

PEC301PC: PROBABILITY THEORY AND STOCHASTIC PROCESSES**B.Tech. II Year I Sem.**

L	T	P	C
3	0	0	3

Pre-requisite: Mathematics**Course Objectives:**

1. This gives basic understanding of random variables and operations that can be performed on them.
2. To know the Spectral and temporal characteristics of Random Process.
3. To Learn the Basic concepts of Information theory Noise sources and its representation for understanding its characteristics.

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

1. Perform operations on single and multiple Random variables.
2. Determine the Spectral and temporal characteristics of Random Signals.
3. Characterize LTI systems driven by stationary random process by using ACFs and PSDs.
4. Understand the concepts of Noise and Information theory in Communication systems.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	-	2	-	-	-	-	-	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-

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, Computer generation of a Random Variable of a given PDF/CDF.

UNIT - III

Multiple random variables and Operations on Multiple random variables: Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density- Point and Interval conditioning, Statistical Independence, Sum of Two and more Random Variables, Central Limit Theorem, Equal and Unequal Distribution (Proof not expected).

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

UNIT IV

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

UNIT V

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

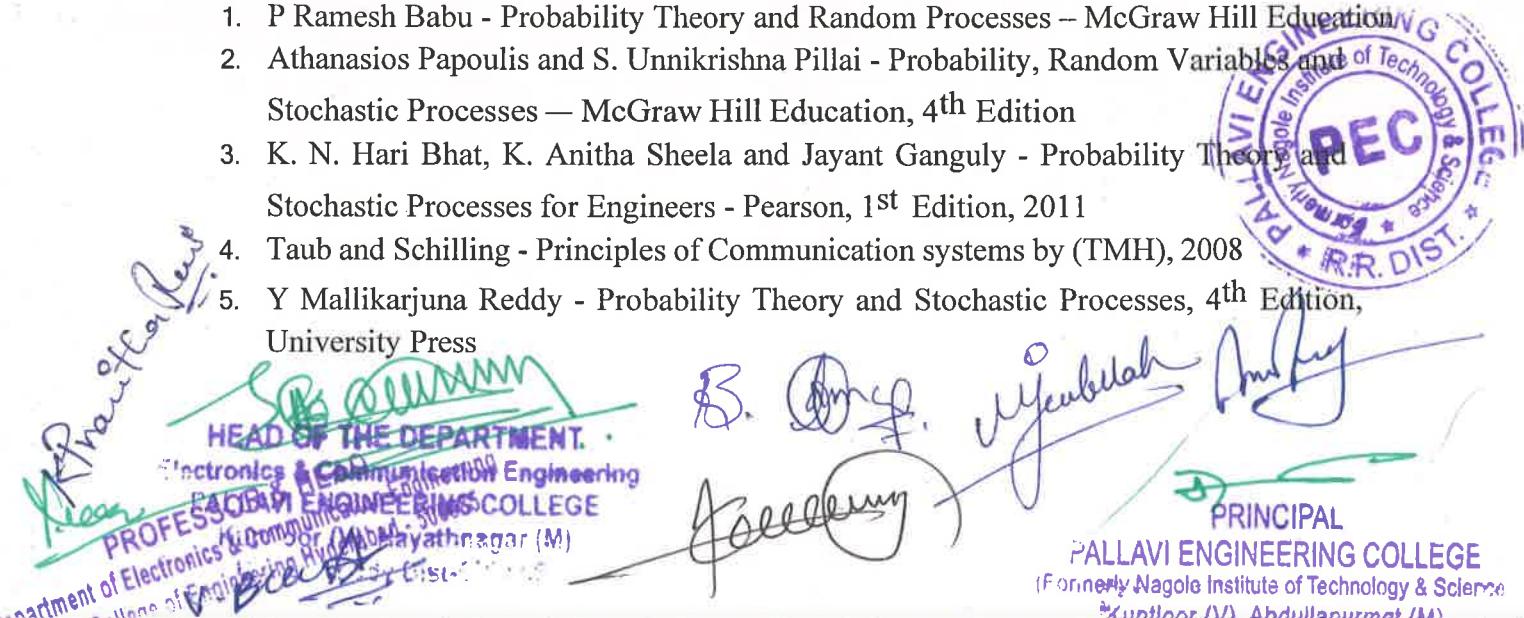
Noise sources: Resistive / Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties.

TEXT BOOKS:

1. Peyton Z. Peebles - Probability, Random Variables & Random Signal Principles - TMH, 4th Edition
2. Murray R Spiegel, John Schiller, R Alu Srinivasan. – Probability and Statistics – Schaum's Outlines, 2nd Edition, TMH

REFERENCES:

1. P Ramesh Babu - Probability Theory and Random Processes – McGraw Hill Education
2. Athanasios Papoulis and S. Unnikrishna Pillai - Probability, Random Variables and Stochastic Processes — McGraw Hill Education, 4th Edition
3. K. N. Hari Bhat, K. Anitha Sheela and Jayant Ganguly - Probability Theory and Stochastic Processes for Engineers - Pearson, 1st Edition, 2011
4. Taub and Schilling - Principles of Communication systems by (TMH), 2008
5. Y Mallikarjuna Reddy - Probability Theory and Stochastic Processes, 4th Edition, University Press



PEC302PC: SIGNALS AND SYSTEMS**B.Tech. II Year I Sem.**

L	T	P	C
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Pre-Requisites: Mathematics

Course Objectives: This subject gives the basics of Signals and Systems required for all Electrical Engineering related courses. The objectives of this subject are to:

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 correlation properties.
3. Understand Laplace and Z-transforms 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.

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

1. Characterize various signals, systems and their time and frequency domain analysis, using transform techniques.
2. Identify the conditions for transmission of signals through systems and conditions for physical realization of systems.
3. Understand the significance of sampling theorem for baseband and band pass signals for various types of sampling and for different duty cycles.
4. Understand the concept of correlation and PSD functions and their applications.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-

UNIT - I**Signal Analysis**

Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

UNIT - II

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

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

UNIT - III

Signal Transmission through Linear Systems: Linear System, Impulse response, Response of a Linear System, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution. Extraction of Signal from Noise by Filtering. 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 risetime. Extraction of Signal from Noise by Filtering.

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, Energy Density Spectrum, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Parseval's Theorem, Detection of Periodic Signals in the presence of Noise by Correlation.

UNIT - V

Sampling theorem: Graphical and analytical proof of Sampling Theorem for Base band/Band Limited 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. Signals, Systems & Communications -B.P. Lathi, BS Publications.
 2. Signals and Systems – Allan. V. Oppenheim, Allan. S. Willsky with S. Hamid. Nawab, 2nd Ed. Pearson.

REFERENCE BOOKS

1. Signals and Systems—Simon Haykin, Barry Van Veen, 2nd Ed., Wiley.
 2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH.
 3. Fundamentals of Signals and Systems – Michel J. Roberts, Govind Sharma, 2nd Ed., MGH.
 4. Signals, Systems and Transforms - Charles. L. Philips, John M. Parr and Eve A. Riskin, 4th Ed., 2004, Pearson, Prentice Hall.

HEAD OF THE DEPARTMENT
Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
Kuntloor (M), Hayathnagar (M)
Ranga Reddy Dist-501 505

V. Bala 
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The image shows the handwritten signatures of Dr. K. M. Tari and Dr. A. K. in blue ink. Below them is a green ink logo consisting of a stylized 'P' and 'E' intertwined. Underneath the signatures and logo, the text 'PRINCIPAL' is written in a bold, black, sans-serif font. Below this, 'PALLAVI ENGINEERING COLLEGE' is written in a large, bold, black, sans-serif font. Underneath that, 'Formerly Nagole Institute of Technology & Science' is written in a smaller, black, sans-serif font. At the bottom, 'Kuntloor (V), Abdullapurmet (M)' is written in a black, sans-serif font, followed by 'Jalshad: R. P. Dist: 501505, Telangana' in a smaller black font.

PEC303PC: ELECTRONIC DEVICES AND CIRCUITS**B.Tech. II Year I Sem.**

L	T	P	C
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Course Overview: This course introduces fundamental semiconductor devices and their behavior, including diodes, BJTs, and FETs. It covers their characteristics, applications, and the analysis of basic electronic circuits. The course also explores rectifiers, voltage regulation, amplifier design, and advanced semiconductor technologies like FinFETs and CNTFETs. Emphasis is placed on developing a strong foundation for analog circuit design and understanding modern device technologies in electronics.

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

- CO1: Analyze the electrical characteristics and models of semiconductor diodes and apply them in rectifier and clipping circuits.
- CO2: Evaluate the operation and configurations of Bipolar Junction Transistors (BJTs) and analyze their input and output characteristics.
- CO3: Design appropriate biasing networks for BJTs and determine the operating point for amplifier applications.
- CO4: Analyze transistor amplifier circuits using h-parameter models and assess performance for various configurations.
- CO5: Analyze the structure, working, and characteristics of JFETs, MOSFETs, and advanced devices like FinFETs and CNTFETs, and compare modern device technologies.

Course Articulation Matrix

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	1	1	-	-	-	-	-
CO2	3	3	2	2	1	-	-	-	-	-	-
CO3	3	3	3	2	1	-	-	-	-	-	-
CO4	3	3	3	2	2	-	-	-	-	-	1
CO5	3	3	2	2	2	1	-	-	-	-	2

Syllabus:**UNIT - I:**

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

UNIT - II:

Bipolar Junction Transistor (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.

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, CC amplifier analysis using h-parameters, Approximate CE model – with and without emitter bypass capacitor.

UNIT - V:

Special Purpose Diodes: Principle of Operation of — SCR, Tunnel Diode, Varactor Diode, Photo Diode, Solar Cell, LED and Schottky Diode

Field Effect Transistors and Advanced Devices: JFET: Structure, operation, and characteristics, MOSFET: Enhancement and Depletion modes — Structure, operation, and characteristics, Advanced Devices: FinFETs - 3D structure, Scaling advantages, CNTFETs - Structure, ballistic transport, fabrication, Comparison: CMOS vs. FinFET vs. CNTFET.

TEXT BOOKS:

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

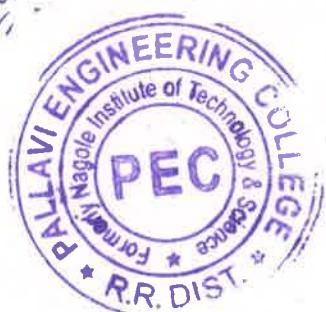
REFERENCE BOOKS:

1. Bell, David A. *Electronic Devices and Circuits*. Oxford University Press, 5th ed., 2008.
2. Neamen, Donald A. *Electronic Circuit Analysis and Design*. McGraw-Hill, 2nd ed., 2001.
3. Salivahanan, S., and N. Suresh Kumar. *Electronic Devices and Circuits*. McGraw-Hill Education, 4th ed., 2017.
4. Razavi, Behzad. *Fundamentals of Microelectronics*. Wiley, 2nd ed., 2013.
5. Taur, Yuan, and Tak H. Ning. *Fundamentals of Modern VLSI Devices*. Cambridge University Press, 2nd ed., 2009.

S. K. Srinivas
HEAD OF THE DEPARTMENT
Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
Kuntloor (M), Hayathnagar (M)
Ranga Reddy Dist-501 505

V. Bellur

K. Praveen Rao



B. Arun

B. Beeswamy

Aljebulah

Amulya

D. S. Rao

PRINCIPAL

PALLAVI ENGINEERING COLLEGE
Formerly Nagole Institute of Technology & Science
Kuntloor (V), Abdullapurmet (M)
Hyderabad, R.R. Dist-501505, Telangana

K. Venkateswaran

PROFESSOR & HEAD
Department of Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
Kuntloor (V), Abdullapurmet (M)
Hyderabad, R.R. Dist-501505, Telangana

PEC304PC: DIGITAL LOGIC DESIGN**B.Tech. II Year I Sem.**

L	T	P	C
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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.

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

- CO1:** Apply Boolean algebra and minimization techniques to simplify Boolean functions.
- CO2:** Design combinational circuits using logic gates.
- CO3:** Analyze latches and flip-flops to design sequential logic circuits.
- CO4:** Construct synchronous sequential circuits combining flip-flops and logic gates.
- CO5:** Utilize programmable logic devices in digital system design.

Course Articulation Matrix

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	1	-	-	-	-	-	1
CO2	3	3	3	2	2	-	-	-	-	-	1
CO3	3	3	3	2	2	-	-	-	-	-	1
CO4	3	3	3	2	2	-	-	-	-	-	1
CO5	3	2	3	2	3	-	-	-	-	-	2

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, 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 BOOK:

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, Cengage Learning.

HEAD OF THE DEPARTMENT
Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
Kuntloor (V), Hayathnagar (M)
Kanya Ready Dist-503 SJ5

V. Blehm

Krautberg



B. Amal, Aljannah Amal
Kesley 
PRINCIPAL



PRINCIPAL
PALANI ENGINEERING COLLEGE
Formerly Negala Institute of Technology & Science
Kuntloor (V), Abdullapurmet (M)
Hyderabad, R.R. Dist-501505, Telangana

PROFESSOR & HEAD
Department of Electronics & Communication Engineering
ITI(H) College of Engineering Hyderabad - 500085

PEC305PC: CONTROL SYSTEMS**B.Tech. II Year I Sem.**

L	T	P	C
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Pre-Requisites: Linear Algebra and Calculus, Ordinary Differential Equations and Multivariable Calculus Laplace Transforms, Numerical Methods and Complex variables

Course Objectives:

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.

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

1. Describe open- and closed-loop systems, and develop mathematical models using block diagrams and signal flow graphs.
2. Analyze time response of second-order systems using time-domain specifications, and assess stability using Routh-Hurwitz criterion and root locus techniques.
3. Analyse frequency response plots including Bode, Polar, and Nyquist plots, and investigate system stability.
4. Design compensators and controllers to meet specific performance criteria in control systems.
5. Apply the state-variable approach and analyze controllability and observability.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	-	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-	-
CO3	3	3	2	1	1	-	-	-	-	-	-
CO4	3	3	3	2	1	-	-	-	-	-	-
CO5	3	3	2	1	1	-	-	-	-	-	-

UNIT - I

Control System fundamentals: Classification of control systems, Open and Closed loop systems. Mathematical modelling of mechanical systems and their conversion into electrical systems. Block diagram reduction and Signal flow graphs.

UNIT - II

Time response Analysis: Transfer function and Impulse response, types of input. Transient response of second order system for step input. Time domain specifications. Types of systems, static error coefficients, Routh - Hurwitz criterion for stability.

Root locus techniques: Analysis of typical systems using root locus techniques. Effect of location of roots on system response.

UNIT - III

Frequency response Analysis: Frequency domain specifications, bode plots, Gain margin and

Phase Margin, Polar plot, Nyquist plot, and Nyquist criterion for stability.

UNIT - IV

Compensators and controllers: Introduction to compensators, Lag compensator, Lead compensator, Lag- Lead compensator, Design of compensators using bode plot. Introduction to controllers, P, I, D, PI, PD, PID controllers.

UNIT - V

State space representation: Concept of state and state variables. State models of linear time invariant systems, State transition matrix, Solution of state equations. Controllability and observability.

TEXT BOOKS:

1. I.J. Nagrath and M. Gopal, Control System Engineering, 5ed., New Age Publishers, 2009.
 2. Benjamin C. Kuo, Automatic Control Systems, 7ed., PHI, 2010.

REFERENCE BOOKS:

1. K. Ogata, Modern Control Engineering, 2ed., Prentice Hall, 2010.
 2. M. Gopal, Control Systems: Principles and Design, Tata McGraw-Hill, 1997.
 3. Norman S. Nise, Control Systems Engineering, 5ed., John Wiley & Sons, 2007.
 4. A.K. Jairath, Solutions and Problems of Control Systems, CBS Publishers, 2013.
 5. A. Nagoor Kani, Control Systems, 2ed., RBA Publications, 2007.

S. K. SELLAM
HEAD OF THE DEPARTMENT
Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
Kuntioor (M), Hayathnagar (M)
Ranga Reddy Dist-501 505

B. Ames

Wajebullah



Ranga Ready Dist-30
N. Blest

PRINCIPAL
PALLAVI ENGINEERING COLLEGE
Formerly Nagole Institute of Technology & Science
Kuntloor (V), Abdullapurmet (M)
Hyderabad, R.R. Dist-501505, Telangana

Kiran
PROFESSOR & HEAD
Department of Electronics & Communication
VITM College of Engineering Hyderabad - 500085

PEC307PC: MODELLING & SIMULATIONLAB**B.Tech. II Year I Sem.**

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Note:

- All the experiments are to be simulated using MATLAB or equivalent software
- Minimum of 12 experiments are to be completed / simulated.

Will be able to use a simulation tool for generating, analyzing and performing various operations on Signals / Sequences both in time and Frequency domain

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

Will be able to use a simulation tool for generating different Random Signals; analyze their Characteristics by finding different higher order Moments and noise removal applications

Will be able to use a simulink for Control System applications

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	3	3	2	-	-	3	1	-
CO2	3	2	3	3	3	2	-	-	3	1	-
CO3	3	2	3	3	3	2	-	-	3	1	-
CO4	3	2	3	3	3	2	-	-	3	1	-

List of Experiments:**Signals and Systems (Minimum 7 Experiments)**

1. Write the code / script for generating various standard viz: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc and Nonstandard Signals and Sequences generated from these standard signals /sequences using Waveform synthesis. Also for perform different operations viz: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power on them.
2. Write the code / script for finding the Even and Odd parts of Signal / Sequence and Real and Imaginary parts of Signal.
3. Write the code / script for finding the output of a System for a given input and Impulse Response and finding Auto Correlation and Cross Correlation of Signals / sequences
4. Write the code / script for Verifying whether a given Continuous/Discrete System is Linear, Time Invariant, Stable and Physically Realizable
5. Write the code / script for obtaining Sinusoidal response and Impulse response of a given Continuous / Discrete LTI System.
 - a) Plot the Real and Imaginary part and
 - b) Magnitude and Phase Plot of the response
6. Write the code / script for finding and plotting the Magnitude and Phase Spectrum of any given Signal by finding its Fourier Transform by using the properties where ever required.
7. Write the code / script for finding and plotting the Magnitude and Phase Spectrum of any given Signal by finding its Laplace Transform by using the properties where ever

- required. Also plot pole-zero diagram in S-plane
8. Write the code/ script for finding and plotting the Magnitude and Phase Spectrum of any given Sequence by finding its Z-Transform by using the properties wherever required. Also plot pole — zero diagram in Z-plane.
 9. Design a Simulink or equivalent model for
 - a) Solving Differential Equations
 - b) Finding the response of any RLC Circuit with different initial Conditions for AC and DC inputs and plot the corresponding responses
 10. Gibbs Phenomenon and waveform synthesis
- Probability Theory and Stochastic Processes (Minimum 3 Experiments)**
11. Write the code / script for generating various Random Variables with different CDFs/ PDFs
 12. Write the code / script for generating Gaussian noise and for finding its mean, 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. Write the code / script for Removal of noise from the signal using Cross correlation.
 15. Write the code / script for Extraction of Periodic Signal masked by noise using Auto Correlation

Control Systems (Minimum 2 Experiments)

16. Build and Simulate a DC Motor using Simulink
17. Implementation of a PID Controller from equations using Simulink
18. Controllability and Observability

Note: For the experiments with code/scripts written in MATLAB or equivalent (1-8, 11-15), the student can design a user interface or app using MATLAB App Designer or equivalent.

Application on Real Time signals

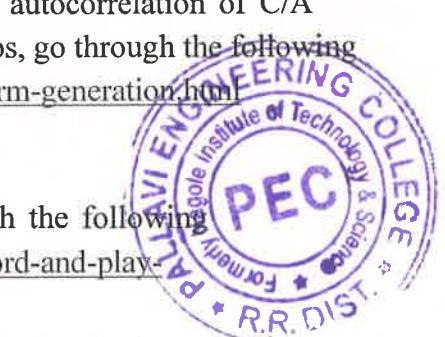
1. Application of Autocorrelation: GPS Synchronization Satellite communication toolbox is required for this experiment.
Generate the GPS signal. Visualize the GPS signal. Plot of autocorrelation of C/A code and visualize the spectrum of GPS signals. For exact steps, go through the following page: <https://www.mathworks.com/help/satcom/ug/gps-waveform-generation.html>

2. Sampling of Speech Signals

Record 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 of aliasing. For steps, go through the following page:

<https://in.mathworks.com/help/signal/ug/changing-signal-sample-rate.html>



PEC308PC: DIGITAL LOGIC DESIGN LAB**B.Tech. II Year I Sem.**

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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.

Course Outcomes (COs): After completing this course, students will be able to:

CO1: Analyze and simplify Boolean expressions and implement them using logic gates and ICs. **CO2:** Design and realize combinational and sequential logic circuits using logic gate hardware. **CO3:** Model digital systems in Verilog HDL using dataflow, behavioral, and structural styles.

CO4: Simulate and verify digital designs using industry-standard EDA tools and testbenches.

CO5: Build modular and hierarchical designs such as counters, FSMs, and shift registers.

Course Articulation Matrix:

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	2	-	-	-	-	-	1
CO2	3	3	3	2	2	-	-	-	-	-	1
CO3	3	3	3	2	3	-	-	-	-	-	2
CO4	2	2	2	3	3	-	-	-	-	-	2
CO5	3	3	3	2	3	-	-	-	-	-	2

List of 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. Verilog HDL-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**.

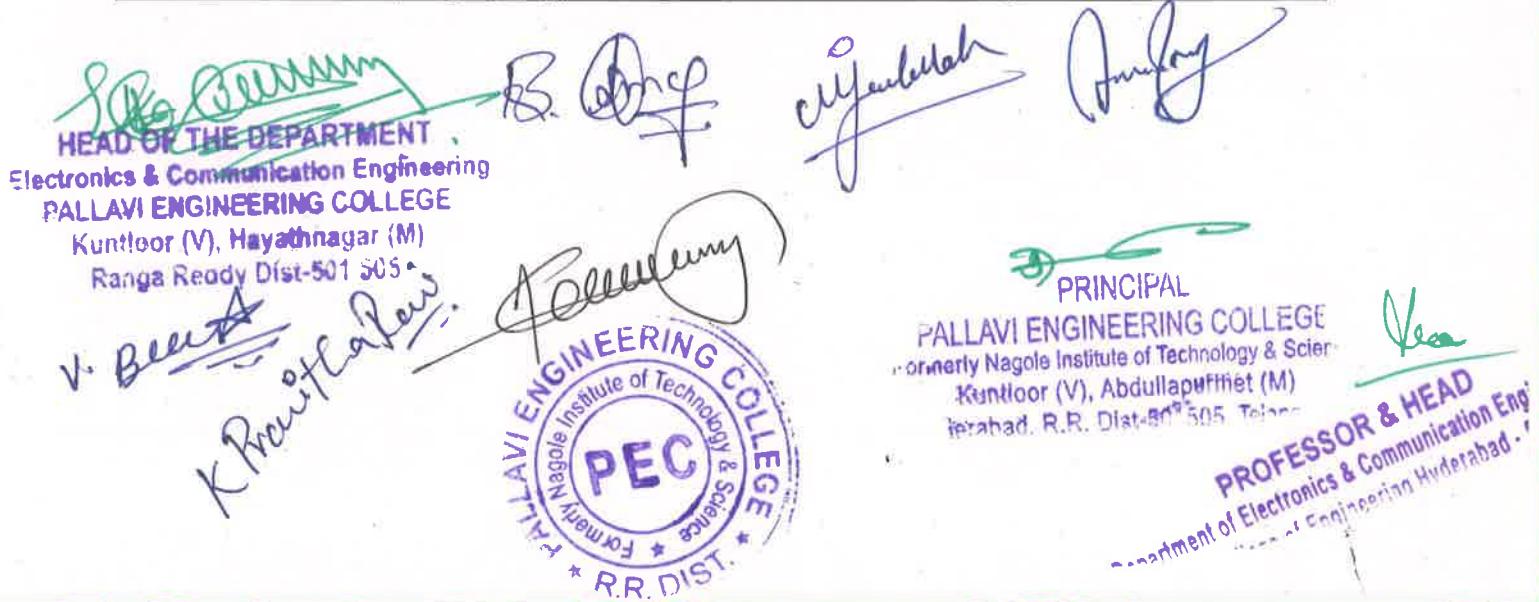
1. Design and simulate a 2-bit comparator using dataflow modeling; extend it to 4-bit using structural modeling.
2. Implement a 2:1 multiplexer using dataflow modeling and design an 8:1 multiplexer using structural modeling.
3. Design a 2-to-4 decoder using dataflow modeling and realize a 3-to-8 decoder using structural modeling.
4. Implement a given Boolean function using a decoder-based approach in behavioural 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 tool 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



PEC309PC: ELECTRONIC DEVICES AND CIRCUITS LAB**B.Tech. II Year I Sem.(ECE &EEE)**

L	T	P	C
0	0	2	1

Course Overview:

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

Course Outcomes (COs): By the end of this course, students will be able to:

- CO1:** Analyze the I-V characteristics of semiconductor devices such as diodes, BJTs, and FETs.
- CO2:** Design and evaluate basic rectifier, clipper, clamper, and voltage regulation circuits.
- CO3:** Demonstrate biasing techniques for BJTs and determine their operating point using DC load line analysis.
- CO4:** Design and analyze transistor amplifier circuits in various configurations using h-parameter models.
- CO5:** Simulate and interpret electronic circuits using appropriate simulation tools.

Course Articulation Matrix

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	1	-	-	-	-	-	-
CO2	3	3	3	2	1	1	-	-	-	-	-
CO3	3	3	2	2	1	-	-	-	-	-	-
CO4	3	3	3	2	1	-	-	-	-	-	1
CO5	2	2	2	3	3	-	-	-	-	-	2

List of Experiments**A. Hardware-Based Experiments (7):**

1. Study the I-V characteristics of a PN junction diode in forward and reverse bias to determine cut-in voltage and dynamic resistance.
2. Examine the reverse bias characteristics of a Zener diode and demonstrate its application as a voltage regulator under varying conditions.
3. Design and analyze half-wave and full-wave rectifiers (center-tap and bridge) with and without capacitor filters to evaluate ripple factor and output voltage.
4. Implement clipper and clamper circuits to observe waveform shaping through positive, negative, and biased configurations.
5. Plot the input and output characteristics of a BJT in common emitter configuration to determine input/output resistance and current gain.
6. Design and test fixed bias and voltage divider bias circuits to establish a stable operating point for a BJT amplifier and study DC load line behavior.
7. Construct and analyze a Common Base (CB) configuration of a BJT to study input-output characteristics and determine current gain (α) and input/output resistance.

B. Software-Based Simulation Experiments (7):

1. Simulate a full-wave bridge rectifier with capacitor filter to analyze waveform smoothing and 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 a common emitter amplifier with and without emitter bypass capacitor to analyze the effect on voltage gain and signal amplification.
4. Simulate BJT operation as a switch and small-signal amplifier to understand its dual functionality in digital and analog applications.
5. Simulate the output and transfer characteristics of a JFET to determine parameters such as pinch-off voltage, drain resistance, and transconductance.
6. Simulate the characteristics of a MOSFET and design a CMOS inverter to study digital switching behavior and low-power logic design.
7. Simulate the transfer and output characteristics of an enhancement-mode NMOS transistor to analyze threshold voltage, drain current, and switching behavior.

Hardware Requirements:

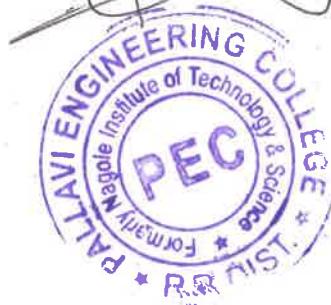
1. Regulated DC Power Supply (0–30V)
2. Function Generator
3. Digital Multimeter
4. Cathode Ray Oscilloscope (CRO) or DSO
5. Breadboards and Connecting Wires
6. Resistors, Capacitors, Diodes (1N4007, Zener Diodes)
7. BJTs (e.g., BC107, 2N2222), JFETs (e.g., J201), MOSFETs (e.g., IRF540N)
8. Trainer Kits (optional but preferred for ease)

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. PSPICE for TI or OrCAD Lite
6. Windows PC or Laptop with minimum 4GB RAM and i3 processor or better

HEAD OF THE DEPARTMENT
Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
Kuntloor (V), Hayathnagar (M)
Ranga Reddy Dist., AP

V. Beera
K. Brahma Reddy



PRINCIPAL
PALLAVI ENGINEERING COLLEGE
Formerly Nagole Institute of Technology & Science
Kuntloor (V), Abdullapurmet (M)
Hyderabad, R.R. Dist. 500150, A.P.

PROFESSOR & HEAD
Department of Electronics & Communication Engineering
Pallavi Engineering College, Hyderabad - 500150

PEC402PC: ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES**B.Tech. II Year II Sem.**

L	T	P	C
3	0	0	3

Pre-requisite: Mathematics**Course Objectives:**

1. To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields and Magneto static Fields and apply them to solve physics and engineering problems.
2. To distinguish between static and time-varying fields and understand the significance and utility of Maxwell's Equations and Boundary Conditions, and gain ability to provide solutions to communication engineering problems.
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.

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

1. Acquire knowledge of Basic Laws, Concepts and solve problems related to Electrostatic Fields and Magnetostatics Fields.
2. Differentiate the static and time-varying EM fields and apply Maxwell's Equations at different Boundaries.
3. Able to classify conductors and dielectric materials and analyze the Wave Propagations in those mediums.
4. To solve transmission line problems numerically and using smith charts.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	1	-	1	-	-	-	1	-
CO2	3	3	2	1	-	1	-	-	-	1	-
CO3	3	3	2	1	-	1	-	-	-	1	-
CO4	3	3	2	1	-	1	-	-	-	1	-

UNIT I – Electrostatics

Review of Coordinate Systems & Vector Calculus, Coulomb's Law, Electric Field Intensity — Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and its applications, Electric Potential, Relation between E and V, Maxwell's 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, Capacitors—Parallel Plate, Coaxial, Spherical.

UNIT II - 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.

UNIT III - Maxwell's Equations (Time Varying Fields)

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,

UNIT IV - EM Wave Characteristics

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves—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.

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,

UNIT V Transmission Lines

Types, Parameters, Equivalent Circuit, Transmission Line Equations, Primary & Secondary Constants, 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, Single Stub Matching.

TEXT BOOKS:

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

REFERENCES:

1. Electromagnetic Waves and Radiating Systems—E.C. Jordan and K.G. Balmain, 2ndEd., PHI, 2000.
2. Engineering Electromagnetics — Nathan Ida, 2ndEd., Springer (India) Pvt. Ltd., New Delhi, 2005.
3. Electromagnetic Field Theory Fundamentals — Bhag Singh Guru and Huseyin R. Hiziroglu, Cambridge University Press, 2nd Ed., 2006.

HEAD OF THE DEPARTMENT
Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
Kunoor (V), Hayathnagar (M)
Rajiv Gandhi Dist-501 505

N. Biju



B. Dnyaneshwar
K. Preethi
PRINCIPAL
PALLAVI ENGINEERING COLLEGE
Formerly Nagole Institute of Technology & Science
Kunoor (V), Abdullapurmet (M)
Hyderabad, R.R. Dist-501505, Telangana

PROFESSOR & HEAD
Department of Electronics & Communication Engineering
INTUH College of Engineering Hyderabad - 500085

PEC403PC: ANALOG AND DIGITAL COMMUNICATIONS**B.Tech. II Year II Sem.**

L	T	P	C
3	0	0	3

Pre-requisite: Signals and Systems**Course Objectives:**

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.

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

1. Design and analyze various Analog and digital Modulation and Demodulation techniques.
2. Understand the effect of noise present in continuous wave Modulation techniques.
3. Understand the concept of Super heterodyne Receiver and Pulse Modulation Techniques
4. Analyze and design the various coding techniques and Base band Transmission.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	1	-	3	2	-	-	-	-
CO2	3	3	3	1	-	2	2	-	-	-	-
CO3	3	3	3	1	-	2	2	-	-	-	-
CO4	3	3	3	1	-	3	2	-	-	-	-

UNIT - I**Amplitude Modulation**

Need for modulation, Amplitude Modulation: Time and frequency domain description, Generation — Switching modulator, Detection - Envelope detector, DSB-SC Modulation: Generation — Balanced Modulator, Detection- Synchronous detector, COSTAS Loop, SSB Modulation: Time and frequency domain description, Generation — Phase discrimination Method and Demodulation - coherent detection, Vestigial side band 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- Armstrong Method, Detection of FM Waves - Phase locked loop, Comparison of FM and AM.

UNIT - II**Transmitters & Receivers**

Classification of Transmitters, AM Transmitters, FM Transmitters, AM Receiver - Super heterodyne receiver, FM Receivers, Stereo FM multiplex reception, Comparison of AM and FM Receiver. Noise analysis in AM, DSB, SSB and FM Modulation System, Threshold effect in Angle Modulation System, Pre- emphasis, and de-emphasis

Pulse Modulation

Types of Pulse modulation-PAM, PWM and PPM, Comparison of FDM and TDM.

UNIT - III

Detection and Estimation: Model of Digital Communication Systems, Geometric

Interpretation of Signals, Gram-Schmidt Orthogonalization, Response of Bank of correlators to Noisy Input, Detection of Known Signals in Noise, Probability of error, Optimum Receivers Using Coherent Detection: Matched filter Receiver and its Properties, Correlation receiver, Detection of signals with unknown Phase in Noise

Base Band Shaping for Data Transmission: Requirements of a line encoding format, various Line encoding formats- Unipolar, Polar, Bipolar, Discrete PAM signals, Inter symbol interference, Nyquist's criterion, Correlation coding: Duobinary signaling, Modified Duobinary technique, generalized form of correlation coding, 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.

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, constellation diagrams.

UNIT - V

Information theory: Entropy, Information rate, Mutual information, Channel capacity of discrete channel, 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, 5th Edition, PHI, 2009.
2. Digital and Analog Communication System – K. Sam Shanmugam, Wiley, 2019.
3. Principles of Communication Systems - Herbert Taub, Donald L Schiling, Goutam Saha, 3rd Edition, McGraw-Hill, 2008.

REFERENCES:

1. Electronic Communications – Dennis Roddy and John Coolean, 4th Edition, PEA, 2004
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH, 2004
3. Communication System - Simon Haykin and Michael Moher, Wiley, 5th edition, 2022

S. B. Sathyanarayana
HEAD OF THE DEPARTMENT
Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
Kuntloor (V), Hayathnagar (M)
Ranga Reddy Dist-501 505

V. Beenu
K. Praveen Kumar



B. D. Jayaram

Subbarao

Subbarao
PRINCIPAL
PALLAVI ENGINEERING COLLEGE
Formerly Nagole Institute of Technology & Science
Kuntloor (V), Abdullapurmet (M)
Ranga Reddy Dist-501 505 Telangana

Subbarao
PROFESSOR & HEAD
Department of Electronics & Communication Engineering
PALLAVI College of Engineering Hyderabad - 500085

PEC404PC: ELECTRONIC CIRCUIT ANALYSIS**B.Tech. II Year II Sem.**

L	T	P	C
3	0	0	3

Course Overview:

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.

Course Outcomes (COs): By the end of this course, students will be able to:

- CO1:** Analyze and classify multistage amplifier configurations and determine the impact of coupling schemes on amplifier performance and frequency response.
- CO2:** Apply the hybrid- π transistor model to evaluate high-frequency behavior of common-emitter amplifiers and calculate gain-bandwidth product.
- CO3:** Examine feedback amplifier types and assess the influence of negative feedback on gain stability, bandwidth, and distortion.
- CO4:** Design and analyze LC, RC, and crystal oscillators based on the Barkhausen criterion to generate sinusoidal waveforms.
- CO5:** Design power amplifiers and multivibrator circuits, and evaluate their performance in terms of efficiency, distortion, and waveform generation.

Course Articulation Matrix:

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	1	1	0	0	0	0	0
CO2	3	3	3	2	2	0	0	0	0	0	1
CO3	3	3	3	2	2	1	0	0	0	0	1
CO4	3	3	3	2	2	0	0	0	0	0	1
CO5	3	3	3	2	2	1	0	0	0	0	1

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 amplifiers, Cascade and Cascode amplifiers, Darlington pair amplifier.

High-Frequency Transistor Model: Hybrid- π model, Hybrid- π parameters: Conductances and capacitances, CE short-circuit current gain, Gain with resistive load and 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 phase shift, Wien

bridge, Crystal oscillator: 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.

UNIT - V:

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

Time Base Generators: General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators, Linearity improvement techniques

TEXT BOOKS:

1. Millman, Jacob, and Christos C. Halkias. *Electronic Devices and Circuits*. McGraw-Hill Education, 2008.
2. Bell, David A. *Electronic Devices and Circuits*. Oxford University Press, 2008.
3. Sedra, Adel S., and Kenneth C. Smith. *Microelectronic Circuits*. 7th ed., Oxford University Press, 2015.

REFERENCE BOOKS:

1. Boylestad, Robert L., and Louis Nashelsky. *Electronic Devices and Circuit Theory*. 11th ed., Pearson Education, 2013.
2. Millman, Jacob, and Arvin Grabel. *Microelectronics*. 2nd ed., McGraw-Hill, 1987.
3. Malvino, Albert Paul. *Electronic Principles*. 7th ed., McGraw-Hill Education, 2007.
4. Millman, Jacob, and Herbert Taub. *Pulse, Digital, and Switching Waveforms*. McGraw-Hill Education, 1991.

HEAD OF THE DEPARTMENT
Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
Kuntloor (V), Hayathnagar (M)
Ranga Reddy Dist-501 505

V. Blesta



PRINCIPAL
PALLAVI ENGINEERING COLLEGE,
Formerly Nagole Institute of Technology & Sciences
Kuntloor (V), Abdullapurmet (M)
Hyderabad, R.R. Dist-501505, Telangana

PROFESSOR & HEAD
Department of Electronics & Communication Engineering
PALLAVI COLLEGE OF ENGINEERING Hyderabad - 500085

PEC405PC: LINEAR AND DIGITAL IC APPLICATIONS**B.Tech. II Year II Sem.**

L	T	P	C
3	0	0	3

Pre-requisite: Switching Theory and Logic Design.**Course Objectives:** The main objectives of the course are:

1. To introduce the basic building blocks of linear integrated circuits.
2. To introduce the theory and applications of analog multipliers and PLL.
3. To introduce the concepts of waveform generation and introduce some special function ICs.
4. To understand and implement the working of basic digital circuits.

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

1. A thorough understanding of operational amplifiers with linear integrated circuits.
2. Attain the knowledge of functional diagrams and design applications of IC555 and IC565.
3. Acquire the knowledge and design the Data converters.
4. Understanding of the different families of digital integrated circuits and their characteristics.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	1	-	-	-	-	-	-	-
CO2	3	3	3	1	-	-	-	-	-	-	-
CO3	3	3	3	1	-	-	-	-	-	-	-
CO4	3	3	2	1	-	-	-	-	-	-	-

UNIT - I**Operational Amplifier**

Ideal and Practical Op-Amp Characteristics, Features of 741 Op- Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

UNIT - II**Op-Amp, IC-555 & IC565 Applications**

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, Square Wave, IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, principle and Applications.

UNIT - III**Data Converters**

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**Combinational Logic ICs**

Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code

Converters, Decoders, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT - V

Sequential Logic IC's and Memories

Familiarity with commonly available 74XX & CMOS40XX Series ICs- All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.

Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

TEXT BOOKS

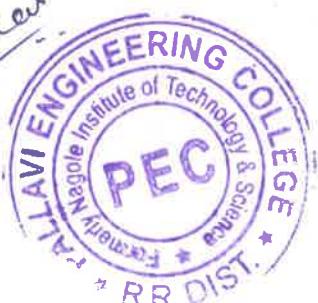
1. Op-Amps & Linear ICs- Ramakanth A. Gayakwad, PHI, 2003.
2. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Ed., 2005.

REFERENCE BOOKS

1. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.
2. Digital Design Principles and Practices – John. F. Wakerly, Pearson 3rd Ed., 2009.
3. Linear Integrated Circuits and Applications – Salivahana, TMH, 2008.
4. Operational Amplifiers with Linear Integrated Circuits, 4th Ed., William D. Stanley, Pearson Education India, 2009.

S. B. Ramaiah
HEAD OF THE DEPARTMENT
Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
Kuntloor (V), Hayathnagar (M)
Ranga Reddy Dist-501 505

V. B. Reddy
K. Pratika Reddy



M. Subrahmanyam Om Prakash
M. Subrahmanyam Om Prakash

D
PRINCIPAL
PALLAVI ENGINEERING COLLEGE
Formerly Nagole Institute of Technology & Science
Kuntloor (V), Abdullapurmet (M)
Hyderabad, R.R. Dist-501505, Telangana

K. Rao
PROFESSOR & HEAD
Department of Electronics & Communication Engineering
Institute of Engineering Hyderabad - 500085

PEC407PC: ANALOG AND DIGITAL COMMUNICATIONS LAB**B.Tech. II Year II Sem.****L T P C**
0 0 2 1**Course Outcomes:**

CO1: Will be able to design and implement various Analog modulation and demodulation Techniques and observe the time and frequency domain characteristics of these modulated Signals

CO2: Will be able to design and implement various Pulse modulation and demodulation Techniques and observe the time and frequency domain characteristics of these modulated Signals

CO3: Will be able to understand the concept of aliasing and different types of Sampling with various Sampling rates and duty Cycles by implementing practically

CO4: Will be able to design and implement various Digital modulation and demodulation Techniques and observe the waveforms of these modulated Signals practically

Cours e	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	-	3	1	2	2	-	2	3	2	-
CO2	1	-	3	1	2	2	-	2	3	2	-
CO3	1	-	3	1	2	2	-	2	3	2	-
CO4	1	-	3	1	2	2	-	2	3	2	-

Note:

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

List of Experiments:

1. Generate Amplitude modulated Signal and perform demodulation for different modulation indices. Plot the corresponding waveforms and their spectrum. Compare the modulation 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. Plot the corresponding waveforms and their spectrum. Compare the modulation 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.

V. Bala
HEAD OF THE DEPARTMENT
Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
Kuntloor (V), Hayathnagar (M)
Ranga Reddy Dist-501 505



V. Bala
PRINCIPAL
PALLAVI ENGINEERING COLLEGE
Formerly Nagole Institute of Technology & Science
Kuntloor (V), Abdullahpurmet (M)
Telangana
R.R. Dist-501505.

V. Bala
PROFESSOR & HEAD
Department of Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE, Hyderabad - 500085

PEC408PC: ELECTRONIC CIRCUIT ANALYSIS LAB**B.Tech. II Year II Sem.****L T P C**
0 0 2 1**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.

Course Outcomes (COs): Upon successful completion of this lab, students will be able to:

- CO1:** Design and analyze multistage and power amplifiers and evaluate their frequency response and efficiency.
- CO2:** Implement and examine feedback and oscillator circuits and validate theoretical conditions for sustained oscillations.
- CO3:** Develop and interpret waveform generation circuits such as multivibrators and time base generators.
- CO4:** Perform simulations to validate analog circuit performance using industry-standard software tools.
- CO5:** Correlate practical results with theoretical predictions and identify deviations due to real-world constraints.

Course Articulation Matrix:

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	2	2	1	-	-	-	-	-
CO2	3	3	3	2	2	1	-	-	-	-	-
CO3	3	3	3	2	1	-	-	-	-	-	-
CO4	2	2	3	3	3	-	-	-	-	-	1
CO5	3	3	2	3	2	1	-	-	-	-	1

List of Experiments:**A. Hardware Experiments (7):**

Perform practical design, implementation, and waveform analysis of amplifiers, 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 gain enhancement and study coupling capacitance effects.
2. Design Hartley and Colpitts oscillators for a specified frequency and observe their output waveforms.
3. Design an RC phase shift oscillator and derive the practical gain condition for oscillations at a given frequency.
4. Design a transformer-coupled class A power amplifier, observe input/output waveforms, and calculate efficiency.
5. Design a class B power amplifier, analyze input/output waveforms, and evaluate harmonic distortion.
6. Design a bistable multivibrator, analyze commutating capacitor effects, and record

transistor waveforms.

7. Design an astable multivibrator and observe transistor base and collector waveforms.

B. Software Simulations (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 four feedback amplifier topologies and compare their frequency responses with and without feedback.
 2. Simulate a monostable multivibrator and analyze its input/output waveforms.
 3. Simulate a Schmitt trigger for gain values greater than and less than one and analyze response behavior.
 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 crossover distortion.
 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 ($\pm 15V$, 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)
 8. Transformers (for power amplifiers)
 9. Inductors, Crystals (1 MHz, 4 MHz, etc.)
 10. Heat sinks, transistors for power stages (e.g., TIP41, TIP42 etc.)

~~Dr. B. S. Reddy~~
HEAD OF THE DEPARTMENT
Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
Kuntloor (M), Hayathnagar (M)
Ranga Reddy Dist-501 505

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PRINCIPAL
PALLAVI ENGINEERING COLLEGE
Formerly Nagole Institute of Technology & Science
Kuntloor (V), Abdullapurmet (M)
Taluk, R.R. Dist-501505, Telangana

PEC409PC: LINEAR AND DIGITAL IC APPLICATIONS LAB**B.Tech. II Year II Sem.**

L	T	P	C
0	0	2	1

Course Outcomes:

CO1: Design and implementation of various analog circuits using 741

ICs. CO2: Design and implementation of various Multivibrators using

555 timer CO3: Design and implement various circuits using digital ICs

CO4: Design and implement ADC, DAC and voltage regulators.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	0	3	3	3	-	-	-	3	3	-
CO2	1	0	3	3	3	-	-	-	3	3	-
CO3	1	0	3	3	3	-	-	-	3	3	-
CO4	1	0	3	3	3	-	-	-	3	3	-

Note:

- Minimum 12 experiments should be conducted.
- Verify the functionality of the IC in the given application.

List of 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 Comparator using Op-Amp and draw the comparison results of $A=B$, $A < B$, $A > B$.
4. Design a Integrator and Differentiator Circuits using IC741 and derive the required condition practically.
5. Design a Active LPF, HPF cutoff frequency of 2 KHz and find the roll off of it.
6. Design a Circuit using IC741 to generate sine / square / triangular wave with period of 1 KHz and draw the output waveform.
7. Construct Mono-stable Multivibrator using IC555 and draw its output waveform.
8. Construct Astable Multivibrator using IC 555 and draw its output waveform and also find its duty cycle.
9. Design a Schmitt Trigger Circuit and find its LTP and UTP.
10. Design Frequency modulator and demodulator circuit and draw the respective waveforms.
11. Design Voltage Regulator using IC723, IC 7805 / 7809 / 7912 and find its load regulation factor.
12. Design R-2R ladder DAC and find its resolution and write a truth table with respective voltages.
13. Design Parallel comparator type / counter type / successive approximation ADC and find its efficiency.
14. Design a Gray code converter and verify its truth table.
15. Design an even priority encoder using IC74xx and verify its truth table.
16. Design a 8x1 multiplexer using digital ICs.
17. Design a 4-bit Adder / Subtractor using digital ICs and Add / Sub the following bits.

(i) 1010	(ii) 0101	(iii) 1011
0100	0010	1001.
18. Design a Decade counter and verify its truth table and draw respective waveforms.
19. Design a Up/downcounter using IC74163 and draw read/write waveforms.

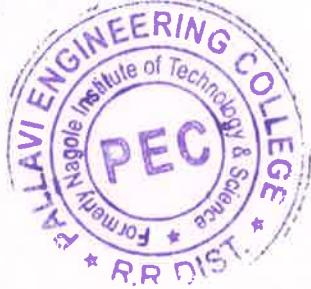
PR25 B.Tech. ECE Syllabus

PEC Hyderabad

20. Design a Universal shift register using IC74194 / 195 and verify its shifting operation.
21. Design a 16x4 RAM using 74189 and draw its read /write operation.
22. Design a 8x3 encoder / 3x8 decoder and verify its truth table.

~~S. B. Bellamkonda~~
HEAD OF THE DEPARTMENT
Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
Kuntloor (V), Hayathnagar (M)
Ranga Reddy Dist-501 505

~~V. Bellamkonda~~
K. Praveen Kumar



~~B. D. Venkatesh~~

~~M. Jayachandran~~
~~M. Jayachandran~~

~~D. S. Venkatesh~~
PRINCIPAL
PALLAVI ENGINEERING COLLEGE
Formerly Nagole Institute of Technology & Science
Kuntloor (V), Abdullapurmet (M)
R.R. Dist. 501 505

~~K. Venkatesh~~

PEC104ES: ELECTRONIC DEVICES AND CIRCUITS**B.Tech. I Year I Sem. (CSE, CSC, CSD)**

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 of basic electronic circuits. The course also explores rectifiers, voltage regulation, amplifier design, and advanced semiconductor technologies like FinFETs and CNTFETs. Emphasis is placed on developing a strong foundation for analog circuit design and understanding modern device technologies in electronics.

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

CO1: Analyze the electrical characteristics and models of semiconductor diodes and apply them in rectifier and clipping circuits.

CO2: Evaluate the operation and configurations of Bipolar Junction Transistors (BJTs) and analyze their input and output characteristics.

CO3: Design appropriate biasing networks for BJTs and determine the operating point for amplifier applications.

CO4: Analyze transistor amplifier circuits using h-parameter models and assess performance for various configurations.

CO5: Analyze the structure, working, and characteristics of JFETs, MOSFETs, and advanced devices like FinFETs and CNTFETs, and compare modern device technologies.

Course Articulation Matrix

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	1	1	-	-	-	-	-
CO2	3	3	2	2	1	-	-	-	-	-	-
CO3	3	3	3	2	1	-	-	-	-	-	-
CO4	3	3	3	2	2	-	-	-	-	-	1
CO5	3	3	2	2	2	1	-	-	-	-	2

Syllabus:**UNIT - I:**

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

UNIT - II:

Bipolar Junction Transistor (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.

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, CC amplifier analysis using h-parameters, Approximate CE model – with and without emitter bypass capacitor.

UNIT - V:

Special Purpose Diodes: Principle of Operation of – SCR, Tunnel Diode, Varactor Diode, Photo Diode, Solar Cell, LED and Schottky Diode

Field Effect Transistors and Advanced Devices: JFET: Structure, operation, and characteristics, MOSFET: Enhancement and Depletion modes – Structure, operation, and characteristics, Advanced Devices: FinFETs - 3D structure, Scaling advantages, CNTFETs - Structure, ballistic transport, fabrication, Comparison: CMOS vs. FinFET vs. CNTFET.

TEXT BOOKS:

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

REFERENCE BOOKS:

6. Bell, David A. *Electronic Devices and Circuits*. Oxford University Press, 5th ed., 2008.
7. Neamen, Donald A. *Electronic Circuit Analysis and Design*. McGraw-Hill, 2nd ed., 2001.
8. Salivahanan, S., and N. Suresh Kumar. *Electronic Devices and Circuits*. McGraw-Hill Education, 4th ed., 2017.
9. Razavi, Behzad. *Fundamentals of Microelectronics*. Wiley, 2nd ed., 2013.
10. Taur, Yuan, and Tak H. Ning. *Fundamentals of Modern VLSI Devices*. Cambridge University Press, 2nd ed., 2009.

HEAD OF THE DEPARTMENT
Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
Kuntloor (V), Hayathnagar (M)
Ranga Reddy Dist-501 505

V. Bapat

K. Ravikumar



B. D. S. *Devi*

K. Keeley

Y. Geetha *Geetha*

Abdullah *Abdullah*

PRINCIPAL
PALLAVI ENGINEERING COLLEGE
Formerly Nagole Institute of Technology & Science
Kuntloor (V), Abdullapurmet (M)
Hyderabad, R.R. Dist-501 505, Telangana

PROFESSOR & HEAD
Department of Electronics & Communication Engineering
JNTUH College of Engineering Hyderabad - 500085

PEC205ES: ELECTRONIC DEVICES AND CIRCUITS**B.Tech. I Year II Sem (CSE-AIML)**

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 of basic electronic circuits. The course also explores rectifiers, voltage regulation, amplifier design, and advanced semiconductor technologies like FinFETs and CNTFETs. Emphasis is placed on developing a strong foundation for analog circuit design and understanding modern device technologies in electronics.

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

- CO1: Analyze the electrical characteristics and models of semiconductor diodes and apply them in rectifier and clipping circuits.
- CO2: Evaluate the operation and configurations of Bipolar Junction Transistors (BJTs) and analyze their input and output characteristics.
- CO3: Design appropriate biasing networks for BJTs and determine the operating point for amplifier applications.
- CO4: Analyze transistor amplifier circuits using h-parameter models and assess performance for various configurations.
- CO5: Analyze the structure, working, and characteristics of JFETs, MOSFETs, and advanced devices like FinFETs and CNTFETs, and compare modern device technologies.

Course Articulation Matrix

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	1	1	-	-	-	-	-
CO2	3	3	2	2	1	-	-	-	-	-	-
CO3	3	3	3	2	1	-	-	-	-	-	-
CO4	3	3	3	2	2	-	-	-	-	-	1
CO5	3	3	2	2	2	1	-	-	-	-	2

Syllabus:**UNIT - I:**

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

UNIT - II:

Bipolar Junction Transistor (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.

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, CC amplifier analysis using h-parameters, Approximate CE model – with and without emitter bypass capacitor.

UNIT - V:

Special Purpose Diodes: Principle of Operation of — SCR, Tunnel Diode, Varactor Diode, Photo Diode, Solar Cell, LED and Schottky Diode

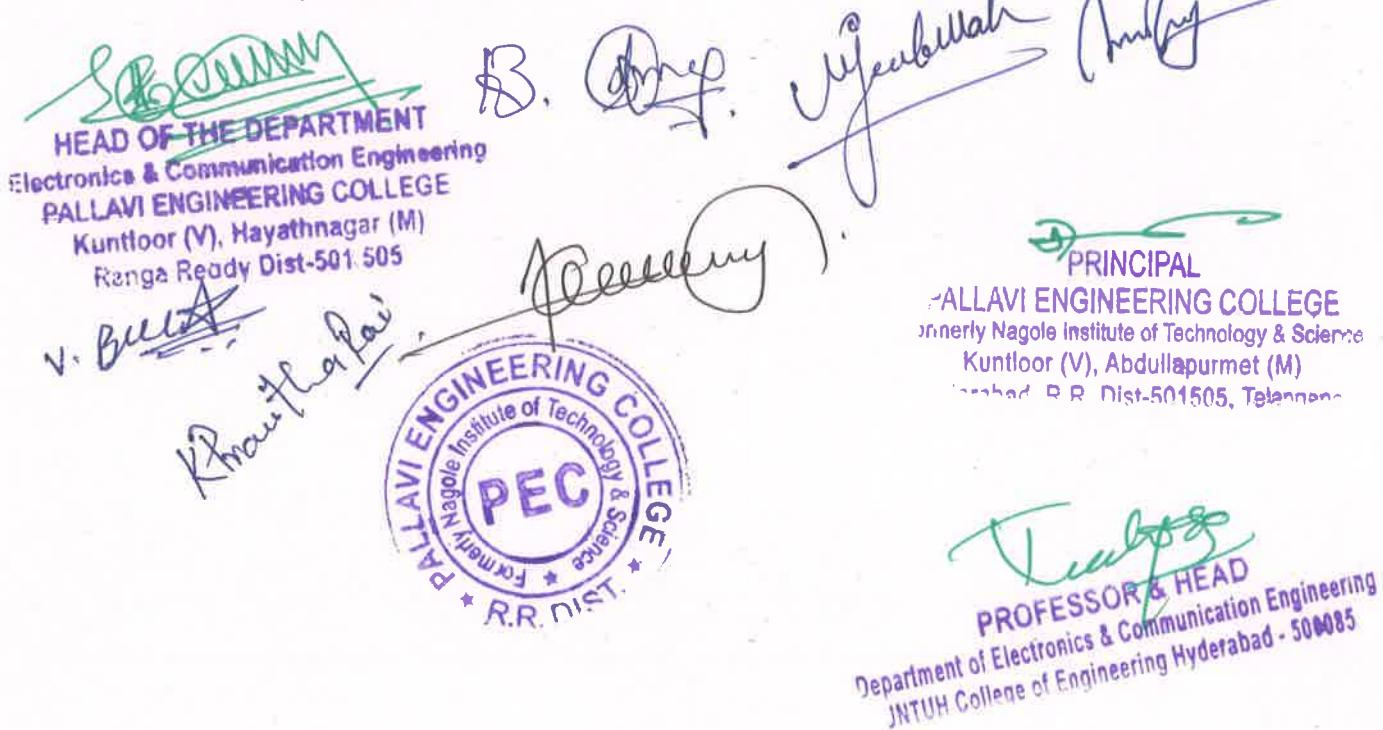
Field Effect Transistors and Advanced Devices: JFET: Structure, operation, and characteristics, MOSFET: Enhancement and Depletion modes — Structure, operation, and characteristics, Advanced Devices: FinFETs - 3D structure, Scaling advantages, CNTFETs - Structure, ballistic transport, fabrication, Comparison: CMOS vs. FinFET vs. CNTFET.

TEXT BOOKS:

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

REFERENCE BOOKS:

11. Bell, David A. *Electronic Devices and Circuits*. Oxford University Press, 5th ed., 2008.
12. Neamen, Donald A. *Electronic Circuit Analysis and Design*. McGraw-Hill, 2nd ed., 2001.
13. Salivahanan, S., and N. Suresh Kumar. *Electronic Devices and Circuits*. McGraw-Hill Education, 4th ed., 2017.
14. Razavi, Behzad. *Fundamentals of Microelectronics*. Wiley, 2nd ed., 2013.
15. Taur, Yuan, and Tak H. Ning. *Fundamentals of Modern VLSI Devices*. Cambridge University Press, 2nd ed., 2009..



PEC303PC: ELECTRONIC DEVICES AND CIRCUITS**B.Tech. II Year I Sem. (EEE)**

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 of basic electronic circuits. The course also explores rectifiers, voltage regulation, amplifier design, and advanced semiconductor technologies like FinFETs and CNTFETs. Emphasis is placed on developing a strong foundation for analog circuit design and understanding modern device technologies in electronics.

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

CO1: Analyze the electrical characteristics and models of semiconductor diodes and apply them in rectifier and clipping circuits.

CO2: Evaluate the operation and configurations of Bipolar Junction Transistors (BJTs) and analyze their input and output characteristics.

CO3: Design appropriate biasing networks for BJTs and determine the operating point for amplifier applications.

CO4: Analyze transistor amplifier circuits using h-parameter models and assess performance for various configurations.

CO5: Analyze the structure, working, and characteristics of JFETs, MOSFETs, and advanced devices like FinFETs and CNTFETs, and compare modern device technologies.

Course Articulation Matrix

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	1	1	-	-	-	-	-
CO2	3	3	2	2	1	-	-	-	-	-	-
CO3	3	3	3	2	1	-	-	-	-	-	-
CO4	3	3	3	2	2	-	-	-	-	-	1
CO5	3	3	2	2	2	1	-	-	-	-	2

Syllabus:**UNIT - I:**

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

UNIT - II:

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UNIT - V:

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Field Effect Transistors and Advanced Devices: JFET: Structure, operation, and characteristics, MOSFET: Enhancement and Depletion modes — Structure, operation, and characteristics, Advanced Devices: FinFETs - 3D structure, Scaling advantages, CNTFETs - Structure, ballistic transport, fabrication, Comparison: CMOS vs. FinFET vs. CNTFET.

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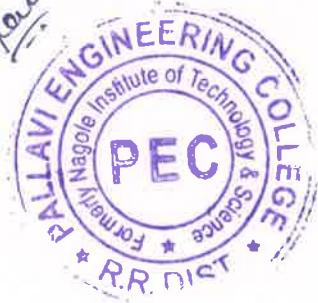
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18. Salivahanan, S., and N. Suresh Kumar. *Electronic Devices and Circuits*. McGraw-Hill Education, 4th ed., 2017.
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S. R. Deekumar
HEAD OF THE DEPARTMENT
 Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
 Kuntloor (V), Hayathnagar (M)
 Ranga Reddy Dist-501 505

V. Bapat

K. Ravatkar



B. S. Rao
Ujwalakar (M)
S. S. Rao
PRINCIPAL
PALLAVI ENGINEERING COLLEGE
 Formerly Nagole Institute of Technology & Science
 Kuntloor (V), Abdullapurmet (M)
 Hyderabad R.R. Dist-501505, Telangana

V. Venkateswaran
PROFESSOR & HEAD
 Department of Electronics & Communication Engineering
 JNTUH College of Engineering Hyderabad - 500085

PCS302PC: COMPUTER ORGANIZATION AND ARCHITECTURE
B.Tech. II Year I Sem. (CSE & Allied Branches) **L T P C**
3 0 0 3

Prerequisites: No prerequisites.

Co-requisite: A Course on “Digital Electronics”.

Course Objectives:

- The purpose of the course is to introduce principles of computer organization and the basic architectural concepts. • It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
- Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

Course Outcomes:

- Understand the basics of instruction sets and their impact on processor design.
- Demonstrate an understanding of the design of the functional units of a digital computer system.
- Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
- Design a pipeline for consistent execution of instructions with minimum hazards.
- Recognize and manipulate representations of numbers stored in digital computers.

UNIT - I:

Boolean Algebra and Logic Gates: Binary codes, Binary Storage and Registers, Binary logic. Digital logic gates. Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation. **Digital Computers:** Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

UNIT - II:

Combinational Logic: Combinational Circuits, Analysis procedure, Design procedure, Binary Adder, Subtractor, Decimal Adder, Binary multiplier, magnitude comparator, Decoders, Encoders, Multiplexers, HDL for combinational circuits. **Sequential Logic:** Sequential circuits, latches, Flip-Flops, Analysis of clocked sequential circuits, state Reduction and Assignment, Design Procedure. Registers, shift Registers, Ripple counters, synchronous counters, other counters.

UNIT III

Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT – IV

Microprogrammed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT – V

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

TEXT BOOKS:

1. Digital Design – M. Morris Mano, Third Edition, Pearson/PHI.
2. Computer System Architecture – M. Morris Mano, Third Edition, Pearson/PHI.

REFERENCE BOOKS:

1. Switching and Finite Automata Theory, ZVI. Kohavi, Tata Mc Graw Hill.
2. Computer Organization – Carl Hamacher, Zvonks Vranesic, Safa Zaky, 5th Edition, McGraw Hill.
3. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
4. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

~~S. R. Srinivas~~
HEAD OF THE DEPARTMENT
Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
Kuntloor (M), Mayathnagar (M)
Ranga Reddy Dist-501 505



B. Obrey

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Indrajyoti

Academy

~~D~~ PRINCIPAL
PALLAVI ENGINEERING COLLEGE
Formerly Nagole Institute of Technology & Science
Kuntloor (M), Abdullapurmet (M)
Hyderabad, R.R. Dist-501505, Telangana

~~Veean~~
PROFESSOR & HEAD
Department of Electronics & Communication Engineering
Pallavi Engineering College of Engineering Hyderabad - 500085

PEE301PC: ELECTROMAGNETIC FIELDS**B.Tech. II Year I Sem. (EEE)****L T P C**
3 0 0 3**Prerequisites:** Mathematics & Physics**Course Objectives:**

- To introduce the concepts of electric field and magnetic field.
- To know Applications of electric and magnetic fields in the development of the theory for power transmission lines and electrical machines.
- To study about electromagnetic waves.

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

- Understand the basic laws of electromagnetism and their applications.
- Analyze time varying electric and magnetic fields.
- Understand the propagation of EM waves.

Course Objectives	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
To introduce the concepts of electric field and magnetic field	3	3	2	1	2	-	-	-	-	-	-	2
To know Applications of electric and magnetic fields in the development of the theory for power transmission lines and electrical machines.	3	3	1	2	2	-	-	-	-	-	-	2
To study about electromagnetic waves	3	3	1	1	2	-	-	-	-	-	-	2

Course Outcomes	Program Outcomes											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
Understand the basic laws of electromagnetism and their applications	3	3	3	2	2	-	-	-	-	-	-	2
Analyze time varying electric and magnetic fields.	3	3	3	1	2	-	-	-	-	-	-	2
Understand the propagation of EM waves	3	2	2	1	1	-	-	-	-	-	-	2

UNIT-I:

Static Electric Field: Review of conversion of a vector from one coordinate system to another coordinate system, Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Absolute Electric potential, potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density.

UNIT-II:

UNIT 11: Conductors, Dielectrics and Capacitance: Current and current density, Ohms Law in Point form, Continuity equation, Boundary conditions of conductors and dielectric materials. Capacitance, Capacitance of a two-wire line, Poisson's equation, Laplace's equation.

UNIT-III:

UNIT 12: Static Magnetic Fields and Magnetic Forces: Biot-Savart Law, Ampere Circuital Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors. Force on a moving charge, Force on a differential current element, Force between differential current elements, Magnetic boundary conditions, Magnetic circuits, Self-inductances and mutual inductances.

UNIT-IV:

Time Varying Fields and Maxwell's Equations: Faraday's laws of Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces.

UNIT-V:

Electromagnetic Waves: Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane wave in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors. Poynting theorem.

TEXT BOOKS:

1. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014.
 2. W. Hayt, "Engineering Electromagnetics", McGraw Hill Education, 2012.

REFERENCE BOOKS:

1. A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.

2. G. W. Carter, "The electromagnetic field in its engineering aspects", Longmans, 1954.

3. W. J. Duffin, "Electricity and Magnetism", McGraw Hill Publication, 1980.

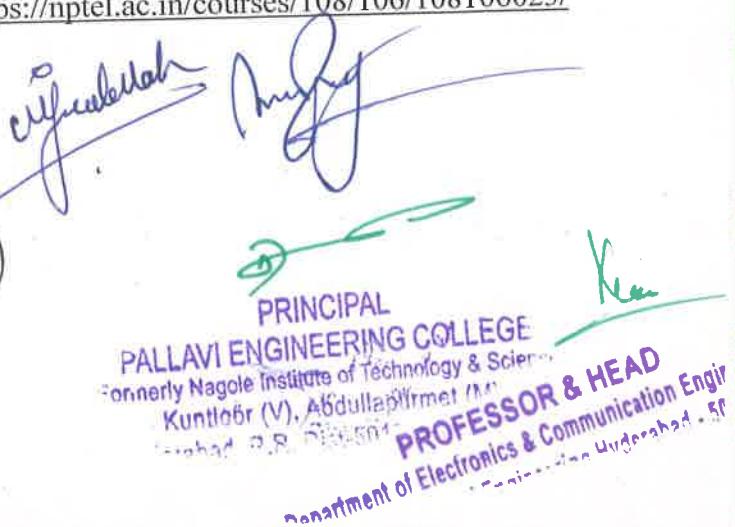
4. W. J. Duffin, "Advanced Electricity and Magnetism", McGraw Hill, 1968.

5. E. G. Cullwick, "The Fundamentals of Electromagnetism", Cambridge University Press, 1966.

6. B. D. Popovic, "Introductory Engineering Electromagnetics", Addison-Wesley Educational Publishers, International Edition, 1971.

7. A. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, New Delhi, 2009.

Online Recourses: 1. <https://nptel.ac.in/courses/108/106/108106073/> 2. <https://nptel.ac.in/courses/115/101/115101005/> 3. <https://nptel.ac.in/courses/108/106/108106023/>



PEE404PC: DIGITAL ELECTRONICS

B.Tech. II Year II Sem. (EEE)

L T P C
3 0 0 3**Prerequisites:** Electronic Devices and Circuits**Course Objectives:**

- To learn fundamental concepts of digital system design and common forms of number representations and their conversions.
- To implement and design logical operations using combinational logic circuits and sequential logic circuits.
- To understand the semiconductor memories and programmable logic devices.

Course Outcomes:

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

- Understand the working of logic families and logic gates.
- Design and implement Combinational and Sequential logic circuits.
- Implement the given logical problems using programmable logic devices.

Course Objectives	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
To learn fundamental concepts of digital system design and common forms of number representations and their conversions	2	1	3	2	1	1	1	1	3	2	1	3
To implement and design logical operations using combinational logic circuits and sequential logic circuits	2	1	3	2	1	1	1	1	3	2	1	3
To understand the semiconductor memories and programmable logic devices	2	2	3	3	2	2	2	1	1	1	3	1

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Understand the working of logic families and logic gates	2	2	3	3	1	2	3	3	1	1	1	1
Design and implement Combinational and Sequential logic circuits	2	2	1	2	3	1	2	2	2	1	1	1
Implement the given logical problems using programmable logic devices	3	2	2	2	2	2	2	1	1	1	1	1

UNIT - I:

Fundamentals of Digital Systems and Logic Families: Digital signals, Digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, Examples of IC gates, Number systems-binary, Signed binary, Octal hexadecimal number, Binary arithmetic, One's and Two's complements arithmetic.

UNIT - II:

Combinational Circuits-I: Standard representation for logic functions, K-map representation and simplification of logic functions using K-map, Minimization of logical functions, Don't care conditions, Multiplexer, De-Multiplexer

UNIT - III:

Combinational Circuits-II: Adders, Subtractors, Carry look ahead adder, Digital comparator, Parity checker/generator, Code converters, Priority encoders, Decoders/Drivers for display devices, Q-M method of function realization.

UNIT - IV:

Sequential Circuits: Introduction to flip-flops, SR, JK, T and D type's flip-flops, Shift registers, Conversion of flip-flops, Ring counter, Ripple (Asynchronous) counters, Synchronous counters.

UNIT - V:

Semiconductor Memories and Programmable Logic Devices: Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read-only memory (ROM), ROM types, Read and write memory (RAM) types, Programmable logic array, Programmable array logic, Field Programmable Gate Array (FPGA).

TEXT BOOKS:

1. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

REFERENCE BOOKS:

1. R.S. Sedha, "A Textbook of Digital Electronics", S. Chand, 2005
2. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

HEAD OF THE DEPARTMENT,
Electronics & Communication Engineering
PALLAVI ENGINEERING COLLEGE
Kunthoor (M), Mayathnagar (M)
Kerala, India Dist-501 505

B. S. Agarwal
A. K. Ghoshal

Subtotal 100000 100000

~~V. Bleeker~~

~~1000~~
K. Franklin
RING CO.
shook



PRINCIPAL
PALLAVI ENGINEERING COLLEGE
Formerly Nagole Institute of Technology & Science
Kuntioor (V), Abdullapurmet (M)
Hyderabad, R.R. Dist-501505, Telangana

Yesss

PROFESSOR & HEAD
Department of Electronics & Communication Engineering
Shri Mata Vaishno Devi College of Engineering Hyderabad - 500025

PEE409PC: DIGITAL ELECTRONICS LAB**B.Tech. II Year II Sem (EEE)****L T P C**
0 0 2 1**Prerequisites: Analog Electronics & Digital Electronics****Course Objectives:**

- To learn basic techniques for the design of digital circuits and number conversion systems.
- To implement simple logical operations using combinational logic circuits.
- To design combinational logic circuits, sequential logic circuits.

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

- Understand the working of logic families and logic gates.
- Design and implement Combinational and Sequential logic circuits.
- Analyze different types of semiconductor memories.

Course Objectives	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
To learn basic techniques for the design of digital circuits and number conversion systems	3	2	3	1	1	1	3	1	2	1	2	3
To implement simple logical operations using combinational logic circuits	3	3	3	2	2	1	3	1	2	2	2	3
To design combinational logic circuits, sequential logic circuits	2	2	1	2	2	1	3	1	2	2	2	3

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Understand the working of logic families and logic gates	2	2	2	3	3	2	1	1	3	3	3	3
Design and implement Combinational and Sequential logic circuits.	2	1	3	1	2	3	3	1	3	2	2	3
Analyse different types of semiconductor memories	1	1	2	1	1	3	3	1	3	3	3	3

List of Experiments:

1. Realization of Boolean Expressions using Gates
2. Design and realization logic gates using universal gates
3. Generation of clock using NAND/NOR gates
4. Design a 4 – bit Adder / Subtractor
5. Design and realization a 4 – bit gray to Binary and Binary to Gray Converter
6. Design and realization of a 4-bit pseudo random sequence generator using logic gates.
7. Design and realization of an 8-bit parallel load and serial out shift register using flip-flops.
8. Design and realization Asynchronous and Synchronous counters using flip-flops
9. Design and realization 8x1 using 2x1 mux
10. Design and realization 2-bit comparator
11. Verification of truth tables and excitation tables
12. Realization of logic gates using DTL, TTL, ECL, etc.,

TEXT BOOKS:

1. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

REFERENCE BOOKS:

1. R.S. Sedha, "A Textbook of Digital Electronics", S.Chand, 2005
2. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

K Pranith Rao
B. Chandra
V. Beera

M. Jay
A. Balaji

Vijayalakshmi

HEAD OF THE DEPARTMENT
Electronics & Communication Engineering
PALAVI ENGINEERING COLLEGE
Kuntloor (V), Mayathnagar (M)
Ranga Reddy Dist-501 505

PRINCIPAL
PALAVI ENGINEERING COLLEGE
Formerly Nagole Institute of Technology & Science
Kuntloor (V), Abdullahpurmet (M)
Hyderabad, R.P. Dist-501505, Telangana

