband Schilling-Principles ofCommunication systemsby(TMH), 2008
5. Y Mallikarjuna Reddy-ProbabilityTheoryand StochasticProcesses, 4thEdition, UniversityPress

SIGNALS AND SYSTEMS

II B.Tech I Semester (ECE)

Course Code: A253403

L	T	P	C
3	0	0	3

Pre-requisite: Mathematics

CourseObjectives:

1. Classify signals and systems and their analysis in time and frequency domains.
2. Study the concepts of distortion less transmission through LTI Systems, convolution and correlationproperties.
3. Understand Laplace and Z-transforms and their properties for analysis of signals and systems.
4. Identify the need for sampling of CT signals, types and merits and demerits of each type.

CourseOutcomes:

Aftergoingthroughthiscoursethestudentcan

1. Analyze and classify signals and systems using vector space concepts, orthogonality, and standard signal representations.
2. Represent and analyze continuous-time signals using Fourier series and Fourier Transform techniques.
3. Analyze signal transmission through linear systems using convolution, transfer functions, and bandwidth concepts.
4. Apply Laplace Transform and correlation techniques to analyze continuous-time signals and systems.
5. Apply sampling theorem and Z-Transform techniques for analysis of continuous-time and discrete-time signals.

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	1	–	–	–	–	–	–	–	3	–
CO2	3	3	2	2	–	–	–	–	–	–	–	3	–
CO3	3	3	2	1	–	–	–	–	–	–	–	3	–
CO4	3	3	3	2	–	–	–	–	–	–	–	3	–
CO5	3	3	2	2	–	–	–	–	–	–	–	3	–

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 PeriodicSignals, 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, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution. 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.

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.

Correlation: Auto Correlation and Cross Correlation Functions, Relation between Convolution and Correlation, Properties of Correlation Functions

UNIT – V

Sampling theorem: Graphical and analytical proof of Sampling Theorem for Base band/Band Limited Signals and Band Pass Signals, Types of Sampling: Impulse Sampling, Natural and Flattop Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing.

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.

TEXT BOOKS:

1. Lathi B P, Signals, Systems & Communications, B.S. Publications, 2003.
2. Alan V. Oppenheim, Alan S. Willsky, Syed Hamid Nawab , Signals and Systems, Prentice Hall India,1997

REFERENCE BOOKS:

1. Simon S. Haykin, Barry Van Veen , Signals and Systems, Wiley, 2003
2. Rama Krishna Rao A, Signals and Systems, 2008, Tata McGraw Hill, 2008.

ELECTRONICDEVICESANDCIRCUITS
(Common for ECE & EEE)

II B.Tech I Semester
Course Code: A253401

L	T	P	C
3	0	0	3

Course Overview:

This course introduces fundamental semiconductor devices and their behavior, including diodes, BJTs, and FETs. It covers their characteristics, applications, and the analysis ofbasic electronic circuits. The course also explores rectifiers, voltage regulation, amplifier design, and advanced semiconductor technologies like FinFETs and CNTFETs. Emphasis is placed ondeveloping a strong foundation for analog circuit design and understanding modern device technologies in electronics

CourseOutcomes:

Aftergoingthroughthiscoursethestudentcan

1. Analyzetheelectricalcharacteristicsandmodelsofsemiconductordiodesandapplythemin rectifier and clipping circuits.
2. Evaluate the operation and configurationsof Bipolar Junction Transistors (BJTs) & Field Effect Transistors and analyzetheir input and output characteristics.
3. Designappropriate biasingnetworks forBJTsanddeterminetheoperating pointfor amplifier applications.
4. Analyzetransistoramplifiercircuitsusingsmall signalmodelsandassessperformancefor various configurations.
5. Analyze the structure and working of Special purpose diodes and advanced devices like FinFETs and CNTFETs

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	1	1	-	-	-	-	-	2	-
CO2	3	3	2	2	1	-	-	-	-	-	-	2	1
CO3	3	3	3	2	1	-	-	-	-	-	-	2	2
CO4	3	3	3	2	2	-	-	-	-	-	1	2	-
CO5	3	3	2	2	2	1	-	-	-	-	2	2	2

UNIT-I:

Diode Characteristics and Applications: PN junction diode – V-I characteristics, Diode resistance andcapacitance, Diode models (Ideal, Simplified, Piecewise Linear), Rectifiers —Half-wave, Full- wave (Center-tap and bridge), Capacitor filter for rectifiers.- Clippers and clampers, Zener diode – V-I characteristics and voltage regulation.

UNIT-II:

Bipolar JunctionTransistor(BJT): Structure and working principle of BJT, Current components and transistor action, Configurations: Common Base (CB), Common Emitter (CE), Common Collector(CC), Input and output characteristics, Determination of h-parameters from transistor characteristics.

Field Effect Transistors (FET): JFET: Structure, operation, and characteristics, MOSFET: Enhancement and Depletion modes —Structure, operation and characteristics.

UNIT-III:
BJT Biasing: Need for biasing and stabilization, Load line and operating point, Biasing techniques:Fixed bias, Collector-to-base bias, Voltage divider bias, Stability factors and thermal runaway

UNIT-IV:
Transistor Amplifiers: Transistor as a small-signal amplifier, h-parameter equivalent circuit, CE, CB, CCamplifieranalysisusingh-parameters,Approximate h parameter model for CE amplifier.
FET Amplifiers: FET Small Signal Model, Analysis of CS, CD, CG JFET Amplifiers.

UNIT-V:
SpecialPurpose Diodes: Principle of Operation of - SCR, Tunnel Diode, Varactor Diode, Photo Diode,SolarCell,LEDandSchottkyDiode.
Advanced Devices: FinFETs - 3D structure, Scaling advantages, CNTFETs - Structure, ballistic transport, fabrication, Comparison: CMOS vs. FinFET vs. CNTFET.

TEXTBOOKS:
1. Boylestad, Robert L., and Louis Nashelsky. Electronic Devices and Circuit Theory. Pearson, 11th ed., 2013.
2. Millman, Jacob, and Christos C. Halkias. Electronic Devices and Circuits. Tata McGraw-Hill, 1991.
3. Sedra, Adel S., and Kenneth C. Smith. Microelectronic Circuits. Oxford University Press, 7th ed., 2014.

REFERENCEBOOKS:
1. Bell,DavidA.ElectronicDevicesandCircuits.OxfordUniversityPress,5th ed.,2008.
2. Neamen,DonaldA.ElectronicCircuitAnalysisandDesign.McGraw-Hill,2nd ed.,2001.
3. Salivahanan,S.,andN.SureshKumar.ElectronicDevicesandCircuits.McGraw-Hill Education, 4th ed., 2017.
4. Razavi,Behzad.FundamentalsofMicroelectronics.Wiley,2nd ed.,2013.
5. Taur, Yuan, and Tak H. Ning. Fundamentals of Modern VLSI Devices. Cambridge University Press, 2nd ed., 2009.

DIGITAL LOGIC DESIGN

II B.Tech I Semester (ECE)

Course Code: A253404

L	T	P	C
3	0	0	3

Course Overview:

This course introduces students to the fundamental principles of digital logic design. Starting from Boolean algebra and its simplification techniques, it covers the formal analysis and design of combinational and sequential circuits. Additionally, the course addresses memory elements and programmable logic devices, which are essential building blocks for complex digital systems.

CourseOutcomes:

Aftergoingthroughthiscoursethestudentcan

1. Apply number systems, codes, and logic gates in digital system design
2. Minimize Boolean functions using K-maps and implement using logic gates.
3. Design and analyze combinational logic circuits.
4. Design and analyze sequential logic circuits.
5. Analyze Moore and Mealy machines and explain memory & PLDs.

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	1	-	-	-	-	-	1	-	1
CO2	3	3	3	2	2	-	-	-	-	-	1	-	2
CO3	3	3	3	2	2	-	-	-	-	-	1	-	3
CO4	3	3	3	2	2	-	-	-	-	-	1	-	3
CO5	3	2	3	2	3	-	-	-	-	-	2	-	3

UNIT–I:

Number Systems: Binary, Octal, Decimal, Hexadecimal, Fixed-point and Floating-point Number Representations, Complements of Numbers: 1's and 2's Complement, Error Detection and Correction Codes: Parity Check, Hamming Code.

Boolean Algebra and Logic Gates: Axiomatic definitions, basic theorems and properties, Boolean Functions: Canonical and standard forms, Digital Logic Gates Overview.

UNIT-II:

Gate-Level Minimization Techniques: Karnaugh maps: 2, 3, and 4 variables, Sum-of-products (SOP) and product-of-sums (POS) simplification, Don't care conditions, Implementation using NAND and NOR gates.

UNIT-III:

Combinational Logic Circuits: Analysis and design procedures, Binary adder-subtractor and BCD adder, magnitude comparator, decoders, encoders, multiplexers and demultiplexers.

UNIT-IV:

Sequential Logic Circuits: Gated latches, Flip-flops: Clocked S-R, D, T, JK, Master-Slave JK, Flip-Flop Conversions, Design of synchronous and asynchronous counters, Shift registers: types and applications.

UNIT-V:

Synchronous Sequential Logic Moore and Mealy state machines, State diagrams, state tables, and state reduction, Case studies: sequence detector, traffic light controller, vending machine.
Programmable Logic Devices: Memory devices - RAM, ROM, Programmable Logic Arrays (PLA), Programmable Array Logic (PAL)

TEXT BOOKS:

1. M. Morris Mano, Michael D. Ciletti, Digital Design with an Introduction to the Verilog HDL, 6th
   Edition, Pearson Education/PHI, 2017.

REFERENCE BOOKS:

1. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, Digital Systems: Principles and Applications,10th Edition, Pearson Education.
2. Charles H. Roth Jr., Larry L. Kinney, Fundamentals of Logic Design, 6th Edition, CengageLearning.

CONTROL SYSTEMS ENGINEERING

II B.Tech I Semester (ECE)

Course Code: A253405

L	T	P	C
2	0	0	2

Pre-Requisites:

Linear Algebra and Calculus, Ordinary Differential Equations and Multivariable Calculus Laplace Transforms, Numerical Methods and Complex variables

CourseObjectives:

1. To introduce the fundamental concepts, classifications, and mathematical modeling of control systems for mechanical and electrical domains.
2. To analyze control system behaviour in time and frequency domains and stability criteria using root locus, Bode plot, Nyquist plot, etc.
3. Design and evaluate compensators and controllers to improve system performance.
4. Explain state-space representation, solution of state equations, and assess system controllability and observability.

CourseOutcomes:

Aftergoingthroughthiscoursethestudentcan

1. Describe open- and closed-loop systems, and develop mathematical models using block diagrams
and signal flow graphs.
2. Analyze the time-domain response of control systems, evaluate transient and steady-state performance, and apply PID controllers to improve system behavior..
3. Determine the stability of control system using Routh-Hurwitz Criterion and root locus technique and assess the effects of poles and zeors on system performance.
4. Analyse frequency response plots including Bode, Polar, and Nyquist plots and investigate system stability.
5. Apply the state-variable approach and analyze controllability and observability.

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	1	1	-	-	-	-	-	-	2	1
CO2	3	3	2	1	1	-	-	-	-	-	-	2	1
CO3	3	3	2	1	1	-	-	-	-	-	-	2	-
CO4	3	3	3	2	1	-	-	-	-	-	-	2	-
CO5	3	3	2	1	1	-	-	-	-	-	-	2	2

UNIT-I

Control System fundamentals: Classification of control systems, Open and Closed loop systems. Mathematical modelling of Translational and Rotational mechanical systems, Blockdiagram reduction and Signal flow graphs.

UNIT-II

Time response Analysis: Transfer function and Impulse response, types of input. Transientresponse of second order system for step input. Time domain specifications. Types of systems, staticerror coefficients, Effects of proportional derivative, proportional integral systems and PID controllers, Application of Proportional, Integral and Derivative Controllers.

UNIT–III

Stability analysis in S- Domain:

The concept of stability – Routh's stability criterion – qualitative stability & conditional stability – limitations of Routh's stability.

Root Locus technique: The root locus concept – construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT–IV

Frequency response Analysis: Frequency domain specifications, Bode plots, Gain margin and Phase Margin. Polar plot, Nyquist plot and Nyquist criterion for stability.

Compensation techniques: Types of Compensation, Introductionto phaseLag, Lead and Lead-Lag Compensators.

UNIT-V

Statespacerepresentation: Conceptofstateandstatevariables.Statemodelsoflineartime invariant systems, Derivation of State model from transfer function, Derivation of transfer function from State model, State transition matrix and it's Properties,Controllability and observability.

TEXT BOOKS:

1. I.J.NagrathandM.Gopal,ControlSystemEngineering,5ed.,NewAgePublishers,2009.
2. Nagoorkani A, Control Systems Engineering, CBS PUB & DIST,2020

REFERENCE BOOKS:

1. K.Ogata,ModernControlEngineering,2ed.,PrenticeHall,2010.
2. M.Gopal,ControlSystems:PrinciplesandDesign,TataMcGraw-Hill,1997.
3. NormanS.Nise,ControlSystemsEngineering,5ed.,JohnWiley&Sons,2007.

INNOVATION AND ENTREPRENEURSHIP

II B.Tech I Semester (ECE)
Course Code: A253005

L	T	P	C
2	0	0	2

Course Objectives:

1. To familiarize on the basic concepts of innovation, entrepreneurship and its importance.
2. To Identify and analyze the process of problem-opportunity identification, market segmentation, and idea generation techniques.
3. To initiate prototype development and understand minimum viable product.
4. To develop initial Business and financial planning and Go-to-Market strategies
5. To impart knowledge on establishing startups, venture pitching and IPR

Course Outcomes:

CO1 Understand the entrepreneurship and the entrepreneurial process and its significance in economic development.

CO2 Assess the problem from an industry perspective and generate solutions using the design thinking principles.

CO3 Assess market competition, estimate market size, and develop a prototype.

CO4 Analyze Business and financial planning models and Go-to-Market strategies.

CO5 Able to build a start-up, register IP and identify funding opportunities.

Syllabus:

UNIT – I:

Fundamentals of Innovation and Entrepreneurship Innovation: Introduction, need for innovation, Features, Types of innovations, fostering a culture of innovation, planning for innovation.

Entrepreneurship: Introduction, types of entrepreneurship attributes, mindset of entrepreneurial and intrapreneurial leadership, Role of entrepreneurs in economic development. Woman Entrepreneurship, Importance of on-campus startups, attributes and networks individuals while on campus.

Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from), Venture Activity.

UNIT – II:
Problem and Customer Identification: Identification of gap, problem, analyzing the problem from a industry perspective, market and customer segmentation, validation of customer problem fit, Iterating problem-customer fit**,** Porter's Five Force Model. Idea generation, Ideation techniques: Brainstorming, SCAMPER, Design thinking principles.
Core Teaching Tool: Several types of activities including: Class, game, Gen AI, 'Get out of the Building**'** and Venture Activity.

UNIT- III:
Opportunity assessment and Prototype development: Identify and map global competitors, review industry trends, and understand market sizing: TAM, SAM, and SOM. Understanding prototyping and Minimum Viable Product (MVP). Developing a prototype: Testing, and validation.
Core Teaching Tool: Venture Activity, Class activity

UNIT– IV:
Business & Financial Models: Introduction to Business Model and types, Business planning: components of Business plan- Sales plan, People plan and financial plan, Financial Planning: Types of costs, preparing a financial plan for profitability using a financial template, analyzing financial performance. Go-To-Market (GTM) approach,
Core Teaching Tool: Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities.

UNIT – V:
Startups and IPR: Startup requirements, building founding team members and mentors, pitch preparation, start-up registration process, funding opportunities and schemes, startup lifecycle, documentation, legal aspects in startup, venture pitching readiness, National Innovation Startup Policy (NISP) and its features. Patents, Designs, Patentability, Procedure for grants of patents. Indian Scenario of Patenting, International Scenario: International cooperation on Intellectual Property. Patent Rights, Copyright, trademark, and GI**.** Licensing and transfer of technology.
Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

TEXT BOOKS:

1. John R Bessant, Joe Tidd, Innovation and Entrepreneurship, 4E, Wiley, Latest Edition.

2. Ajay Batra, The Stratup Launch Book- A Practical Guide for Launching Customer Centric Ventures, Wiley, 2020. (For Core Teaching Tool).

REFERENCES:

1. Entrepreneurship Development and Small Business Enterprises, Poornima M Charantimath, 3E, Pearson, 2018.
2. D.F. Kuratko and T.V. Rao, Entrepreneurship: A South-Asian Perspective, Cengage Learning, 2013.
3. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition.

MODELLING & SIMULATION LAB

II B.Tech I Semester (ECE)
Course Code: A253482

L	T	P	C
0	0	2	1

Note:

- AlltheexperimentsaretobesimulatedusingMATLABorequivalent software
- Minimum of12experimentsaretobecompleted /simulated.

CourseOutcomes:

Aftergoingthroughthiscoursethestudent

1. Will be able to use a simulation tool for generating, analyzing and performing various operations on Signals / Sequences both in time and Frequency domain
2. Will be able to use a simulation tool for Analyzing and Characterizing Continuous and Discrete Time Systems both in Time and Frequency domain along with the concept of Sampling
3. Will be able to use a simulation tool for generating different Random Signals
4. Analyze their Characteristics by finding different higher order Moments and noise removal applications.
5. Will be able to use a Simulink for Control System applications

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	3	3	3	2	-	-	3	1	-	3	-
CO2	3	2	3	3	3	2	-	-	3	1	-	3	-
CO3	3	2	3	3	3	2	-	-	3	1	-	3	-
CO4	3	2	3	3	3	2	-	-	3	1	-	3	-
CO5	3	2	3	3	3	2	-	-	3	1	-	3	-

Listof Experiments:

SignalsandSystems(Minimum7Experiments)

1. Write the code / script for generating various standard viz: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.

2. Perform different operations viz: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power on them.
3. Write the code / script for finding the Even and Odd parts of Signal / Sequence and Real and Imaginary parts of Signal.
4. Write the code / script for finding the output of a System for a given input and Impulse Response.
5. Write the code / script for finding Auto Correlation and Cross Correlation of Signals / sequences
6. Write the code / script for Verifying whether a given Continuous/Discrete System is Linear, Time Invariant.
7. Write the code / script for obtaining Sinusoidal response and Impulse response of a given Continuous / Discrete LTI System.
   a) PlottheRealandImaginarypartand
   b) MagnitudeandPhasePlotoftheresponse
8. Write the code / script for finding and plotting theMagnitude and Phase Spectrum of anygiven Signal by finding its Fourier Transform.
9. Write the code / script for finding and plotting theMagnitude and Phase Spectrum of anygiven Signal by finding its Laplace Transform. Also plot pole-zero diagram in S-plane.
10. Write the code/ script for finding and plotting the Magnitude and Phase Spectrum of anygiven Sequence byfinding its Z-Transform. Alsoplot pole — zero diagram in Z-plane.
11. GibbsPhenomenon.

ProbabilityTheoryandStochasticProcesses(Any 3Experiments)

12. Writethecode/scriptforgeneratingGaussiannoiseandforfindingitsmean,Skewness, Kurtosis, PDF and PSD.
13. Write the code / script for Verifying Sampling theorem for different sampling rates, Sampling types and Duty Cycles and for plotting the sampled and reconstructed Signals.
14. Writethecode /scriptforRemovalof noisefromthesignalusingCross correlation.
15. Writethecode/scriptforExtractionofPeriodicSignalmaskedbynoise usingAuto Correlation

ControlSystems(Minimum 2 Experiments)

16. Build and Simulate a DC Motor using Simulink
17. ImplementationofaPIDControllerfromequationsusingSimulink
18. ControllabilityandObservability

Application on Real Time signals

1. Application of Autocorrelation: GPS Synchronization Satellite communication toolbox is required for this experiment.
   Generate the GPS signal. Visualize the GPS signal. Plot of autocorrelation of C/A code andvisualize the spectrum of GPS signals. For exact steps, go through the following

page:https://www.mathworks.com/help/satcom/ug/gps-waveform-generation.html

2. Sampling of Speech SignalsRecord and play speech in MATLAB. For steps, go through the following page:
https://in.mathworks.com/help/matlab/import_export/record-and-play-audio.html
Change the sampling rate of the recorded speech signal and play back to see the effect ofaliasing. For steps, go through the following page:
https://in.mathworks.com/help/signal/ug/changing-signal-sample-rate.html

ELECTRONICDEVICESANDCIRCUITSLAB
(Common for ECE & EEE)

II B.Tech I Semester
Course Code: A253481

L	T	P	C
0	0	2	1

Note:

- Minimum of12experimentsaretobecompleted.

Course Overview:

This laboratory course aims to provide hands-on experience and simulation-based learning ofsemiconductor devices and basic electronic circuits. Students will analyze the characteristics andapplications of diodes, BJTs, and FETs, design rectifiers and amplifiers, and simulate modernelectronic circuits using software tools. The course bridges theoretical concepts with practicalimplementation, developing foundational skills essential for analog electronics and circuit analysis.

CourseOutcomes:

After completing this course, students will be able to:

1. AnalyzetheV–Icharacteristicsofsemiconductordevicessuch asdiodes,BJTs, andFETs.
2. Designandevaluatebasicrectifiercircuits.
3. Demonstratebiasing techniques for BJT and determinetheiroperatingpointusing DC load line analysis.
4. Designandanalyzetransistoramplifiercircuitsinvariousconfigurationsusingsmall signal models.
5. Simulateandinterpretelectroniccircuitsusingappropriatesimulationtools.

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	-
CO2	3	3	3	2	1	1	-	-	-	-	-	2	-
CO3	3	3	2	2	1	-	-	-	-	-	-	2	-
CO4	3	3	3	2	1	-	-	-	-	-	1	3	-
CO5	2	2	2	3	3	-	-	-	-	-	2	2	-

Listof Experiments:

A. Hardware-BasedExperiments(7):

1. Plot theV–IcharacteristicsofaPNjunctiondiodeinforwardandreversebiastodetermine cut-in voltage and dynamic resistance.
2. Plot the V–I characteristics of a Zener in forward and reverse bias to determine cut-in voltage and break down voltage.
3. Implement clipper and clamper circuits to observe waveform shaping through positive, negative, and biased configurations.
4. Design and analyze half-wave with and without capacitor filters to evaluate ripple factor and output voltage.
5. Design and analyze full-wave rectifiers (center-tap) with and without capacitor filters to evaluate ripple factor and output voltage.
6. Plot the input and output characteristics of a BJT in common emitter configuration to determine the value of h parameters.
7. Design and test voltage divider bias circuit to establish a stable operating point for a BJT amplifier and draw the DC load line behavior.

B.Software-BasedSimulationExperiments(7):

1. Simulateafull-wavebridgerectifierwithcapacitorfiltertoanalyzewaveformsmoothingand ripple reduction in DC power supply design.
2. Simulate a Zener diode-based voltage regulator to study voltage stabilization against varying supply voltages and load resistances.
3. Simulate the output and transfer characteristics of a JFET to determine parameters such as pinch-off voltage, drain resistance, and transconductance.
4. Simulate a common emitter amplifier to analyze the effect on voltage gain and signal amplification.
5. Simulate a common source amplifier to analyze the effect on voltage gain and signal amplification.
6. SimulateBJToperationasaswitchandsmall-signalamplifiertounderstanditsdual functionality in digital and analog applications.
7. Designand simulateaCMOSinvertertostudydigital switching behavior and low-power logic design.

Hardware Requirements:

1. Regulated DC Power Supply (0-30 V)
2. Function Generators
3. Digital Multimeter
4. Cathode Ray oscilloscope or DSO
5. Breadboards and connecting wires
6. Resistors, Capacitors Diodes
7. BJTs, JFETs, and MOSFETS
8. Trainer kits (optional)

Software Requirements (any one of the listed tools or equivalent)

1. LTSpice (Free from Analog Devices)

2. NI Multisim (Academic License or Student version)
3. Proteus Design Suite (Simulation and PCB design)
4. TINA-TI (Free from Texas Instruments)
5. PSICE for TI or OrCAD Lite
6. Windows PC

DIGITAL LOGIC DESIGN LAB

II B.Tech I Semester (ECE)
Course Code: A253483

L	T	P	C
0	0	2	1

Note:

- Minimum of12experimentsaretobecompleted.

Course Overview:

This laboratory course provides hands-on experience with the design, analysis, and simulation of digital circuits. Students begin by constructing and testing basic digital components using logic gate ICs, covering Boolean minimization, arithmetic circuits, code converters, and combinational building blocks. The second part focuses on implementing equivalent and advanced designs using Verilog HDL, exploring various modeling styles—dataflow, behavioral, and structural—along with simulation tools. The course emphasizes both foundational logic principles and modern digital system development practices.

CourseOutcomes:

After completing this course, students will be able to

1. Analyze and simplify Boolean expressions and implement them using logic gates and ICs.
2. Design and realize combinational and sequential logic circuits using logic gate hardware.
3. Model digital systems in Verilog HDL using dataflow, behavioral, and structural styles.
4. Simulate and verify digital designs using industry-standard EDA tools and test benches.
5. Build modular and hierarchical designs such as counters, FSMs, and shift registers.

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	2	-	-	-	-	-	1	3	1
CO2	3	3	3	2	2	-	-	-	-	-	1	3	1
CO3	3	3	3	2	3	-	-	-	-	-	2	3	2
CO4	2	2	2	3	3	-	-	-	-	-	2	2	3
CO5	3	3	3	2	3	-	-	-	-	-	2	2	3

Listof Experiments:

A. Realization in Hardware Laboratory (Using Logic ICs)

These are fundamental hands-on experiments conducted using logic ICs such as AND, OR, NOT, NAND, NOR, XOR gates, flip-flops, multiplexers, and decoders.

1. Realize and minimize Boolean functions using basic gates and universal gates

(NAND/NOR) in SOP/POS form.

2. Design and implement Half Adder, Full Adder, Half Subtractor, and Full Subtractor using logic gates.
3. Construct and analyze basic logic gates (AND, OR, NOT, XOR, XNOR) using only NAND and NOR gates.
4. Design and implement parity bit generators (even and odd) and a 4-input majority logic circuit.
5. Design and implement code converters such as Binary to Gray, Gray to Binary, and BCD to Excess-3 using gates.
6. Design and implement simple combinational circuits: 2-to-1 multiplexer, 1-bit comparator, and 7-segment decoder logic.

B. VerilogHDL-Based Digital Design Experiments(Simulation-Based)

These experiments are implemented using **Verilog HDL** with different modeling styles (dataflow, behavioral, structural) and simulated using tools like **Vivado, ModelSim, or Xilinx ISE**.

1. Design and simulate a 2-bit comparator using data flow modeling; extend it to 4-bit using structural modeling.
2. Implement a 2:1 multiplexer using data flow modeling and design an 8:1 multiplexer using structural modeling.
3. Design a 2-to-4 decoder using data flow modeling and realize a 3-to-8 decoder using structural modeling.
4. Implement a given Boolean function using a decoder-based approach in behavioral modeling.
5. Design and simulate a universal n-bit shift register(left, right, hold, parallel load)using behavioural modeling.
6. Design a synchronous MOD-n counter using behavioural modeling with D or JK flip-flops.
7. Design and simulate an asynchronous (ripple) counter for a custom sequence using structural modeling.
8. Implement a sequence detector for a given binary pattern using FSM(Moore/Mealy)in behavioural modeling.

Required Hardware (for Hardware Lab Experiments)

Component	**Description**
Digital Trainer Kit	Breadboard with power supply and clock generator
Logic ICs	7400 (NAND), 7402 (NOR), 7408 (AND), 7432 (OR), 7486 (XOR), 7404 (NOT), etc.
Flip-Flop ICs	7474 (D Flip-Flop), 7476 (JK Flip-Flop)
MUX/Decoder ICs	74153, 74138, 74139

LEDs, switches, connecting wires	For I/O interface and testing

Required Software Tools (for Verilog HDL Experiments) (Any one of the tools given below)

Software	**Purpose**
Xilinx Vivado	HDL simulation and synthesis (preferred tool)
ModelSim	Verilog simulation and waveform analysis
Xilinx ISE	Legacy support for simulation and FPGA design

LINUX AND SHELL SCRIPTING

II B.Tech I Semester (ECE)
Course Code: A253581

L	T	P	C
0	0	2	1

Course Outcomes:
At the end of the course, student will be able to:

1. Understand Linux system structure, OS architecture, and command-line environment.
2. Perform Linux installation and basic administration including file, user, and permission management.
3. Develop shell scripts to automate tasks such as backups, monitoring, and data processing.
4. Use Linux tools for software management, networking, and service configuration.
5. Implement backup, recovery, and basic troubleshooting techniques through practical labs.

List of Experiments:
Week 1: Introduction to OS Concepts
Lab Activity: Linux History, Opensource software basics & Licenses, Why Linux vs windows Identify system and application software on your PC. Differentiate their roles and explain basic OS functions.

Week 2: Linux Architecture & Kernel Types
Lab Activity: Compare Monolithic and Microkernel architectures using diagrams. Discuss how Linux's structure supports device-level control.
Week 3: Installing Linux (Ubuntu/CentOS)
Lab Activity: Install Linux using VirtualBox or WSL. Document each installation step and troubleshoot any permission or hardware issues.

Week 4: Linux Filesystem& Navigation
Lab Activity: Navigate key directories like /home, /etc, and /var. Create folder structures for a team project.

Week 5: File Permissions & Ownership
Lab Activity: Set permissions on project folders so only group members can access/edit them. Verify permissions using multiple users.

Week 6: User and Group Management
Lab Activity: Create users and groups for a coding team. Set up shared access using group permissions and configure hidden config files.

Week 7: Process Management Lab Activity: Identify and terminate frozen or unresponsive processes during compilation using commands like ps and top.

Week 8: Process Priorities & Memory Tools
Lab Activity: Adjust priority of background jobs using nice and monitor system memory usage with vmstat and free. Display information about the processes using top and kill the applications/processes with the task id

Week 9: Shell Scripting Basics
Use Case: System Info Script for Lab Login
Lab Activity: Create a shell script that automatically displays system uptime, current date/time, available disk space, and active users each time a lab user logs in. Use variables and echo statements to present the information in a readable format.

Week 10: Loops, Functions, and Cron Jobs
Use Case: Automated Backup Scheduler for Project Folders
Lab Activity: Write a shell script that loops through all user folders in /home and backs them up to a predefined backup location. Add functions for logging success/failure. Schedule it to run daily at 2 AM using cron. Handle missing folders gracefully.

Week 11: Text Processing & Networking Utilities
Use Case: Security Log Analysis & Network Check After Intrusion Alert
Lab Activity: Analyze /var/log/auth.log or/var/log/secure to detect failed login attempts using grep, awk, cut, and sort. Use ping, trace route, net stat, nbt stat, arp and scp to check remote system connectivity and transfer reports securely.
Concepts of Linux clusters, Virtual machines (virtual box in chapter 3), creating VMs, allocating resources, interconnection between VMs, Containers concepts

Week 12: Service Management & Disk Mounting
Use Case: Adding Extra Storage Without Reboot
Lab Activity: Create a new virtual disk in Virtual Box. Partition and format it. Mount it to /mnt/data and ensure it auto-mounts on reboot. Enable a required service (like ssh or apache2) using system ctl and check its status.

Week 13: Backup & Recovery
Use Case: Disaster Recovery After Accidental Deletion
Lab Activity: Use a backup script to create a backup of critical folders. Simulate file deletion and restore them using your backup. Analyze /var/log/sys log or equivalent to trace user activity that led to the issue.

Week 14: Mini Project – Tool Development
Use Case: Custom Shell Tool for New Employee On boarding or Admin Task
Lab Activity: Develop a complete shell-based tool. Examples:
A user account creation wizard for new employees
A disk usage monitoring alert system
A log cleaner tool that archives and clears logs weekly
Include user prompts, help menu, error checks, and logging features

Final Demo & Viva

ENVIRONMENTAL SCIENCE
(Common to all branches)

II B.Tech I Semester
Course Code: A253105

L	T	P	C
1	0	0	1

CourseObjectives: Thiscourseisexpectedtoenablethestudent:

- Describeecosystemcomponents,functions,andtheirsocietalrelevance.
- Explainnaturalresourceclassification,management,andchallenges.
- Analyzepollutiontypes,impacts,andcontrolmeasures.
- Evaluateglobalenvironmentalissues,policies, andEIA's roleinsustainability.

Course Outcomes: After completion of the course, the student will be able to:

CO1: Describeecosystemstructure,functions,andbiodiversityconservation.
CO2: Analyze natural resource management and alternative energy options.
CO3: Evaluate biodiversity threats and conservation frameworks.
CO4: Identifypollutionsources,impacts,andcontroltechnologies.
CO5: ApplyenvironmentalpoliciesandEIAfor sustainablemanagement.

UNIT-I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, andfunction of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Bioaccumulation, Bio magnification, ecosystem value, services andcarrying capacity

UNIT-II

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

UNIT-III

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

UNIT-IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Pollution control technologies; Overview of air pollution control technologies, Concepts of bioremediation. Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletionand Ozone depleting substances (ODS). Deforestation and desertification.

UNIT-V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handlingrules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). Contemporary Environmental Issues, Climate change; Sustainable development goals (SDGs); Global environmental challenges; Environmental policies and international agreements.

TEXT BOOKS:

1. Anjaneyulu,Y.,IntroductiontoEnvironmentalScience,BSPublications,2ndEdition,2017.
2. Bharucha,E.,TextbookofEnvironmentalStudiesforUndergraduateCourses,University Grants Commission, 3rd Edition, 2021.
3. Rajagopalan,R., Environmental Studies, OxfordUniversityPress, 3rdEdition, 2023.

REFERENCEBOOKS:

1. Wright, R. T., Environmental Science: Towards a Sustainable Future, PHI Learning Pvt.Ltd., Revised Edition, 2008.
2. Masters, G. M., &Ela, W. P., Environmental Engineering and Science, PHI Learning Pvt. Ltd., 1st Edition, 2008.
3. Botkin, D. B., & Keller, E. A., Environmental Science: Earth as a Living Planet, Wiley India, 8th Edition, 2012.
4. Kaushik, A., &Kaushik, C. P., Perspectives in Environmental Studies, New Age International Publishers, 7th Edition, 2021.
5. Reddy, M.A.,TextbookofEnvironmentalScienceandTechnology,BSPublications, 2nd Edition, 2007.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/109105203

NUMERICAL METHODS & COMPLEX VARIABLES

II B.TechII Semester (ECE)
Course Code: A254002

L	T	P	C
3	0	0	3

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

Objectives: To learn

- Various numerical methods to find roots of polynomial and transcendental equations.
- 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 of first order 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 course the students must be able to:

CO1: Apply the Knowledge to find the root of a given polynomial and transcendental equations.
CO2: Estimate the value for the given data using interpolation
CO3: Solve the given first order ODE's using Numerical Techniques
CO4: Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems
CO5: Expand the complex functions using Taylor's and Laurent's series expansions.

Syllabus:

UNIT-I: Numerical Methods-I: (Algebraic and Transcendental Equations)

Solution of polynomial and transcendental equations: Bisection method, Iteration Method, Newton- Raphson method and Regula-Falsi method. Jacobi and Gauss-Seidal iteration methods for solving linear systems of equations.

UNIT-II: Numerical Methods-II (Interpolation&Numerical Integration)

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.

Numerical integration: Trapezoidal ruleandSimpson's1/3rdand3/8thrules.

UNIT-III: Numerical Methods-III (Solutions of Initial Value Problems)

Solutions of Ordinary differential equations: Taylor's series, Picard's method, Euler and modified Euler's methods, Runge-Kutta method of second and fourth order for first order

UNIT-IV:Complex Analysis-I(Function of Complex Variables and Differentiation)

Introduction, Complex functions - limits and Continuity-Differentiability, Analytic functions and Properties, Cauchy-Riemann Equations (Cartesian and Polar), Harmonic functions, Construction of analytic functions.(All theorems without Proofs).

UNIT-V: Complex Integration:

Introduction, Complex integration-Line integral, Cauchy's integral theorem, Cauchy's integral formula, Generalized Cauchy's integral formula, Power series: Taylor's series, Laurent series, Singular points, Types of Singularities, Residue, Cauchy's Residue theorem.(All theorems without Proofs)

Textbooks:

1. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers.
2. Introductory methods of numerical analysis 2005. byS. S. Sastry, , PHI, 4th Edition.

Reference Books:

1. Advanced Engineering Mathematics : Kreyszig, John Wiley & sons
2. Numerical methods for Scientific and Engineering Computations, by M. K. Jain, S. R. K. Iyengar, R. K. Jain, New Age International publishers.
3. Functions of Complex Variables by J.N.Sharma, Krishna Prakashan Media.

ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES

II B.TechII Semester (ECE)
Course Code: A254402

L	T	P	C
3	0	0	3

Pre-requisite: Mathematics

CourseObjectives:

1. To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields and Magneto static Fields and apply them to solve engineering problems.
2. To distinguish between static and time-varying fields and understand the significance and utilityof Maxwell's Equations andBoundaryConditions, and gainabilityto provide solutions to communication engineering problems.
3. To analyze the characteristics of Uniform Plane Waves (UPW), determine their propagation parameters and estimate the same for dielectric and dissipative media.
4. To analyze the propagation of waves in transmission line and able to solve transmission line problem using Smith Chart.

CourseOutcomes:

Aftergoingthroughthiscoursethestudentwill be able to

1. Apply electrostatic principles to analyze electric fields, potentials for various charge distributions and boundary conditions.
2. Analyzemagneto static fields and forces using Biot–Savart's law, Ampere's law and magnetic potentials for steady current systems.
3. Apply Maxwell's equations to analyze time-varying electromagnetic fields and evaluate electric and magnetic boundary conditions at material interfaces
4. Analyze electromagnetic wave propagation and reflection–refraction characteristics in conductingand dielectric media
5. Evaluate and compare transmission line performance, reflections, and impedance matchingtechniques using analytical methods and Smith Chart.

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-		-	-	-	-	-	-	2	-
CO2	3	2	-	-		-	-	-	-	-	-	2	-
CO3	3	3	-	-		-	-	-	-	-	-	3	-
CO4	3	3	-	-		-	-	-	-	-	-	3	-
CO5	3	3	2	-	3	-	-	-	-	-	-	3	2

UNITI–Electrostatics

Coulomb'sLaw,ElectricFieldIntensity—Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and its applications, Electric Potential,RelationbetweenEandV,Maxwell'sEquationsforElectrostaticFields,EnergyDensity, ConvectionandConductionCurrents,DielectricConstant,IsotropicandHomogeneousDielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitors–

Parallel Plate, Coaxial, Spherical.

UNITII-Magnetostatics

Biot-Savart's Law, Ampere's Circuit Law and its applications, Magnetic Flux Density, Maxwell's equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law.

UNITIII-Maxwell'sEquations(TimeVaryingFields)

Faraday's Law, Transformer and Motional EMF, Inconsistency in Ampere's Law and Displacement Current Density, Maxwell's Equations in Differential, Integral and Phasor form.
Electric and magnetic Boundary Conditions (Dielectric – Dielectric, Conductor– Dielectric, Conductor– Free Space interfaces).

UNITIV-EM WaveCharacteristics

WaveEquationsforConductingandPerfectDielectricMedia,UniformPlaneWaves–Definitions, Relation between E&H, Wave Propagation in Lossless and Conducting Media, Conductors &Dielectrics — Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Skin Depth, Surface Impedance, Wave Polarization. Poynting Vector and Poynting Theorem.

UNITVTransmissionLines

Types, Parameters, Equivalent Circuit, Transmission Line Equations, Primary & SecondaryConstants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless Lines, Types of Distortions, condition for Distortion less transmission lines, Minimum Attenuation, Loading —Types of Loading, Input Impedance, SC and OC Lines, Reflection Coefficient, VSWR, Impedance Transformations - $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines, Smith Chart- Configuration and Applications.

TEXT BOOKS:

1. PrinciplesofElectromagnetics–MatthewN.O.SadikuandS.V.Kulkarni,6thEd.,OxfordUniversity Press, Asian Edition, 2015.
2. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck,8thEd., McGraw Hill, 2014

REFERENCE BOOKS:

1. ElectromagneticWavesandRadiatingSystems–E.C.JordanandK.G.Balmain,2nd Ed., PHI, 2000.
2. EngineeringElectromagnetics—Nathan Ida,2ndEd.,Springer(India)Pvt.Ltd.,New Delhi,2005.
3. ElectromagneticFieldTheoryFundamentals–BhagSinghGuruandHuseyinR.Hiziroglu, Cambridge University Press, 2ndEd., 2006

ANALOG AND DIGITAL COMMUNICATIONS

II B.TechII Semester (ECE)

L	T	P	C
3	0	0	3

Course Code: A254403

Pre-requisite: Signals and Systems

CourseObjectives:

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

CourseOutcomes:

Aftergoingthroughthiscoursethestudentwill be able to

1. Analyse AM, DSB-SC, SSB, FM and PM techniques and explain their generation and detection in time and frequency domains.
2. Explain the operation and performance of AM/FM transmitters and receivers, including superheterodyne and FM systems under noise.
3. Apply pulse modulation, detection and baseband shaping concepts to analyze signal detection in noise and intersymbol interference.
4. Analyse digital modulation schemes and evaluate their bandwidth efficiency, power spectra and noise performance.
5. Apply information theory to evaluate channel capacity and design efficient source and channel coding schemes.

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	1	1	–	–	–	–	–	–	2	1
CO2	3	2	1	2	1	–	–	–	–	–	–	1	1
CO3	3	3	2	2	2	–	–	–	–	1	–	3	1
CO4	3	3	3	2	2	–	–	–	–	–	–	3	2
CO5	3	3	2	1	1	–	–	–	–	–	–	2	1

UNIT – I

Amplitude Modulation

Need for modulation, amplitude modulation: time and frequency domain description, generation using switching modulator, detection using envelope detector, DSB-SC modulation: generation using balanced modulator, detection using synchronous detector, COSTAS loop, SSB modulation: time and frequency domain description, generation using phase discrimination method and demodulation using coherent detection, vestigial sideband modulation and demodulation.

Angle Modulation

Basic concepts of phase modulation, frequency modulation: single-tone frequency modulation, spectrum analysis, Carson's rule, generation of FM waves using Armstrong method, detection of FM waves using phase-locked loop, comparison of FM and AM.

UNIT – II

Transmitters & Receivers

Classification of transmitters, AM transmitters, FM transmitters, AM receiver – superheterodyne receiver, FM receivers, stereo FM multiplex reception, comparison of AM and FM receivers, noise analysis in AM, DSB, SSB and FM modulation systems, threshold effect in angle modulation systems, pre-emphasis and de-emphasis.

UNIT – III

Pulse Modulation

Pulse modulation techniques including PAM, PWM and PPM, and a comparison of FDM and TDM.

Detection and Estimation

Detection of signals in noise, probability of error, optimum coherent receivers including matched filter and correlation receivers and detection of signals with unknown phase.

Baseband Shaping for Data Transmission

Line encoding requirements, unipolar, polar and bipolar line coding, discrete PAM signalling, inter symbol interference, Nyquist criterion, Duobinary signalling, and eye pattern.

UNIT – IV

Digital Modulation Techniques

PCM generation and reconstruction, quantization noise, non-uniform quantization and companding, DPCM, DM and adaptive DM, noise in PCM and DM systems.

Digital modulation formats: coherent binary modulation techniques (BPSK, BFSK), coherent quadrature modulation techniques (QPSK), non-coherent binary modulation techniques (BFSK, DPSK), QAM, M-ary modulation techniques (PSK, FSK, QAM), comparison of M-ary digital modulation techniques, power spectra, bandwidth efficiency, and constellation diagrams.

UNIT – V

Information Theory and Coding

Entropy, information rate, mutual information, channel capacity of discrete channels, Shannon–Hartley law, trade-off between bandwidth and SNR.

Source coding: Huffman coding, Shannon–Fano coding; channel coding: linear block codes and cyclic codes.

TEXT BOOKS

1. Electronics Communication Systems – Fundamentals through Advanced, Wayne Tomasi, PHI, 2009
2. Digital and Analog Communication System – K. Sam Shanmugam, Wiley, 2019
3. Principles of Communication Systems – Herbert Taub, Donald L. Schilling, GoutamSaha, McGraw-Hill, 2008

REFERENCES

1. Electronic Communications – Dennis Roddy and John Coolen, PEA, 2004
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH, 2004
3. Communication System – Simon Haykin and Michael Moher, Wiley, 5th Edition

ELECTRONIC CIRCUIT ANALYSIS

II B.TechII Semester (ECE)
Course Code: A254404

L	T	P	C
3	0	0	3

CourseOverview:

The Electronic Circuit Analysis course provides foundational and advanced knowledge in the design and analysis of analog electronic circuits. This includes the study of multistage amplifiers, feedback amplifiers, oscillators, power amplifiers, and multivibrators. Emphasis is placed on frequency response, feedback theory, transistor behavior at high frequencies, and waveform generation techniques. The course equips students with the necessary analytical and practical skills required in analog circuit design and communication systems.

CourseOutcomes:

Aftergoingthroughthiscoursethestudentwill be able to

1. Analyze and classify multistage amplifier configurations also apply the hybrid-π transistor model to evaluate high-frequency behavior of common-emitter amplifiers.
2. Examine feedback amplifier types and assess the influence of negative feedback on gain stability, bandwidth, and distortion.
3. DesignandanalyzeLC,RC,andcrystaloscillatorsbasedontheBarkhausencriterionto generate sinusoidal waveforms
4. Design and evaluate the performance analyze of power amplifiers and tuned amplifiers
5. Design and generate output waveforms of multivibrator circuits.

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	1	1	0	0	0	0	0	3	1
CO2	3	3	3	2	2	0	0	0	0	0	1	3	1
CO3	3	3	3	2	2	1	0	0	0	0	1	3	2
CO4	3	3	3	2	2	0	0	0	0	0	1	2	3
CO5	3	3	3	2	2	1	0	0	0	0	1	2	2

UNIT-I:

Multistage Amplifiers: Classification of Amplifiers, Distortion in Amplifiers, Coupling schemes: RC, Transformer, Direct coupling, Frequency response of multistage amplifiers, Transistor configuration choice in cascade amplifier, Cascode amplifier and Darlington pair amplifier.

High-Frequency Transistor Model: Hybrid-π model, Hybrid-π parameters: Conductances and capacitances, CE short-circuit current gain, Gain-bandwidth product

UNIT-II:

Feedback Amplifiers: Concept and need for feedback in amplifiers, Types and classification of feedback amplifiers, Characteristics of negative feedback: Gain stability, bandwidth, noise, distortion, Voltage series, Voltage shunt, Current series, Current shunt configurations.

UNIT-III:

Oscillators: Principle of positive feedback, Barkhausen Criterion for oscillations, LC Oscillators: Generalized analysis, Hartley,Colpitts,RC Oscillators: RC phaseshift,Wienbridge, Crystaloscillator: Working and advantages

UNIT-IV:

Power Amplifiers: Classification: Class A, B, AB, C, Series-fed Class A amplifier, Transformer- coupled Class A amplifier, Class B amplifier: Push-pull, Complementary symmetry, Efficiency calculations and Crossover distortion.

Tuned Amplifiers: Introduction, single Tuned capacitive coupled Amplifier – Q factor, frequency response, Concept of stagger tuning amplifier.

UNIT-V:

Multivibrators: Analysis and design of Bistable, Monostable and Astablemultivibrators and Schmitt Trigger using transistors.

TimeBaseGenerators:Generalfeaturesofatimebasesignal,methodsofgeneratingtimebase waveform, Miller and Bootstrap time base generators, Linearity improvement techniques

TEXTBOOKS:

1. Millman,Jacob,andChristosC.Halkias.ElectronicDevicesandCircuits.McGraw-HillEducation, 2008.
2. Bell,DavidA.ElectronicDevicesandCircuits.OxfordUniversityPress,2008.
3. Sedra,AdelS.,andKennethC.Smith.MicroelectronicCircuits.7thed.,OxfordUniversity Press, 2015.

REFERENCEBOOKS:

1. Boylestad, Robert L., and Louis Nashelsky. Electronic Devices and Circuit Theory. 11th ed., Pearson Education, 2013.
2. Millman,Jacob,andArvinGrabel.Microelectronics.2nded.,McGraw-Hill,1987.
3. Malvino,AlbertPaul.ElectronicPrinciples.7thed.,McGraw-HillEducation,2007.
4. Millman,Jacob,andHerbertTaub.Pulse,Digital,andSwitchingWaveforms.McGraw-Hill Education, 1991.

LINEAR AND DIGITAL IC APPLICATIONS

II B.TechII Semester (ECE)
Course Code: A254405

L	T	P	C
3	0	0	3

CourseObjectives: Themainobjectivesofthecourseare:

1. Tointroducethebasicbuildingblocksoflinearintegratedcircuits.
2. TointroducethetheoryandapplicationsofanalogmultipliersandPLL.
3. TointroducetheconceptsofwaveformgenerationandintroducesomespecialfunctionICs.
4. Tounderstandandimplementtheworkingofbasicdigitalcircuits.

CourseOutcomes:

Aftergoingthroughthiscoursethestudentwill be able to

1. Explain the characteristics and functioning of ideal and practical operational amplifiers and analyze op-amp–based circuits and voltage regulators for analog applications.
2. Analyze and design active filter circuits, waveform generators using operational amplifiers, IC 555timer, and IC 565 PLL for signal processing applications.
3. AcquiretheknowledgeanddesigntheDataconverters.
4. Apply TTL 74XX and CMOS 40XX series ICs to analyze and implement combinational logic circuits.
5. Apply 74XX series ICs to analyze and implement sequential logic circuits

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	1	-	-	-	1	-	-	-	3	2
CO2	3	3	3	1	-	-	-	1	-	-	-	3	2
CO3	3	3	3	1	-	-	-	1	-	-	-	3	2
CO4	3	3	3	2	-	-	-	1	-	-	-	3	3
CO5	3	3	3	2	-	-	-	1	-	-	-	3	3

UNIT-I

OperationalAmplifier

Introduction to IC’s-advantages, Ideal and Practical Op-Amp Characteristics, Features of 741 Op- Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Sample & hold Circuit, Differentiators and Integrators, Comparators, Schmitt Trigger, Voltage Regulators- Three Terminal Voltage Regulators, Features of IC 723.

UNIT-II

Op-Amp,IC-555&IC565Applications

Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators — Triangular, Sawtooth, SquareWave. IC555 Timer - FunctionalDiagram,Monostableand AstableOperations, Applications, IC565 PLL - Block Schematic, principle and Applications.

UNIT-III

DataConverters

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

CombinationalLogicICs

Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters-Binary to Gray, Gray to Binary, BCD to Excess-3, Decoders, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Parity Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT-V

SequentialLogicIC's

Familiaritywithcommonlyavailable74XX&CMOS40XXSeriesICs–AllTypesofFlip-flops, Synchronous Counters, Decade Counters, Shift Registers and Types.

TEXTBOOKS

1. Op-Amps&LinearICs–RamakanthA.Gayakwad,PHI,2003.
2. DigitalFundamentals–Floyd andJain,PearsonEducation,8thEd.,2005.

REFERENCEBOOKS

1. LinearIntegratedCircuits–D.RoyChowdhury,NewAgeInternational(p)Ltd,2ndEd., 2003.
2. DigitalDesignPrinciplesand Practices–John.F.Wakerly,Pearson3rdEd.,2009.
3. LinearIntegratedCircuitsandApplications–Salivahana,TMH, 2008.
4. OperationalAmplifierswithLinearIntegratedCircuits,4thEd.,WilliamD.Stanley, Pearson Education India, 2009.

COMPUTATIONAL MATHEMATICS LAB
(Common forAll Branches)

II B.TechII Semester (ECE)
Course Code: A254081

L	T	P	C
0	0	2	1

CourseObjectives: Tolearn

1. SolveproblemsofEigenvaluesandEigenVectorsusingPython/MATLAB.
2. SolutionofAlgebraicandTranscendentalEquationsusingPython/MATLAB
3. SolveproblemsofLinearsystemofequations
4. Solve problems of First-Order ODEs Higher order linear differential equations with constantcoefficients

Course Outcomes: Afterlearningthecontentsofthispaperthestudentmustbeable to

1. DevelopthecodetofindtheEigenvaluesandEigenVectorsusingPython/MATLAB.
2. Develop the code find solution of Algebraic and Transcendental Equations and Linear system of equations using Python/MATLAB
3. WritethecodetosolveproblemsofFirst-OrderODEsHigherorderlineardifferentialequations with constant coefficients

Syllabus:

*__Visualizeallsolutionsgraphicallythroughprogrammes__

UNIT-I:EigenvaluesandEigenvectors: **6P**

Programs:

- FindingrealandcomplexEigenvalues.
- FindingEigenvectors.

UNIT-II:SolutionofAlgebraicandTranscendentalEquations **6P**

Bisection method,NewtonRaphsonMethod

Programs:

- RootofagivenequationusingBisectionmethod.
- RootofagivenequationNewtonRaphsonMethod.

UNIT-III:Linearsystemofequations: **6P**

Jacobi'siterationmethodandGauss-Seidaliterationmethod

Programs:

- SolutionofgivensystemoflinearequationsusingJacobi'smethod
- SolutionofgivensystemoflinearequationsusingGauss-Seidalmethod

UNIT-IV:First-OrderODEs **8P**

Exactandnon-exactequations,Applications:exponentialgrowth/decay,Newton'slawofcooling.

Programs:

- Solvingexactandnon-exactequations
- Solving exponential growth/decayandNewton'slawofcoolingproblems

UNIT-V: Higher order linear differential equations with constant coefficients **6P**

Programs:

- SolvinghomogeneousODEs
- Solvingnon-homogeneousODEs

TEXTBOOKS:

1. MATLABanditsApplicationsinEngineering,RajkumarBasal,AshokKumarGeo,ManojKumar Sharma, Pearson publication.
2. KennethA.Lambert,ThefundamentalsofPython:FirstPrograms,2011,CengageLearnings.
3. ThinkPythonFirstEdition,byAllenB.Downey,Oriellypublishing.
4. IntroductiontoPythonProgramming,William Mitchell,PovelSolin,MartinNovaketal.,NCLab Public Computing, 2012.
5. IntroductiontoPythonProgramming,©JacobFredslund,2007.

REFERENCEBOOKS:

1. AnIntroductiontoPython,JohnC.Lusth,TheUniversityofAlabama,2011.
2. IntroductiontoPython,©DaveKuhlman,2008.

ANALOG AND DIGITAL COMMUNICATIONS LAB

II B.TechII Semester (ECE)

L	T	P	C
0	0	2	1

Course Code: A254483

Note:

- Minimum12experimentsshouldbeconducted.
- All these experiments are to be simulated either using MATLAB, Commsim or any other simulation package.

CourseOutcomes:

Aftergoingthroughthiscoursethestudentwill be able to

1. Apply analog communication principles to generate, demodulate, and analyze AM, FM, DSB-SC, and SSB-SC signals in time and frequency domains.
2. Implement and analyze multiplexing and sampling techniques, including FDM and sampling theorem verification, using practical observations.
3. Design and realize pulse modulation systems (PAM, PWM, PPM, PCM, and Delta modulation) using hardware and simulation tools.
4. Generate and evaluate digital modulation schemes (FSK, BPSK, DPSK, QPSK) and analyze constellation diagrams under noise.
5. Analyze advanced digital communication concepts such as ISI, eye diagrams, pulse shaping, source coding, and matched filter performance.

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	-	3	1	2	2	-	2	3	2	-	3	2
CO2	1	-	3	1	2	2	-	2	3	2	-	3	2
CO3	1	-	3	1	2	2	-	2	3	2	-	2	1
CO4	1	-	3	1	2	2	-	2	3	2	-	3	2
CO5	1	-	3	1	2	2	-	2	3	2	-	3	2

Listof Experiments:

1. Generate Amplitude modulated Signal and perform demodulation for different modulation indices. Plotthecorresponding waveformsandtheir spectrum.Comparethemodulation index theoretically and practically. Plot the effect of modulating Signal frequency and Amplitude on the modulation index.
2. Generate Frequency modulated Signal and perform demodulation for different modulation indices. Plotthecorresponding waveformsandtheir spectrum.Comparethemodulation index theoretically and practically. Plot the effect of modulating Signal frequency and Amplitude on the modulation index.
3. Generate modulated and demodulate DSB-SC Signal for different modulation indices and plot the corresponding waveforms and their spectrum. Compare the modulation index theoretically and practically

4. Generate and demodulate SSB-SC modulated Signal (Phase Shift Method) for different modulation indices and plot the corresponding waveforms and their spectrum. Also calculate theoretically and practically the modulation index in each case
5. Demonstrate the Frequency Division Multiplexing & De multiplexing practically by transmitting at least 4 different signals simultaneously with respect to time and recovering without distortion.
6. Verify Sampling theorem for different sampling rates, Sampling types and Duty Cycles and Plot the sampled and reconstructed Signals. Write the conclusions, based on practical observations
7. Design and implement a Pulse Amplitude Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
8. Design and implement a Pulse Width Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
9. Design and implement a Pulse Position Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
10. Generate PCM Modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations
11. Generate Delta Modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
12. Generate FSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
13. Generate practically Binary PSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
14. Generate practically DPSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
15. Generate practically QPSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
16. Plot Signal Constellation for BPSK, BFSK and QPSK
17. Analyze the performance of BPSK, BFSK and QPSK under noisy environment through constellation diagram
18. Demonstrate ISI through eye diagram
19. Simulate raised cosine signal and duo binary signals
20. Encode data using Shannon Fano /Huffman Coding through Hardware / Simulator
21. Analyze the performance of a Matched filter.

ELECTRONIC CIRCUIT ANALYSIS LAB

II B.TechII Semester (ECE)

Course Code: A254484

L	T	P	C
0	0	2	1

Note:

- Minimum12experimentsshouldbeconducted.

Course Overview:

The Electronic Circuit Analysis Laboratory is designed to provide hands-on experience in designing, building, and analyzing analog electronic circuits. It focuses on the practical implementation of amplifiers, oscillators, power amplifiers, multivibrators, and waveform generators using discrete components and simulation tools. The lab strengthens understanding of frequency response, gain, feedback, waveform shaping, and time base generation.

CourseOutcomes:

Aftergoingthroughthiscoursethestudentwill be able to

1. Design and analyze multistage amplifier and evaluate their frequency response.
2. Design and analyze feedback & power amplifiers and evaluate their frequency response.
3. Develop and interpret waveform generation circuits such as oscillators, multivibrators and time base generators.
4. Perform simulations to validate analog circuit performance using industry-standard software tools.
5. Correlate practical results with theoretical predictions and identify deviations due to real-world constraints.

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	2	1	-	-	-	-	-	3	1
CO2	3	3	3	2	2	1	-	-	-	-	-	3	2
CO3	3	3	3	2	1	-	-	-	-	-	-	3	1
CO4	2	2	3	3	3	-	-	-	-	-	1	2	2
CO5	3	3	2	3	2	1	-	-	-	-	1	2	2

Listof Experiments:

A.HardwareExperiments(7):

Performpracticaldesign,implementation,andwaveformanalysisofamplifiers,oscillators,power stages, and multivibrators to validate theoretical concepts and observe real-world circuit behavior.

1. Design and analyze a two-stage RC coupled amplifier to demonstrate gainenhancement.
2. DesignHartleyoscillatorforaspecifiedfrequencyandobservetheiroutput waveforms.

3. Design an RC phase shift oscillator and derive the practical gain condition for oscillations at a given frequency.
4. Designatransformer-coupledclassApoweramplifier,observeinput/outputwaveforms,and calculate efficiency.
5. DesignaclassBPush Pullpoweramplifier,analyzeinput/outputwaveformsandcalculate its efficiency.
6. Design a bistablemultivibrator, analyze commutating capacitor effects, and record transistor
   Waveforms.
7. Designanastablemultivibratorandobservetransistorbaseandcollector waveforms.

B.SoftwareSimulations(7):

Use circuit simulation software to design, analyze, and verify the performance of feedback amplifiers, waveform generators, and power amplifier circuits through virtual experimentation and frequency response evaluation.

1. Simulate voltage series/voltage shunt feedback amplifier topologies and compare their frequency responses with andwithout feedback.
2. Simulate a monostablemultivibrator and analyze its input/output waveforms.
3. Simulate a Schmitt trigger for gain values greater than and less than one and analyze responsebehavior.
4. Simulate a bootstrap time base generator using BJT and observe the output sweep waveform.
5. Simulate a Miller sweep circuit using BJT and observe the time base output waveform.
6. Simulate a complementary symmetry push-pull amplifier and verify elimination of crossoverdistortion.
7. Simulate a single tuned amplifier and determine the quality factor (Q) of its tuned circuit.

Software Requirements:

Simulation Tools: LTspice / Multisim / PSpice / Proteus / NI Multisim Live or equivalent
Operating System: Windows 10/11 or Linux (Ubuntu preferred)

Hardware Requirements:

1. Dual Power Supply (±15V, 0–30V)
2. Function Generator (up to 1 MHz)
3. CRO / DSO (Dual Channel, 20 MHz or more)
4. Digital Multimeters
5. Breadboards and Connecting Wires
6. BJTs: BC107, BC547, BC557, 2N2222, etc.
7. Resistors, Capacitors (Wide range of values)

LINEAR AND DIGITAL IC APPLICATIONS LAB

II B.TechII Semester (ECE)

Course Code: A254485

L	T	P	C
0	0	2	1

Note:

- Minimum12experimentsshouldbeconducted.

CourseOutcomes:

Aftergoingthroughthiscoursethestudentwill be able to

1. Design and implementation of various analog circuits using IC 741.
2. Design and Implementation of Various Multivibrators Using 555 timer.
3. Design and implement low pass and High pass filters and DAC using IC 741.
4. Design and implement various combinational circuits using digital ICs.
5. Design and implement various sequential circuits using digital ICs.

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	1	-	-	-	3	3	3	-	2	1
CO2	3	3	2	1	-	-	-	3	3	3	-	2	1
CO3	3	3	2	1	-	-	-	3	3	3	-	2	1
CO4	3	3	2	1	-	-	-	3	3	3	-	-	3
CO5	3	3	2	-	-	-	-	3	-	-	-	-	3

Listof Experiments:

1. Design an Inverting and Non-inverting Amplifier using Op Amp and calculate gain.
2. Design Adder and Subtractor using Op Amp and verify addition and subtraction process.
3. Design a inverting Comparator with positive/negative/zero reference voltages using Op-Amp
4. Design first order Active LPF, HPF using Op-Amp
5. Design a Circuit using IC741 to generate square wave and draw the output waveform.
6. Design a Circuit using IC741 to generate triangle wave and draw the output waveform
7. Construct Mono-stable Multivibrator using IC555 and draw its output waveform.
8. Construct AstableMultivibrator using IC555 and draw its output waveform and also find its duty cycle..
9. Design R-2R ladder DAC and find its resolution and write a truth table with respective voltages.

10. Design a 4 -bit binaryto Gray code converter and verify its truth table.
11. Verify the truth table of priority encoder using IC 74148
12. Design 4-bit function using 8x1 multiplexer digital IC 74138.
13. Design a 4-bit Adder/ Subtractor using digital ICs and Add/Sub the following bits.
    (i) 1010(ii) 0101iii)1011
    0100 0010 1001
14. Verify the truth table of Decade counter using IC 7490
15. Verify the truth table of Up/down counter using IC74163
16. Verify the functionality of Universal shift register using IC74194/195
17. Verify the truth table magnitude comparator IC 7485

WEB AND MOBILE APPLICATIONS

II B.TechII Semester (ECE)
Course Code: A254581

L	T	P	C
0	0	2	1

Course Outcomes:
At the end of the course, student will be able to:
1. Understand and apply core web technologies (HTML, CSS, JavaScript) for structured, styled,and interactive webpages.
2. Build responsive websites using frameworks like Bootstrap and manage code using Git/GitHub.
3. Create simple server-side functionality using Node.js and store/retrieve data from basicdatabases.
4. Design and develop mobile applications using Flutter for Android and iOS.
5. Integrate web and mobile development into a functional mini-project with deployment.

List of Experiments:
Week 1: Introduction to the Web
Understand web architecture, clients, servers, and workflows. Explore an existing website's structure and elements using browser DevTools.

Week 2: HTML Basics
Learn about different markup languages and their significance. Create a homepage for a static site using paragraphs, headings, lists, links, and images.

Week 3: CSS – Layout & Design Foundations
Apply colors, spacing, and layouts using CSS. Practice Flexbox and Grid techniques by cloning a simple website layout.

Week 4: Introduction to JavaScript
Understand the Document Object Model (DOM) and basic JavaScript constructs. Add interactivity to a webpage with a 'Contact Us' form that dynamically displays/hides details.

Week 5: Combining HTML, CSS, and JavaScript
Integrate skills from previous weeks to start building a personal portfolio website.

Week 6: Responsive Design using Bootstrap
Make your site adapt to different screen sizes (mobile, tablet, desktop) using Bootstrap's grid system and components.

Week 7: Basic Server Concepts & Node.js
Set up a basic Node.js server to serve web content. Understand server-side fundamentals and simple routing.

Week 8: Introduction to Databases

Learn to store and retrieve data in SQLite or MangoDB. Save contact form submissions from your portfolio into a database.

Week 9: Introduction to Flutter

Understand Flutter's widget structure and framework basics. Design a simple login and landing page for a mobile app.

Week 10: Deployment using GitHub

Learn version control basics with Git and GitHub. Publish your portfolio online via GitHub Pages and collaborate with classmates for code reviews.

Week 11: Project Work

Apply all learned skills to build a real-world project such as a club/college event management application integrating both web and mobile interfaces.

Week 12: Final Presentations

Present your completed project to classmates, highlighting key features, responsive design, and integration. Gather peer feedback for improvement.

Mini-Project Example Themes

- Event registration & tracking for college clubs
- Simple inventory tracking system
- Student feedback & announcement portal
- IoT project dashboards (linking to electronics projects)

Reference Books:

1. "Web Technologies: HTML, CSS, JavaScript" – Uttam K. Roy (Oxford University Press)
2. "Web Technology: Theory and Practice" – M.N. Rao & P.S. Rao (Pearson)
3. "Web Technologies: TCP/IP, Web/HTTP, Web Servers, Web Applications, and CloudComputing" – Achyut S. Godbole&AtulKahate(McGraw-Hill Education)
4. "Mobile Application Development" – DebasisSamanta&Goutam Kumar Panda (PrenticeHall India)
5. "Full Stack Web Development" – V. Srinivasa Rao (Notion Press)