FACULTY OF ENGINEERING

Scheme of Instructions & Detailed Syllabus of II Year

For

Four Year Degree Programme of

Bachelor of Engineering (B.E)

In

Electronics and Communication Engineering

(Accredited by NBA)

(With effect from the academic year 2022-23)

(Approved by College Academic Council on 28th July, 2022)

Issued by Dean, Academics

METHODIST COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

(Affiliated to Osmania University)

(Accredited by NAAC with "A+" Grade)

Abids, Hyderabad - 500 001, Telangana.

Vision of the Institute

To produce ethical, socially conscious and innovative professionals who would contribute to sustainable technological development of the society.

Mission of the Institute

Ml: To impart quality engineering education with latest technological developments and interdisciplinary skills to make students succeed in professional practice.

M2: To encourage research culture among faculty and students by establishing state of art laboratories and exposing them to modern industrial and organizational practices.

M3: To inculcate humane qualities like environmental consciousness, leadership, social values, professional ethics and engage in independent and lifelong learning for sustainable contribution to the society.

Vision of the Department

To strive to become center of excellence in Education, Research with moral, ethical values and serve society

Mission of the Department

M1: To provide Electronics & Communication Engineering knowledge for successful career either in industry or research

M2: To develop Industry-Interaction for innovation, product-oriented research and development.

M3: To facilitate value added education combined with hands-on trainings.

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PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO-1: Graduate shall have skills to excel in professional career and in applied research through innovative design by acquiring the knowledge in Electronics and Communication Engineering principles

PEO-2: Graduate shall pursue higher education and participate in research and development activities or entrepreneurship to integrate engineering work in the environmental, ethical and broader societal contexts.

PEO-3: Graduate shall exhibit effective communication, good team building and leadership qualities to design socially accepted and economically feasible solutions through multidisciplinary and interdisciplinary approaches for analysis of real-life problems.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Professional Competence: Apply the knowledge of Electronics & Communication Engineering principles in VLSI, Signal processing, Communication, Embedded system & Control Engineering.

PSO2: Technical Skills: Design and implement products using the cutting- edge software and hardware tools.

PSO3: Social consciousness: Demonstrate the leadership qualities and strive for the betterment of organization, environment and society.

B.E. – ECE

(Full - Time)

INDEX

B.E. III Semester

Sl. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs per Week	CIE	SEE	SEE Duration in ours	
Theory Courses										
1	5PC301EC	Electronic Devices	3			3	40	60		3
2	5PC302EC	Signals and Systems	3			3	40	60		3
3	5PC303EC	Network Theory	3			3	40	60		3
4	5PC304EC	Switching Theory and Logic Design	3			3	40	60		3
5	5ES303EC	Probability Theory and Stochastic Processes	3	1		3	40	60		3
6	5HS302HS	Managerial Economics and Financial Accountancy	3			3	40	60		3
7	5MC303HS	Indian Constitution	2			2	40	60		0
8	5ES304EC	Python Programming	2			2	40	60		2
Practical/Laboratory Course										
9	5PC351EC	Electronic Devices and Logic Design Lab	0	0	2	2	40	60		1
10	5PC352EC	Network Theorem Lab	0	0	2	2	40	60		1
11	5ES353CS	Python Programming Laboratory	0	0	2	2	40	60		1
		Total	**22**	**1**	**6**	**28**	**440**	**660**		**23**

III Semester Detailed Syllabus

Course Code	Course Title						Core/ Elective
5PC301EC	**Electronic Devices**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**-**	**0**	**40**	**60**	**3**

Course Objectives

This course aims to familiarize:

1. The concepts of semiconductor devices like PN junction diode, Transistor, and special diodes.
2. The applications of diodes.
3. To familiarize the students with various two terminal and three terminal electronic devices working and usein the design
4. of real time electronic products.
4. Design DC biasing techniques and evaluate A.C parameters for BJT in Amplifier Applications.
5. Explore V-I characteristics of FETs, MOSFETs and study IC fabrication techniques

Course Outcomes

1. Demonstrate understanding of the characteristic behavior of various electronic devices such as Diodes, Transistors etc, and applying them for understanding variouscircuits
2. Evaluate the performance parameters of various diode circuits (rectifiers, clippers and clampers) Identify the merits and demerits of various filters, formulate and design rectifier circuits with filters Calculate ripple factor, efficiency and percentage regulation of rectifier circuits.
3. Discriminate the BJT configurations to recognize appropriate transistor configuration for any given application and design the biasing circuits with good stability.
4. Analyze and design various circuits for different applications in Engineering Field.

UNIT-I

Semiconductor Diode Characteristics: The p-n junction Diode, Energy band diagram, Current equations, V-I characteristics, Temperature dependence, Diode resistance-Static and Dynamic, Transition capacitance, Diffusion capacitance, Zener diode, Avalanche breakdown, Zener breakdown mechanisms – Zener diode as voltage Regulator, Hall effect.

UNIT-II

Diode Applications: Diode as a circuit element, Clipping and clamping circuits, clamping circuit theorem. Half wave, Full wave and Bridge Rectifiers - their operation, performance characteristics-ripple factor calculations, and analysis; Filters (L, C, LC and CLC filters).

Special Purpose Semi-Conductor Devices: Elementary treatment of Silicon Controlled Rectifier (SCR), UJT, Tunnel diode. Schottky diode, LED, Photodiode, Solar cell.

UNIT – III

Bipolar Junction Transistor:

Construction and Operation of Bipolar Junction Transistor, current components, Modes of transistor operation, BJT input and output characteristics of CB, CE, CC configuration, early effect

Biasing and Stabilization: Biasing techniques**,** Stabilization factors, Compensation techniques, Thermal run away, Thermal Stability

UNIT –IV

Small Signal Transistors equivalent circuits: Small signal low frequency h-parameter model of BJT, Approximate model, Analysis of BJT amplifiers using approximate model for CB, CE and CC configurations

UNIT-V

Field Effect Transistor: Junction Field Effect Transistor: Principle of Operation - the Pinch-off Voltage VP, V-I Characteristics of JFET.

MOSFETs: Enhancement & Depletion mode MOSFETs, V-I characteristics, CMOS inverter. Small signal model analysis for FET

Text Books:

1. "Electronic Devices and Circuits", Millman and Halkias , 2nd Edition, McGraw Hill Publication, 2007.
2. "Electronic Devices and Circuit Theory", Robert L. Boylestad, 10th Edition, PHI, 2009.
3. "VLSI Fabrication Principles: Silicon and Gallium Arsenide", S.K. Gandhi, Wiley India Pvt. Ltd., New Delhi, 2nd Edition. 1994.

Suggested Reading:

1. "Integrated Electronics", Jacob Millman, Christos Halkias, Chetan Parikh, McGraw Hill Publication, 2nd Edition, 2009.
2. "Fundamentals of Electronic Devices and Circuits", David Bell, Oxford University Press, 5th Edition , 2008.
3. "Low Power CMOS Circuits Technology, Logic Design and CAD Tools", Christian Piguet, 1st Indian Reprint, CRC Press, 2010.

Course Code	Course Title						Core/ Elective
5PC302EC	**Signals and Systems**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**-**	**0**	**40**	**60**	**3**

Course Objectives:

- Analyze basic concepts related to continuous time signals and systems, mathematical representation of periodic signals.
- Familiarize with basic operations on signals and mathematical representation of aperiodic signals using Fourier and Laplace transform.
- Analyze basic concepts related to discrete time signals and systems, mathematical representation discrete time signals.
- Describe the concept of Z- Transform and its properties and illustrate their applications to analyze systems.
- Define convolution, correlation operations on continuous and discrete time signals.

Course Outcomes

- Define and differentiate types of signals and systems in continuous and discrete time
- Apply the properties of Fourier transform for continuous time signals
- Relate Laplace transforms to solve differential equations and to determine the response of the Continuous Time Linear Time Invariant Systems to known inputs
- Apply Z-transforms for discrete time signals to solve Difference equations
- Obtain Linear Convolution and Correlation of discrete time signals with graphical representation

UNIT-I

Definitions and classifications: Classification of signals. Elementary continuous time signals, Basic operations on continuous-time signals. Classification of continuous-time systems: continuous time & discrete time systems, lumped-parameter & distributed –parameter systems, static & dynamic systems, causal & non-causal systems, Time-invariant & time-variant systems, stable & unstable systems

UNIT-II

Representation of Continuous-time signals: Analogy between vectors and signals, orthogonality and completeness.

Fourier series Analysis of Continuous-time signals: Fourier series – Existence of Fourier series, Trigonometric and Exponential Fourier series, computational formulae, symmetry conditions, complex Fourier spectrum.

UNIT-III

Continuous-time Fourier Transform (FT): The direct and inverse FT, existence of FT, Properties of FT, FT of standard signals, properties of FT, The Frequency Spectrum.

Linear Convolution of continuous time signals: Graphical interpretation, properties of convolution, Correlation between continuous-time signals: Auto and Cross correlation, graphical interpretation, properties of correlation.

Laplace Transform (LT) Analysis of signals and systems: The direct LT, Region of convergence, existence of LT, properties of LT. The inverse LT, Solution of differential equations, system transfer function.

UNIT IV

Discrete-time signals and systems: Sampling, Classification of discrete-time signals, Basic operations on discrete time signals, Classification of discrete time systems, properties of systems.

Linear Convolution of discrete time signals: Graphical interpretation, properties of discrete convolution

Fourier analysis of discrete-time signals: Discrete-time Fourier transform (DTFT), properties of DTFT, Transfer function, Discrete Fourier transform properties of DFT

UNIT V

Z-Transform analysis of signals & systems: The direct Z-transform, Region of convergence, Z-plane and S-plane correspondence. Inverse Z-transform, Properties of Z-transforms. Solution to linear difference equations, linear constant coefficient systems, System transfer function.

Text Books:

1. "Linear Systems and Signals*",* B. P. Lathi, 2nd Edition, Oxford University Press, 2009
2. *"*Signals and System*",* Alan V Oppenheim, A. S. Wlisky,2nd Edition, Prentice Hall.

Suggested Reading:

1. "Introduction to Signals and Systems", Douglas K. Linder, McGraw Hill, 1999
2. "Signals and Systems*",* P. Ramesh babu, R Ananada Natarajan, SCITECH, 3rd edition, 2009
3. "*Signals and Systems",* Rodger E. Ziemer, William H Trenter, D. Ronald Fannin, Pearson ,4th Edition, 1998.

Course Code	Course Title						Core / Elective
5PC303EC	NETWORK THEORY						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	-	-	-	40	60	3

Course Objectives:

- Concepts of Two Port networks, study about the different two port parameter representations.
- Concepts about the image impedance a different network, design of attenuators.
- Design concepts of equalizers.
- Design concepts of different filters.
- Design concepts of network synthesis.

Course outcomes:

- Able to Express given Electrical Circuit in terms of A,B,C,D and Z,Y Parameter Model and Solve the circuits and how they are used in real time applications.
- Able to learn how to calculate properties of networks and design of attenuators.
- Able to design of equalizers.
- Able to design different types of filters using passive elements.
- Able to synthesize the RL & RC networks in Foster and Cauer Forms

UNIT-I

Two Port networks: Z, Y, h, g and ABCD parameters, equivalence of two ports networks, T-PI transforms, Reciprocity theorem, Interconnection of two port networks and Brune's test for inter connections.

UNIT-II

Symmetrical and Asymmetrical Networks: Characteristic impedance and propagation constant of symmetrical T and pi networks, Image and iterative impedances, Image transfer constant and iterative transfer constant of asymmetrical L, T and pi networks,

UNIT-III

Constant k- Filters- Low pass, high pass, band pass and band elimination filter design, m-derived low pass and high pass filter design, Composite filter design and notch filter.

UNIT-IV

Attenuators and Equalizers- Design of symmetrical T, pi, Bridge-T and Lattice attenuators, impedance matching networks, Inverse networks, Equalizers, Constant resistance equalizer, full series and full shunt equalizer**.**

UNIT-V

Network Synthesis: Hurwitz polynomials, positive real functions, Basic Philosophy of Synthesis, L-C Immittance functions, RC impedance functions and RL admittance functions. RL impedance functions and RC admittance functions. Cauer And Foster's forms of RL impedance and RC admittance. Properties of RC, RL Networks**.**

Text Books

1. "Network Lines Fields", Ryder J.D, Prentice Hall of India, 2nd edition, 1991.
2. "Networks, Filters and Transmission Lines*",* P.K. Jain and Gurbir Kau, Tata McGraw- Hill Publishing Company Limited, 1st edition, 1994.

Suggested Reading:

1. "Circuits Networks: Analysis Synthesis", A. Sudhakar and Shyam mohan, Tata McGraw Hill, 4th edition, 2010.
2. "Introduction to Modern Network Synthesis", Van Valkenburg M.E, Wiley Eastern, 1st edition, 1994.
3. "*Network Analysis and Synthesis",* S.P. Ghosh and A.K. Chakraborty, *McGraw* Hill, 1st edition, 2009.

Course code	Course Title						Core/ Elective
5PC304EC	**Switching Theory and Logic Design**						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
	3	0	-	0	40	40	3

Course Objectives:

1. To understand basic number systems, codes and logical gates.
2. To understand the concepts of Boolean algebra.
3. To understand the use of minimization logic to solve the Boolean logic expressions.
4. To understand the design of combinational and sequential circuits.
5. To understand the state reduction methods for Sequential circuits.
6. To understand the basics of various types of memories.

Course Outcomes:

Students will be able to: -

1. To apply the basic concepts of Boolean algebra for the simplification and implementation of logic functions using suitable gates namely NAND, NOR etc.
2. Make use of the concepts to solve the problems related to the logic circuits.
3. Design simple Combinational Circuits such as Adders, Subtractors, Code Convertors, Decoders, Multiplexers, and Magnitude Comparators etc.
4. Identification of gates – application. Understand and Design – concept of FSM, Mealy and Moore machines.
5. Design Sequential Circuits such as different types of Counters, Shift Registers, Serial Adders, and Sequence Generators. Compare various Programmable logic devices

UNIT -I

Number System: Binary, decimal, octal, hexa decimal, weighted and un-weighted codes.

Boolean Algebra: Axiomatic definition of Boolean algebra, Binary operators, postulates of and theorems. Boolean addition, subtraction, 1's complement, 2's complement. Switching functions, Canonical forms and Standard forms, Simplification of switching functions using theorems.

Character coding schemes - ASCII. Arithmetic operations on binary octal, hexadecimal and BCD numbers. Error Detection and Correction – Parity and Hamming code

UNIT – II

Logic gates: Basic gates and universal gates.

Minimization of Switching Functions: simplification rules, Karnaugh map method, Prime implicants, don't care combinations, Minimal SOP and POS forms, Quine-McCluskey Tabular Method, Prime Implicant chart.

UNIT – III

Single output and multiple output combinational logic circuit design, AND-OR, OR-AND, and NAND/NOR realizations, Exclusive-OR and Equivalence functions, Binary adders/subtractors, carry look ahead adder, BCD adder, code converter, magnitude comparator, Encoder, Decoder, Multiplexer, Demultiplexer, MUX realization of switching functions, Parity bit generator, Code-converters, Concepts of threshold logic and threshold gates.

UNIT – IV

Sequential Circuits-1:

Classification of sequential circuits (Synchronous, Asynchronous Pulse mode, and Level mode with examples). Basic flip-flops-Triggering and excitation tables. Conversion of flip-flops.

Sequential Circuits-2:

The sequential circuit model, Asynchronous counters, Design of simple synchronous sequential circuits such as counters (Design of modulo-N counter, Ring counter, twisted ring counter) and Shift registers

UNIT – V

Programmable Logic Devices:

Basic PLD's-ROM, PROM, PLA, and PLD Realization of Switching functions using PLDs.

Algorithmic State Machines:

State machines and state diagrams. Design of weighing machine and binary multiplier.

Text Books:

1. "Digital design" Morris Mano, PHI, 2nd Edition.
2. "Switching & Finite Automata theory" Zvi Kohavi and Niraj K Jha – Cambridge, 3rd Edition.

Suggested Readings:

1. "An Engineering Approach to Digital Design" Fletcher – PHI. -2nd edition.
2. "Fundamentals of Logic Design", Roth, Kenny, Cengage Learning, Seventh Edition.
3. "Digital Logic Applications and Design" John M. Yarbrough – Thomson Publications, 2006.
4. "Switching Theory and Logic Design" CVS Rao, Pearson Education, 2005.

Course Code	Course Title						Core/ Elective
5ES303EC	**PROBABILITY THEORY AND STOCHASTIC PROCESSES**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**1**	**-**	**0**	**40**	**60**	**3**

Course Objectives:

- To understand fundamentals of probability and random variables as applicable to Electronic Engineering.
- To learn one Random variable characteristic function of different variables using their density functions.
- To learn Two Random variable characteristic functions of different variables using their density functions.
- To understand elementary concepts of the stochastic processes and their temporal characteristics.
- To understand elementary concepts of the stochastic process and their spectral characteristics.

Course Outcomes:

Upon completing this course, the student will be able to

- To understand different types of Random variables their density and distribution functions.
- To learn one Random variable characteristics of different variables their density and distribution functions.
- To Extend their bi-variate distributions and the operations on them.
- To understand elementary concepts of the stochastic process in to Temporal characteristics.
- To understand elementary concepts of the stochastic process in to spectral characteristics.

UNIT–I: Probability & Random Variable: Probability introduced through Sets and Relative Frequency, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Baye's Theorem, Independent Events, *Random Variable-* Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable.

UNIT -II: Distribution & Density Functions and Operations on One Random Variable

Distribution and Density functions and their Properties - Binomial, Poisson, Uniform, Gaussian, Rayleigh, Methods of defining Conditional Event, Conditional Density, Properties. Expected Value of a Random Variable, Function of a Random Variable g(x) and its distribution, Moments about the Origin, Central Moments, Variance and Skew, Chebyshev's Inequality (no proof), Characteristic Function, Moment Generating Function; Transformations of Random Variables.

UNIT-III: Two Random Variables and operations

Joint Distribution and Density Functions and their properties, Joint Moments, Joint Characteristic Functions, Conditional Distributions (Point & Interval), Conditional Expected Values. Marginal distribution functions, statistical independence, sum of two random variables, Central Limit Theorem

(no proof); Engineering application (theoretical discussion) – Mutual information, Channel Capacity and Channel Coding.

UNIT-IV Stochastic Processes – Temporal Characteristics

Introduction to stationary (First and Second order; WSS; SSS), statistical independence, Time averages and ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Auto correlation Function and its Properties, Cross-Correlation Function and its Properties, Covariance and its Properties. Linear System Response of Mean and Mean-squared Value.

UNIT-V Stochastic Processes – Spectral Characteristics

Power Density Spectrum and its properties; Relationship between Power Density Spectrum and Autocorrelation Function; Relationship between Cross-Power Density Spectrum and Cross-Correlation Function; White and colored noise, response to linear systems and stochastic inputs, concept of Markov Processes.

Text Books:

1. "Probability and Random Processes with Application to Signal Processing", Henry Stark and John W. Woods, Pearson Education, 3rd edition, 2014.
2. "Probability, Random Variables and Stochastic Processes", Athanasius Papoulis and S. Unni krishna Pillai, McGraw Hill, 4th edition, 2006.

Suggested Readings:

1. "Probability Random Variables & Random Signal Principles", Peyton Z. Peebles, Tata McGraw Hill, 4th edition, 2001.
2. "Probability statistics and Random processes" , k. Murugeshan and P.Guruswamy , Anuradha Agencies, 3rd edition, 2003.
3. "Random processes for Engineers", Bruce Hajck, Cambridge unipress, 2nd edition ,2015.

Course Code	Course Title						Core/ Elective
5HS302HS	**Managerial Economics & Financial Accountancy**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	0	-	0	40	60	3

Course Objectives

The objective of this course is to impart knowledge of the

1. To understand responsibilities of a manager of a business undertaking.
2. To analyse various determinants influencing demand and price
3. To understand the principles of accounting and prepare Journal, Ledger, Trial Balance & Final accounts
4. To understand financial statement Analysis
5. To evaluate & analyse the long-term investments

Course Outcomes

1. Determine the responsibilities & decision making in the Organization
2. Understand various factors influencing demand & market structure
3. Understand the principles of accounting & solve the problems
4. Analyze the Financial performance
5. Understand the capital structure & to take decision on selection of projects

UNIT-I

Introduction to Managerial Economics its Scope, Importance and relation to other sciences, its usefulness to Engineers-Basic concepts of Managerial Economics - Theory of firm.

UNIT-II

Demand Analysis: Introduction to demand, determinants, law of demand, its assumptions, Elasticity of demand-price, income and cross elasticity, demand forecasting, Market competitive structure, price & output determination under perfect competition and Monopoly.

UNIT-III

Basics of Accounting: Financial Accounting–Definition- Accounting Cycle Journal - Ledger and Cash book - Trial Balance Book- Preparation of final accounts with simple adjustments (including Problems)

UNIT-IV

Financial statement Analysis: - Importance-Users-Ratio Analysis-liquidity, solvency, turnover and profitability ratios.

UNIT-V

Capital management: Significance, determinates and estimation of fixed and working capital requirements, sources of capital. Introduction to capital budgeting, Time Value of money - Methods: Non-Discounted cash flow methods (pay back, ARR), Discounted (NPV, PI, IRR) with problems.

Text Books:

1. Mehta P.L., Managerial Economics, Sultan Chand & Sons Publishers
2. Managerial Economics - **A Problem Solving Approach**, by Luke M Froeb

Suggested Readings:

1. I.M.Panday Financial Management, Vikas Publishing House.
2. Maheswari S.N. Introduction to Accountancy. Vikas Publishing House
3. R.L.Varshney, K. L. Maheshwari, Managerial Economics, Sultan Publishers
4. D.M.Mithani, Managerial Economics, Himalaya Publishing House.

Course Code	Course Title						Core/ Elective
5HS302HS	**INDIAN CONSTITUTION**						**MC**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**-**	**0**	**40**	**60**	**3**

Course Objectives:

- To create awareness and relevance of the Indian Constitution, its directive principles.
- To impart understanding of the role, powers and functions of administration at the Central,State and local levels.
- To expose students to the relations between Central/Federal, State and Provincial units,divisions of executive, legislative and judiciary in them.
- To impart knowledge about the statutory institutions and their role.

Course Outcomes:

- Have a general knowledge and back ground about the Constitution of India and its importance.
- Will distinguish and understand the working of the Central, state and provincial levels of administration.
- Will be conscious about the fundamental duties, responsibilities and rights as an ideal citizen of India
- Will be able to perceive and interpret the functioning and distribution of resources between centre and state.
- Have an awareness and relate to the existing hierarchy of the social structure, election process and grievance redressal in a democracy.

UNIT- I

Introduction to Constitution- Meaning, reasons for having a constitution. Evolution of the Indian Constitution: History, 1909 Act, 1919 Act and 1935 Act. Constituent Assembly: Composition and Functions; Preable- its importance and key words; Fundamental features of the Indian Constitution. Emergency powers

UNIT -II

Style of Governance adopted, Structure of the Indian Union, Relationship between bodies in hierarchy.

Union Government: Executive-President, Prime Minister, Council of Minister-role, position and powers.

State Government: Executive: Governor, Chief Minister, and Council of Minister -role, position and powers.

Local Government: Panchayat Raj Institutions, Rural and Urban local bodies-composition, role, position and powers.

UNIT - III

-Rights and Duties: Fundamental Rights- importance and salient features,

-Directive principles of State Policy-meaning and purpose, classification, importance and implementation

-Fundamental Duties of a good citizen.

UNIT-IV

Relation between Federal and Provincial units:

-Union-State relations: Administrative, legislative and Financial, Inter-State council, NITI Ayog, Finance Commission of India.

-Judiciary: Meaning and Functions, Conditions of independence of judiciary, Composition and powers of Supreme court, judicial activism and judicial restraint.

UNIT - V

-Constitutional bodies: Finance Commission, the UPSC, the Election Commission, the CAG, National Commissions for SCs and STs, etc.

-Statutory Institutions: Securities & Exchange Board of India, National Human Rights Commission, National Commission for Women, National Commission for Minorities, National Green Tribunal, National Commission for Protection of Child Rights etc.

Suggested Readings:

1. Introduction to the Constitution of India, Durga Das Basu, 25th Edition, English-Hardcover – 1 January 2021, by Dr. Durga das Basu (Author), ASIN:B091Q92R7R Publisher:Lexis Nexis, New Delhi.National Book Trust Our Parliament By Subhash Kashyap in English.
2. The Constitution of India, PM Bhakshi, 1 January 2017, English, Paperback, Publisher Universal Law Publishing - An imprint of Lexis Nexis.
3. National Book Trust Our Parliament By Subhash Kashyap-English Medium, ISBN 19788123701479, Publication National Book Trust-New Delhi.
4. Indian Government and Politics Paperback by Peu Ghosh (Author) Publisher: Prentice Hall India Learning Private Limited (1 January 2012), English, Paperback, ISBN-10: 8120346491; ISBN-13 : 978-8120346499.
5. Indian Government and Politics, Authors: Dr. B.L. Fadia, Dr. Kuldeep Fadia, ISBN: 978-93 84885-62-5, Sahithya Bhavan Publications, Agra.

Course Code	Course Title						Core/ Elective
5MC304EC	**PYTHON PROGRAMMING**						**Mandatory**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Basic Mathematics	**2**	**2**	**-**	**-**	**40**	**60**	**2**

Course Objectives

1. To learn how to use lists, tuples, and dictionaries in Python programs.
2. To learn how to write loops and decision statements in Python.
3. To learn how to read and write files in Python.
4. To learn how to use exception handling in Python applications for error handling.

Course Outcomes

1. Explain basic principles of Python programming language.
2. Create, run, and manipulate Python Programs using core data structures like Lists, Tuple, Set and Dictionaries.
3. Understand and summarize different File handling operations.
4. Handle exceptions in programming.

UNIT-I

Basics of Python: Algorithms, building blocks of algorithms (statements, state, control flow), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms. Python Basics, Features of Python, Python Applications, Installing and running Python with Different IDEs, Comments in Python, Memory Management in Python, Garbage Collection in Python, Python I/O : Printing to the Screen, Reading Keyboard Input.

UNIT-II

Python Operators: Arithmetic, Relational and Comparison Operators, Python Assignment Operators, Logical Operators and Bitwise Operators, Membership Operators, Identity Operators, Operator Precedence and Associativity, Evaluating Expressions. Control Statements: A Word on Indentation, the if Statement, The if … else Statement, The if … elif … else Statement, The while Loop, The for Loop, Infinite Loops, Nested Loops, Loop manipulation using pass, continue, break and else Statement.

UNIT-III

Variables and Data Types in Python: How Python Sees Variables, Constants, Identifiers and Reserved words in Python, Naming Conventions in Python. Declaring and using Numeric data types: int, float, complex and Boolean, Sequences: Using String data type, Lists and Tuples, Methods and Useful Built-in Functions, Dictionaries and Set Types

UNIT-IV

Python Programming using functions, **modules, and packages**: Organizing python codes using functions, Formal and Actual Arguments, Positional Arguments, Keyword Arguments, Default Arguments, Variable Length Arguments, Pass by Object Reference, Local and Global Variables, Scope and Lifetime of variables, Nested Functions, Recursive Functions, Powerful Lambda function.

UNIT-V

Python File Input-Output: Opening and closing file, Various types of file modes, reading and writing to files. Python Exception Handling: Avoiding code break using exception handling, Various keywords to handle exception, try .. exception else … finally, Raising Exceptions, Assertions, Python Custom Exceptions. Writing: Technical Reports- Introduction – Characteristics of a Report –

Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Text Books

1. Learning with Python: How to Think Like a Computer Scientist, 3rd Edition – Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Shroff O'Reilly Publishers.

Suggested Readings

1. Introduction to Python for Computational Science and Engineering (A beginner's guide), Hans Fangohr.
2. Exploring Python, Timothy A. Budd, Mc Graw Hill Education
3. John V Guttag, ―Introduction to Computation and Programming Using Python,,,,, Revised and expanded Edition, MIT Press.

Course Code	Course Title						Core/ Elective
5PC352EC	**Electronic Devices and Logic Design Laboratory**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives

1. The V-I characteristics of diodes and determination of static and dynamic resistances of semiconductor diode.
2. To design the rectifiers and evolution of performances.
3. To understand the characteristics of transistor in various configurations

Course Outcomes

1. To demonstrate the characteristic behavior of PN junction diode and Zener diode.
2. To Design various non-linear wave shaping circuits using diodes for a given specification.
3. Analyze the behavior of non-linear wave shaping circuits using diodes.
4. Examine the characteristics of BJT and FET in various configurations.
5. Evaluate and compare the significant parameters obtained from the characteristics of BJT and FET.

List of Experiments:

PART-A

1. V-I Characteristics of Silicon and Germanium diodes and measurement of static and dynamic resistances.
2. Zener diode characteristics and its application as voltage regulator.
3. Clipping and Clamping Circuits.
4. Design, realization and performance evaluation of half wave rectifiers without filters and with filters (capacitor filter and π - section filter).
5. Plotting the characteristics of BJT in Common Base configuration and Common Emitter configuration
6. V-I Characteristics of JFET in CS configuration.
7. Frequency response of Common Source FET amplifier.
8. V-I characteristics of UJT

PART-B

1. Verification of truth tables of Logic gates and realization of Binary to Gray and Gray to Binary code converters.
2. Realization of Half adder/sub and full adder/sub using universal logic gates.
3. Realization of Full adder/Sub using MUX and Decoder
4. Design 2's complement Adder/subtractor using IC 74283 and verify experimentally.
5. Verification of truth tables of Flip Flops and Flip flop conversions form one form to the other.

Note:

1. Wherever possible, Analysis and design of circuits shall be carried out using simulation tools.
2. A minimum of 10 experiments should be performed.

Objective

- To get acquainted with the Analog/Digital Training System.
- To get acquainted with different standard integrated circuits (ICs).
- To study the basic logic gates: AND, OR, INVERT, NAND, NOR, and XOR.
- To understand formulation of Boolean function and truth table for logic circuits.

Apparatus

Analog/Digital Training System - IC Type 7400 Quadruple 2-input NAND gates
- IC Type 7402 Quadruple 2-input NOR gates
- IC Type 7404 Hex Inverters
- IC Type 7408 Quadruple 2-input AND gates
- IC Type 7432 Quadruple 2-input OR gates
- IC Type 7486 Quadruple 2-input XOR gate

Experiment No.	Title of the Experiment	Objective of the Experiment
1	To study and verify the truth table of logic gates	Identify various ICs and their specification a. OR gate b. AND gate c. NAND gate d. NOR gate
2	Realization of a Boolean function	To simplify the given expression and to realize it using Basic gates and Universal gate
3	Design and implementation using NAND gate	To realize why NAND gate is known as the universal gate by implementation of: a. NOT using NAND b. AND using NAND c. OR using NAND d. XOR using NAND
4	Adders and Subtractors	To realize a. Half Adder and Full Adder b. Half Subtractor and Full Subtractor by using Basic gates and NAND gates
5	Binary to grey generator	To learn the importance of weighted and non weighted code To learn to generate gray code.
6	Multiplexer and Demultiplexer	a. To design and set up a 4:1 Multiplexer (MUX) using only NAND gates. b. To design and set up a 1:4 Demultiplexer(DE-MUX) using only NAND gates.
7	Realization of a Boolean function using Logisim	To learn the use of Logisim software to design digital electronics circuits.
8	FlipFlop	a. Truth Table verification of 1) RS Flip Flop 2) T type Flip Flop. 3) D type Flip Flop. 4) JK Flip Flop. b. Conversion of one type of Flip flop to another

Suggested Reading

1. Modern Digital Electronics - R P Jain
2. Digital Electronics: An Introduction To Theory And Practice by William Gothmann H
3. Digital Electronics by John Morris
4. Fundamentals of Digital Circuits by Anand Kumar

Course Code	Course Title						Core/Elective
PC352EC	**Network Theorem Lab**						Core
Prerequisite	Contact Hours perWeek				CIE	SEE	Credits
-	L	T	D	P			
	-	-	-	**2**	**25**	**50**	**1**

Course Objectives:

1. To learn the usage of basic electronic components, equipment and meters used in electronic laboratories.
2. To learn practical electric AC & DC circuits.
3. To learn about PCB making
4. To learn various filters.

Course Outcomes:

1. Use the basic electronic components and design circuits.
2. Verify various parameters of the circuits by applying theorems.
3. Understand the making of PCB.
4. Design various filters.

List of Experiments

1. Study of all types of discrete Active & passive devices, display devices, integrated components, electro mechanical components (switches, sockets, connectors etc.,) electromagnetic components (relays). Study and use of different meters (volt/ammeter, AVO/Multi meter) for the measurement of electrical parameters. Measurement of RLC components using LCR Meter.
2. Study of CRO and its applications.
3. Verification of Superposition and Tellegan's theorem
4. Verification of of Thevenin's and Maximum Power Transfer Theorem.
5. Measurement of two-port network parameters.
6. Measurement of Image impedance and Characteristics impedance.
7. Design of T-section constant K Low Pass Filter.
8. Design of m-derive High Pass Filter.
9. Verification of Reciprocity theorem.
10. Verification of Norton's theorem.
11. Soldering and De-soldering.
12. PCB Making.

Note: A minimum of 10 experiments should be performed. The students may use any commercial / open-source SPICE programs available like MULTISIM, PSPICE, TINA, and LABVIEW for simulation.

B.E. (ECE) - IV SEMESTER

Sl. No.	Course Category	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P	Total Hours	CIE	SEE	
Theory									
1	5PC405EC	Analog Electronic Circuits	3	0	0	3	40	60	3
2	5PC406EC	Automatic Control Systems	3	0	0	3	40	60	3
3	5PC407EC	Computer Organization and Architecture	3	0	0	3	40	60	3
4	5PC408EC	Electro Magnetic Theory and Transmission Lines	3	0	0	3	40	60	3
5	5PC409EC	IC Applications	3	0	0	3	40	60	3
6	5MC402HS	Essence of Indian Traditional Knowledge	2	0	0	2	40	60	0
7	5HS403HS	Human Values and Professional Ethics	3	0	0	3	40	60	3
Laboratories									
8	5PC453EC	AEC Laboratory	0	0	2	2	40	60	1
9	5PC454EC	IC Applications Laboratory	0	0	2	2	40	60	1
Total Credits									**20**

IV Semester Detailed Syllabus

Course Code	Course Title						Core/ Elective
5PC405EC	**Analog Electronic Circuits**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**-**	**0**	**40**	**60**	**3**

Course Objectives

1. The Understand the applications of BJT & FET as a switch and an amplifier.
2. Analysis of BJT & FET in various configurations using small signal equivalent models and their frequency response.
3. Familiarize with concept and effect of negative feedback**.**
4. Study positive feedback and Design different types of oscillators.
5. Design Power Amplifiers and calculate their efficiencies.

Course Outcomes

1. Recall and relate the knowledge of BJT and FET behavior in the design of various biasing and amplifier circuits.
2. Apply low and high frequency models of transistor in the analysis of single stage and multistage amplifiers.
3. Design and analyze amplifier and oscillator circuits.
4. Compare and Contrast different types of biasing, Multistage, Feedback and Power amplifiers.
5. Interpret a given analog circuit and evaluate its performance parameters by applying acquired knowledge.

UNIT-I

Transistor at high frequencies: Hybrid π CE transistor model, Hybrid π Conductance's and Capacitances, CE short circuit current gain, Current gain with resistive load, Millers Theorem.

BJT Amplifiers - Frequency Response: Frequency response of BJT Amplifier, Analysis at Low and High frequencies, Effect of coupling and bypass Capacitors - Single Stage CE Transistor Amplifier Response, Gain-Bandwidth Product, Emitter follower at higher frequencies.

UNIT II:

Multi Stage Amplifiers-Analysis of Cascaded RC Coupled BJT amplifiers, Cascode Amplifier, Darlington Pair, Different Coupling Schemes used in Amplifiers - RC Coupled Amplifier, Transformer Coupled Amplifier, Direct Coupled Amplifier.

UNIT-III

Feed Back Amplifiers: The feedback concept, General characteristics of negative feedback amplifier, Effect of negative feedback on input and output impedances. Method of analysis of feedback amplifiers, Analysis of Voltage series, voltage shunt, current series and current shunt feedback amplifiers.

UNIT-IV

Oscillators: Positive feedback and conditions for sinusoidal oscillations, RC oscillator, LC oscillator, Crystal oscillator, Amplitude and frequency stability of oscillator.

Voltage Regulators: Transistor series and shunt voltage regulators.

UNIT-V

Large Signal Amplifies: Large Signal Amplifiers: BJT as large signal audio amplifiers, Classes of operation, Harmonic distortion, Class A resistive coupled and transformer coupled amplifiers, Class-B Push-pull and complementary symmetry amplifiers, Class AB operation.

Text Books:

1. Millman and Halkias, "Electronic Devices and Circuits", 2nd Edition, McGraw Hill Publication, 2007.
2. Robert L. Boylestad, "Electronic Devices and Circuit Theory", 10th Edition, PHI, 2009.

Suggested Reading:

1. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", 2nd Edition, McGraw Hill Publication,2009.
2. David Bell, "Fundamentals of Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2008.
3. Christian Piguet, "Low Power CMOS Circuits Technology, Logic Design and CAD Tools" 1st Indian Reprint, CRCPress, 2010.
4. S.K. Gandhi, "VLSI Fabrication Principles: Silicon and Gallium Arsenide", Wiley India Pvt. Ltd., New Delhi,2nd Edition. 1994.

Course Code	Course Title						Core/ Elective
5PC406EC	**AUTOMATIC CONTROL SYSTEMS**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**-**	**0**	**40**	**60**	**3**

Course Objectives:

1. To Analyze the stability and performance of dynamic systems in both time and frequency domain.
2. To design feedback controllers, such as PID, lead and lag compensators, to meet desired system performance specifications.
3. To provide knowledge of state variable models and fundamental notions of state model design.
4. To understand the classical methods of control engineering and physical system modeling by linear differential equations.
5. To understand state space representation of control systems.

Course Outcomes:

1. Convert a given control system into equivalent block diagram and transfer function
2. Analyze system stability using time domain techniques
3. Analyze system stability using frequency domain techniques
4. Design a digital control system in the discrete time domain
5. Analyze a control system in the state space representation

UNIT - I

Control System fundamentals and Components: Classification of control systems including Open and Closed loop systems, Transfer function representation, Mathematical modeling of Mechanical systems and their conversion into electrical systems, Block diagram representation, Block diagram algebra and reduction and Signal flow graphs and Mason's gain formula.

UNIT - II

Time Response: Transfer function and types of input. Transient response of second order system for step input. Time domain specifications Characteristic Equation of Feedback control systems Types of systems, static error coefficients, error series,

Stability: Concept of Stability, Routh-Hurwitz criterion for stability, Root locus technique and its construction.

UNIT - III

Frequency response plots: Bode plots, frequency domain specifications Gain and Phase margin. Principle of argument Nyquist plot and Nyquist criterion for stability

Compensation Techniques: Cascade and feedback compensation. Phase lag, lead and lag-lead compensators PID controller.

UNIT - IV

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

UNIT - V

Discrete Control Systems: Digital control, advantages and disadvantages, Digital control system architecture. The discrete transfer function sampled data system Transfer function of sample data systems. Analysis of Discrete data systems

Text Books:

1. "Control System Engineering", Nagrath, I.J, and Gopal. M, New Age Publishers, 5/e, 2009
2. " Control systems", Nagoor Kani. RBA Publications, Second Edition.

Suggested Readings:

1. "Modern Control Engineering", Ogata, K., PHI, 5/e
2. "Digital Signal Processing", Ramesh Babu, 2/e
3. "Digital Signal Processing, Theory and Applications", K.Deergha Rao, Swamy MNS, Springer Publications, 1/e, 2018

Course Code	Course Title						Core/ Elective
5PC407EC	**Computer Organization and Architecture**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**-**	**0**	**40**	**60**	**3**

Course Objectives

1. Implement the Fixed point and Floating point addition, Subtraction, multiplication and Division.
2. Describe the basic structure and operation of a Digital computer.
3. Discuss the different ways of communicating with I/O devices and standard I/O interfaces.
4. Analyze the hierarchical memory system including cache memories and virtual memory.
5. Understand issues affecting modern processors.

Course Outcomes

1. Apply digital engineering fundamentals to acquire knowledge of arithmetic algorithms for different processors.
2. Interpret the concept of Basic processor system and Analyze the performance of Micro programmed Control unit organization.
3. Implementing the techniques of pipelining and parallelism to analyze the performance of a Processor.
4. Apply the conceptual knowledge of system development with appropriate I/O Interface.
5. Interpret various techniques for efficient memory utilization to develop a system application.

UNIT - I: DATA REPRESENTATION AND COMPUTER ARITHMETIC:

Introduction to Computer Organization and architecture, evolution and computer generations; Fixed point representation of numbers, digital arithmetic algorithms for Addition, Subtraction, ripple carry adder, carry look-ahead adder, Multiplication using Booth's algorithm and Division using restoring and non restoring algorithms. Floating point representation with IEEE standards and its arithmetic operations.

UNIT-II: BASIC PROCESSOR ORGANIZATION AND DESIGN:

Instruction codes, stored program organization, computer registers and common bus system, computer instructions, timing and control, instruction cycle: Fetch and Decode, Register reference instructions; Memory reference instructions. Input, output and Interrupt: configuration, instructions, Program interrupt, Interrupt cycle, Micro programmed Control organization, address sequencing, micro instruction format and micro program sequencer

UNIT - III: CENTRAL PROCESSING UNIT:

General register organization, stack organization, instruction formats, addressing modes, Data transfer and manipulation, Program control. CISC and RISC: features and comparison. Pipeline and vector Processing, Parallel Processing, Pipelining, Instruction Pipeline, Basics of vector processing and Array Processors.

UNIT - IV: INPUT-OUTPUT ORGANIZATION:

I/O Bus and interface modules, I/O versus Memory Bus, Asynchronous data transfer: Strobe control, Handshaking, Asynchronous serial transfer. Modes of Transfer: Programmed I/O, Interrupt driven I/O, Priority interrupt; Daisy chaining, Parallel Priority interrupt. Direct memory Access, DMA controller and transfer. Input output Processor, CPU-IOP communication.

UNIT - V: MEMORY ORGANIZATION:

Memory hierarchy, Mapping of memory with CPU, Primary memory, Concept of memory interleaving, Associative memory, Cache memory organization and performance measures, cache mapping functions, Virtual memory organization, paging mechanism ,address mapping using pages, Memory management hardware

Suggested Readings:

1. Morris Mano, M., "Computer System Architecture," 3/e, Pearson Education, 2005.
2. Hamacher, Vranesic, Zaky, "Computer Organization," 5/e, McGraw Hill, 2007.
3. William Stallings, "Computer Organization and Architecture: Designing for performance," 7/e, Pearson Education, 2006.
4. Govindarajulu, B., “Computer Architecture and Organization,” 2/e, TMH, 2010.
5. John Hennessy and David Patterson, Computer Architecture: A Quantitative Approach, 5 th Edition, Elsevier.

Course Code	Course Title						Core/ Elective
5PC408EC	**Electro Magnetic Theory and Transmission Lines**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**-**	**0**	**40**	**60**	**3**

Course Objectives

1. Analyze fundamental concepts of vector analysis, electrostatics and magneto statics law and their applications to describe the relationship between Electromagnetic Theory and circuit theory.
2. Formulate the basic laws of static electricity and magnetism and extend them to time varying fields to define the Maxwell's equations in differential and integral form.
3. Derive the wave equations for conducting and di-electric mediums to analyze the wave propagation characteristics of Uniform Plane Waves (UPW) in normal and oblique incidences.
4. Analyze fundamental concepts of Transmission lines and to formulate the basic relationship between distortion less transmission lines & applications.
5. To understand the concepts of RF Lines and their characteristics, Smith Chart, and its applications, acquires knowledge to configure circuit elements, QWTs and HWTs and to apply the same for practical problems.

Course Outcomes

1. Understand the different coordinate systems, vector calculus, coulombs law and gauss law for finding electric fields due to different charges and to formulate the capacitance for different capacitors.
2. Learn basic magneto-statics concepts and laws such as Biot –Savart's law and Amperes law, their application in finding magnetic field intensity, inductance, and magnetic boundary conditions.
3. Distinguish between the static and time-varying fields, establish thecorresponding sets of Maxwell's Equations and Boundary Conditions, and use them for solving engineering problems.
4. Determine the Transmission Line parameters for different lines, characterize the distortions and estimate the characteristics for different lines.
5. Analyze the RF Line features and configure them as SC, OC Lines, λ/2, λ/4 and λ/8 Lines and design the same for effective impedance transformation.
6. Study the Smith Chart profile and stub matching features, and gain ability to practically use the same for solving practical problems.

UNIT-I

Electrostatics: Review of coordinate systems. Coulomb's Law, Electric field due to various Charge distributions and Electric flux density. Gauss's Law and its applications. Work, Potential and Energy, The dipole. Current and Current density, Laplace and Poisson's equations. Calculation of capacitance for simple configurations.

UNIT-II

Magnetostatics: Steady magnetic - Biot-Savart's law, Ampere's law. Stoke's theorem, Magnetic flux and magnetic flux density. Scalar and vector magnetic potentials. Electric and Magnetic fields boundary conditions. Maxwell's equations for static and time varying fields.

UNIT-III

Electromagnetic Waves:

Uniform plane waves in free space and in conducting medium, Polarization. Instantaneous, average and complex Power, Poynting theorem, Surface Impedance.

Reflection and Refraction: Normal and Oblique incidence on dielectric and conducting medium.

UNIT-IV

Transmission Lines 1:

Overview of T and π networks. Two wire Transmission lines, Primary and secondary constants. Transmission Line equations. Infinite line and characteristic impedance- Open and short circuit lines and their significance. Distortion less transmission line, Concept of loading of a transmission line, Campbell's formula.

UNIT-V

Transmission Lines 2:

Impedance of a transmission line, RF and UHF lines, transmission lines as circuit elements. Properties of λ/2, λ/4 and λ/8 Lines. Reflection coefficient and VSWR. Matching: Stub matching. Smith chart and its applications.

Suggested Readings:

1. Matthew N.O. Sadiku, "*Principles of Electro-magnetics"*, Oxford University Press, 6th edition 2016.
2. William H. Hayt Jr. and John A. Buck, "*Engineering Electromagnetics"*, Tata McGraw Hill, 7th edition, 2006.
3. E.C. Jordan and K.G. Balmain, "*Electromagnetic Waves and Radiating Systems"*, Pearson, 2nd edition, 2015.
4. K.D. Prasad, "*Antennas and Wave Propagation"*, Khanna Publications.
5. Nannapaneni Narayana Rao, "*Elements of Engineering Electromagnetics"*, Pearson, 6th edition, 2004.

Course Code	Course Title						Core/ Elective
5PC409EC	**INTEGRATED CIRCUITS AND APPLICATIONS**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**-**	**0**	**40**	**60**	**3**

Course Objectives

1. To learn the concept of Op-Amp and its characteristics.
2. To impart the linear and nonlinear applications of operational amplifier.
3. To impart the theory and applications of 555 IC Timer , PLL & IC Regulator
4. To learn the characteristics of different logic families
5. Discuss the operation of the most commonly used D/A and A/D converters.
6. To analyze combinational and sequential circuits with ICs.

Course Outcomes

Student will be able to:

1. Understand the basic construction, characteristics and parameters of Op-Amp.
2. Analyze the linear and nonlinear applications of Op-Amp.
3. Understand the concepts of IC555 timer, IC723 regulator and PLL.
4. Classify and describe the characteristics of different logic families
5. Design and analyze ADC & DAC converters.
6. Design the Combinational and Sequential circuits with ICs.

UNIT-I

Differential Amplifiers: Classification, DC and AC analysis of single / dual input Balanced and unbalanced Output Configurations of Differential amplifiers using BJTs, Level Translator.

Introduction to ICs: Integrated circuits classification, Integrated circuit package & types, pin identification and temperature ranges.

Operational Amplifier (IC741): Op-Amp block diagram, ideal Op-Amp Characteristics, Op-Amp parameters: Input offset voltage; Output offset voltage, input offset and bias currents, Slew rate, CMRR and PSRR.

UNIT-II

Op-Amp Applications : Inverting and Non-inverting amplifiers with ideal and non-ideal Op-amps, Voltage Follower, Difference Amplifier, Summing Amplifier, ideal and practical Integrator and differentiator, Voltage to Current and Current to Voltage converters, Log and antilog amplifiers ,Comparator, Schmitt Trigger with and without reference voltage, Triangular waveform generator.

Active Filters :Introduction – First order, Second order Active filters – LP, HP, BP, BR and All pass.

UNIT-III

555 Timer: Functional diagram. Modes of operation: Monostable, Astable multivibrators, applications of 555 Timer.

Voltage Regulators: Basic of voltage Regulators, Linear regulators using opamp, IC Regulators 78XX and 723.

PLL: Operation, lock range, Capture range, PLL applications: Frequency multiplier and frequency translator.

UNIT-IV

Logic families: Digital IC characteristics. TTL logic family, TTL series and TTL output configurations: open collector, Totem pole, Tri state logic. MOS logic family, CMOS logic family and its series characteristics, CMOS transmission gate, CMOS open drain and high impedance outputs. Comparison of TTL and CMOS logic families

Data Converters: Introduction, Digital to Analog Converters: Weighted Resistor DAC & Inverted R-2R Ladder DAC. Analog to digital Converters: Parallel Comparator ADC, Successive Approximation ADC and Dual Slope ADC. DAC and ADC specifications.

UNIT-V

Combinational Circuits: Design using TTL-74XX or CMOS 40XX series: Decoders, drivers for LED, Encoder, priority encoder, Multiplexer and their applications, Demultiplexer, Digital comparator, Parallel and serial binary adder,Subtractor circuits using 2's complement. Carry look-ahead adder, BCD adder.

Sequential Circuits: Design using TTL-74XX or CMOS 40XX series: Synchronous and Asynchronous counters, Cascading of BCD counters, applications of counters,Shift register and applications.

Text Books:

1. "Operational Amplifiers and Linear ICs", David A Bell, Oxford Publications, 3/e , 2011.
2. "Op-Amps and Linear Integrated Circuits," Ramakant A. Gayakwad, PHI, 4/e 2010.

Suggested Readings:

1. "Linear Integrated Circuits", D.Roy Chowdhury, ShailB.Jain, New / Age International (P) Ltd., 4/e, 2008.
2. "Digital Systems: Principles and Applications" Ronald J. Tocci, Neal S. Widmer& Gregory L.Moss PHI, 10/e, 2011.
3. "Modern Digital Electornics" Jain R.P, TMH, 4/e, 2011.

Course Code	Course Title						Core/ Elective
5MC402HS	**ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE**						**MC**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**-**	**0**	**40**	**60**	**0**

Course Objectives

1. To reinforce the students understanding with the pan-Indian heritage in terms of culture, traditions and knowledge.
2. To impart understanding of the importance of the roots of the traditional knowledge and types.
3. To impart basic knowledge on the evolution of the multiple languages that highlightIndia's diversity.
4. To know Indian Languages, Philosophies, Religion, Literature, Fine arts and Technology.
5. To explore the Ancient Science, Scientists, in Medieval and Modern India; the education system.

Course Outcomes

1. Understand the concepts of Indian culture and Traditions and their importance.
2. Distinguish the Indian languages and literature
3. Learn the philosophy of ancient, medieval and modern India.
4. Acquire the information about the fine arts in India
5. Know the contribution of scientists of different eras, interpret the concepts and theimportance to protect Intellectual property of the nation.

UNIT- I

-Dawn of human civilization and evolution of various cultures
-Introduction to Culture: Civilization, Culture and heritage
-General characteristics of culture, importance of culture in human literature
-Indian Culture, Ancient India, Medieval India, Modern India

UNIT -II

Indian Languages, Culture and Literature:
Indian Languages and Literature-I:-the evolution and role of Sanskrit, significance of scriptures to current society
-Indian philosophies, other Sanskrit literature, literature of south India. Indian Languages and Literature-II:
-Northern Indian languages & literature

UNIT - III

-Religion and Philosophy:
-Religion and Philosophy in ancient India
-Religion and Philosophy in medieval India
-Religious reform movements in modern India (selected movements only)

UNIT-IV

Fine Arts in India (Art, Technology& Engineering):
-Indian Painting, Indian handicrafts
-Music: Divisions of Indian classic music, moderm Indian music

-Dance and Drama-Indian Architecture (ancient, medieval and modern) Science and Technology in India:
-development of science in ancient, medieval and modern India. Their relation in terms of modern scientific perspective.
-Protection of traditional knowledge, significance, value to economy
-role of government in protection of indigenous knowledge and technology; protection of traditional knowledge bill, 2016.

UNIT - V

-Education System in India:
-Education in ancient, medieval and modern India
-Aims of education, subjects, languages
-Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

Suggested Readings:

1. Indian Knowledge Systems (2 Vols-Set), Kapil Kapoor and Avadhesh Kumar Singh; ISBN 10: 8124603367 / ISBN 13: 9788124603369, Published by D K Print world, Publication Date: 2007
2. Science in Samskrit, Samskrita Bharati, Published by Samskrita Bharati, New Delhi, India, 2007; ISBN 10: 8187276339 / ISBN 13: 9788187276333.
3. Traditional Knowledge System and Technology in India, Book by Basanta Kumar Mohanta and Vipin K. Singh, Originally published: 2012 Publication Date: 2012; ISBN 10: 8177023101ISBN 13: 9788177023107.
4. 1.7-Position paper, National Focus Group on Arts, Music, Dance and Theatre NCERT, March 2006, ISBN 81-7450-494-X, NCERT, New Delhi, 2010.
5. Indian Art and Culture, 4th Edition, By Nitin Singhania, ISBN: 9354601804 · 9789354601804, © 2022 | Published: December 20, 2021
6. 'Education and Examination Systems in Ancient India, written/authored/edited by
7. S. Narain', published 2017, English-Hardcover, ISBN 9789351282518 publisher: Kalpaz Publications.
8. Satya Prakash, Founders of Sciences in Ancient India, Vijay Kumar Publisher, New Delhi, 1989
9. M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, New Delhi, 2005

Course Code	Course Title						Core/ Elective
5HS403HS	**Human Values & Professional Ethics**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Adaptive	**3**	**0**	**-**	**0**	**40**	**60**	**3**

Course Objectives

1. To create an awareness on Human Values and Engineering Ethics.
2. To move from discrimination to commitment.
3. To understand social responsibility of an engineer.
4. To appreciate ethical dilemma while discharging duties in professional life.
5. To encourage students to discover what they consider valuable in life.

Course Outcomes

1. Understand the significance of value inputs in a classroom and start applying them in their life and profession
2. Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3. Understand the role of a human being in ensuring harmony in society and nature.
4. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

UNIT I:

Introduction to Value Education: Value Education, Definition, Concept and Need for Value Education. The Content and Process of Value Education. Basic Guidelines for Value Education. Self-exploration as a means of Value Education. Happiness and Prosperity as parts of Value Education.

UNIT II:

Harmony in the Human Being: Human Being is more than just the Body. Harmony of the Self ('I') with the Body. Understanding Myself as Co-existence of the Self and the Body. Understanding Needs of the Self and the needs of the Body. Understanding the activities in the Self and the activities in the Body.

UNIT III:

Harmony in the Family and Society and Harmony in the Nature

Family as a basic unit of Human Interaction and Values in Relationships. The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory, Gratitude and Love. Comprehensive Human Goal: The Five Dimensions of Human Endeavour. Harmony in Nature : The Four Orders in Nature. The Holistic Perception of Harmony in Existence.

UNIT IV:

Social Ethics: The Basics for Ethical Human Conduct. Defects in Ethical Human Conduct. Holistic Alternative and Universal Order. Universal Human Order and Ethical Conduct. Human Rights violation and Social Disparities.

UNIT V:

Professional Ethics: Value based Life and Profession. Professional Ethics and Right Understanding. Competence in Professional Ethics. Issues in Professional Ethics – The Current Scenario. Vision for Holistic Technologies, Production System and Management Models.

Suggested Readings:

1. A.N Tripathy, "New Age International Publishers", 2003.
2. Bajpai. B. L ,"New Royal Book Co, Lucknow", Reprinted, 2004
3. Bertrand Russell "Human Society in Ethics & Politics"
4. Corliss Lamont, "Philosophy of Humanism"
5. Gaur. R.R, Sangal. R, Bagaria. G.P, A Foundation Course in Value
6. Education, Excel Books, 2009.

Course Code	Course Title						Core/ Elective
5PC453EC	**AEC Laboratory**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**0**	**-**	**0**	**25**	**50**	**1**

Course Objectives

1. To design and simulate various BJT and FET Voltage and Power amplifiers
2. To design and simulate various BJT Feedback amplifiers
3. Analyse Oscillator circuits
4. Analyse Series and Shunt Voltage Regulators
5. Design and simulate tuned voltage amplifier

Course Outcomes

1. Apply the concepts of amplifiers in the design of Public Addressing System.
2. To be able to Generate Sinusoidal wave forms of given specifications.
3. Design stable system using feedback concepts.
4. Design of Tuned amplifier.
5. Design Series and Shunt Voltage Regulators

List of Experiments

1. Two Stage RC Coupled CE BJT amplifier.
2. Two Stage RC Coupled CS FET amplifier.
3. Voltage Series Feedback Amplifier.
4. Voltage Shunt Feedback Amplifier.
5. Current series feedback Amplifier
6. RC Phase Shift Oscillator.
7. Hartly & Colpitt Oscillators
8. Design of Class A and Class B Power amplifiers.
9. Constant-k low pass & high pass filters.
10. Series and Shunt Voltage Regulators
11. RF Tuned Amplifier

SPICE:

12. Two Stage RC Coupled CS FET amplifiers.
13. Voltage Series Feedback Amplifier
14. Current Shunt Feedback Amplifier

Note: A minimum of 10 experiments should be performed. It is mandatory to simulate any three experiments using SPICE.

Course Code	Course Title						Core/ Elective
5PC454EC	**INTEGRATED CIRCUITS APPLICATIONS LAB**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives

1. To learn the configurations and parameters of the 741 Op-Amp.
2. To explain the circuits of linear and nonlinear applications of Op-Amp
3. Design and analyze the active filters circuit using Op-amp.
4. To know the concepts of IC555 timer & IC723
5. To know the various characteristics of TTL and CMOS gates.
6. To learn combinational and Sequential circuits using digital ICS.

Course Outcomes

1. Analyze the configurations, parameters of Op-Amp (IC741).
2. Demonstrate the circuits of Op-Amp for various applications.
3. Implement Active filters using Op-amps
4. Analyze and design the circuits using IC555 timer, IC723 and dataconverters.
5. Analyze the characteristics of TTL and CMOS gates
6. Analyze and design various combinational & sequential circuits using digital ICs.

List of Experiments

Part-A: Linear IC

1. Measurement of Op-Amp parameters
2. Voltage Follower, Inverting and Non-Inverting Amplifiers using Op-Amp.
3. Arithmetic Circuits using Op-Amp
4. Active filters: LP, HP and BP using Op-Amp.
5. Triangle and Square wave Generators. Schmitt Trigger using Op-Amp.
6. Monostable and Astable multivibrator using Op-Amp.
7. Astable, Monostable multi vibrators using IC555Timer.
8. IC voltage regulator.
9. Voltage controlled oscillator – NE 565

Part-B: Digital IC

1. Measurement of various characteristic parameters of TTL and CMOSgates.
2. Flip Flop conversions and latches using gates and ICs.
3. Designing Synchronous, Asynchronous up/ down counters.
4. Shift Registers and Ring counters using IC Flip-Flop & Standards IC counters.
5. Interfacing counters with 7-segment LED /LCD display units.
6. Mux – Demux applications.
7. Code Converters and Parity Generator & Checker
8. Binary adder and subtractor, BCD adders using ICs.

Note: Atleast ten experiments should be conducted in the sem, of which three should be from PART - B.

Program Outcomes

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modem engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment & Sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and Team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

12. **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Strive for perfection in everything you do. Take the best that exists and make it better. When it does not exist, design it.

- Sir Henry Royce, English Engineer

Have courage to think differently, courage to invent, to travel the unexplored path, courage to discover the impossible to conquer the problems and succeed.

- APJ Abdul Kalam

METHODIST COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

(Affiliated to Osmania University) (Accredited by NAAC with "A+" Grade)

Abids, Hyderabad - 500 001, Telangana.