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 .....)

Empower Women - Impact The World

Issued by **Dean, Academics**

STANLEY COLLEGE OF ENGINEERING AND TECHNOLOGY FOR WOMEN (AUTONOMOUS)

(Affiliated to Osmania University)

(Accredited by NAAC with "A" Grade)

Abids, Hyderabad - 500 001, Telangana.

Vision of the Institute

Empowering girl students through professional education integrated with values and character to make an impact in the World.

Mission of the Institute

M1 : Providing quality engineering education for girl students to make them competent and confident to succeed in professional practice and advanced learning.

M2 : Establish state-of-art-facilities and resources to facilitate world class education.

M3 : Integrating qualities like humanity, social values, ethics, leadership in order to encourage contribution to society.

Vision of the Department

Empowering girl students with the contemporary knowledge in Electronics and Communication Engineering for their success in life.

Mission of the Department

M1 : To impart rationalized and high quality technical education and knowledge.

M2: To achieve self-sustainability and overall development through Research and Consultancy activities.

M3: To provide education for life by focusing on the inculcation of human and moral values through an honest and scientific approach

M4: To groom students with good attitude and personality skills.

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PROGRAM EDUCATIONAL OBJECTIVES

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

PSO1: Appertain to Communication and Automation Principles: To apply principles of Communication Engineering and Signal Processing both in private and public organizations.

PSO2: Adaptability to Productive Environment: To be well equipped with Management skills, interdisciplinary and modern technologies.

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 Hours	
Theory Courses										
1.	SHS301BM	Managerial Economics & Accountancy	3	1	-	4	40	60	3	4
2.	SBS302MT	Probability Theory and Stochastic Processes	3	1	-	4	40	60	3	4
3.	SPC301EC	Electronic Devices and Circuits	3		-	3	40	60	3	3
4.	SPC302EC	Electromagnetic Theory and Transmission Lines	3		-	3	40	60	3	3
5.	SPC303EC	Digital System Design	3		-	3	40	60	3	3
Practical / Laboratory Course										
1.	SES315EC	Data Structures Lab	2		2	4	40	60	3	3
2.	SPC311EC	Electronic Devices Lab	-	-	2	2	40	60	3	1
3.	SPC312EC	Digital System Design Lab			2	2	40	60	3	1
		Total	**17**	**2**	**6**	**25**	**320**	**480**	**24**	**22**

III Semester Detailed Syllabus

Course Code	Course Title						Core / Elective
SHS301BM	Managerial Economics and Accountancy						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
–	3	1	–	–	40	60	4

Course Objectives:

1. To explain the basics of Managerial Economics and its usefulness to Engineers
2. To explain the Accounting principles and methods of financial statements
3. To gain knowledge of breakeven analysis and its use to management

Course Outcomes:

1. To Relate Economics With Other Sciences.
2. To be able to forecast Demand
3. To be able to Distinguish Cost Concepts
4. To Prepare Final Accounts And To Analyze The Financial Statements
5. To practice and apply Capital Budgeting method

UNIT-I

Meaning and Nature of Managerial Economics: Managerial Economics its usefulness to Engineers, Fundamental Concepts of Managerial Economics, Scarcity, Marginalism, Equi-marginalism, Opportunity cost, Discounting Principle, Time Perspective, Risk and Uncertainty, Profits, Case study method.

UNIT-II

Demand Analysis: Law of Demand, Determinants, Kinds, Elasticity of Demand (Price, Income and Cross-Elasticity); Demand Forecasting, Law of Supply, Concept of Equilibrium.

UNIT-III

Theory of Production and Markets: Production Function, Law of Variable Proportion, Isoquants, Economies of Scale, Cost of Production (Types and their measurement), Concept of Opportunity Cost, Concept of Revenue, Cost-Output relationship, Break-Even Analysis, Price – Output determination under Perfect Competition and Monopoly.

UNIT-IV

Book-Keeping: Principles and significance of double entry book keeping, Journal, subsidiary books, Ledger accounts, Trial Balance, concept and preparation of Final Accounts with simple adjustments, Analysis and interpretation of Financial Statements through Ratios.
(Theory questions and numerical problems on preparation of final accounts, cash book, petty cash book, bank reconciliation statement, calculation of some ratios).

UNIT-V

Capital Management: Its significance, determination and estimation of fixed and working capita requirements, sources of capital, Introduction to capital budgeting, methods of payback and discounted cash flow methods with problems. (Numerical problems on evaluation of capital budgeting opportunities can be asked).

Text Books:

1. M S Bhat And A V Rau, Managerial Economics And Financial Analysis,BS Publications,2008
2. Joseph G.Nellis& David Parter" Principles of Business Economics",2009,2nd Edition
3. Mehta P.L., "Managerial Economics – Analysis, Problems and Cases", Sulthan Chand & Son's Educational publishers, 2011.
4. Earl K.Stice and James.D.Stice,Financial Accounting-Reporting and Analysis,2009,7thEd.SouthWestern,Cengage Learning
5. Maheswari S.N. "Introduction to Accountancy", Vikas Publishing House, 2005.
6. Panday I.M. "Financial Management", Vikas Publishing House, 2009.

Reference Books

1. D.M. Mithani, "Managerial Economics" 2008, Himalayan Publishing House.
2. Ramachandran, RamkumarKakani, Financial Accounting for Management, 2009, 2nded, Tata McGraw Hill Publishing, Pvt., Ltd.
3. Kasi Reddy and N Saraswathi "Managerial economics and Financial Accounting"PHI Learning Pvt. Ltd,2007

Course Code	Course Title						Core / Elective
SBS302MT	Probability Theory and Stochastic Processes						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
–	3	1	–	–	40	60	4

Course Objectives:

1. To familiarize the fundamentals of probability and random variables.
2. To give insights of the distribution functions of random variables.
3. To introduce stochastic processes and their temporal characteristics.
4. To define spectral characteristics of stochastic processes.
5. To comprehend the concepts of statistics and linear regression.

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

1. Understand and use the concepts of probability and random variables.
2. Choose appropriate distribution functions for determination of probabilistic characteristics.
3. Illustrate the concepts of statistics and linear regression.
4. Apply stochastic processes and use their temporal characteristics.
5. Explain and apply spectral characteristics of stochastic processes.

UNIT-I: Probability and Random Variable

Probability: Concepts of Probability, Events, Conditional Probability, Bernoulli Trials, Bernoulli's Theorem, Total Probability, Bayes' Theorem.

Random Variable: Definition and types - Discrete, Continuous and Mixed Random Variables, Probability Mass Function (PMF) /Probability Density Function (pdf), Cumulative Distribution Function (CDF), Expectation, Moments.

UNIT-II: Distribution Functions of Single Random Variable

Binomial, Poisson, Uniform, Gaussian, Rayleigh –Properties, Mean, Variance, Moment Generating Function, Characteristic Function.

Two Random Variables and operations: Bi-variate Distributions, One Function of Two Random Variables, Joint Distribution and Density Function and their properties, Joint Moments, Joint Characteristic Functions, Conditional Distributions, Central Limit Theorem: statement and applications.

UNIT-III: Statistics & Linear Regression

Measures of Central Tendency, Moments. Curve fitting using Method of Least Squares: Fitting of straight line, second-degree parabolas, and power curves, Correlation, Rank correlation and Linear Regression.

UNIT-IV: Stochastic Processes – Temporal Characteristics

Concepts of stationarity-First and Second order- wide sense stationary and strict sense stationary, statistical independence, Time averages and ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Definition and Properties - Autocorrelation Function, Cross-Correlation Function, Covariance.

Linear System Response of Mean and Mean-squared Value.

Qualitative study of Gaussian and Poisson Random Processes.

UNIT-V: Stochastic Processes-Spectral Characteristics

Power Spectral Density and its properties; Relationship - Power Spectrum and Autocorrelation Function; Cross-Power Spectrum and Cross-Correlation Function; Response to linear systems and stochastic inputs.

Reference Books:

1. Peyton Z. Peebles, Probability, Random Variables & Random Signal Principles, 4th edition, Tata McGraw Hill, 2001.
2. Athanasius Papoulis and S. Unnikrishna Pillai, Probability, Random Variables and Stochastic Processes, 4th edition, McGraw Hill, 2006.
3. P. Ramesh Babu, Probability Theory and Random Processes, 1st edition, McGraw Hill Education (India) Private Limited, 2015.

Suggested Readings:

1. Henry Stark and John W. Woods, Probability and Random Processes with Application to Signal Processing, 3rd edition, Pearson Education, 2014.
2. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, 11th edition, S. Chand, 2006.
3. T. Veerarajan, Probability, Statistics and Random Processes, 3rd Edition, McGraw Hill Companies, 2010.
4. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham, V. S. S. N. Prasad, Mathematical Methods, S. Chand, 2010.

Course Code	Course Title						Core / Elective
SPC301EC	Electronic Devices and Circuits						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
–	3	–	–	–	40	60	3

Course Objectives:

1. To familiarize basic concepts of semiconductor devices.
2. To comprehend the applications of diodes as rectifiers and filters.
3. To give insights of V-I characteristics of BJT configurations.
4. To comprehend amplifier configurations using h-parameter model.
5. To illustrate V-I characteristics of FETs and MOSFETs and their applications.

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

1. Interpret the characteristics of diodes using models for analysis of various applications.
2. Compare performance characteristics of various filters.
3. Discriminate the BJT configurations and design a stable biasing circuit.
4. Analyse and design BJT amplifiers.
5. Distinguish the operations of FETs & MOSFETs.

UNIT-I:

Basics of Semiconductors: Review of semiconductors and their properties, Poisson and continuity equations, Hall Effect, Fermi level in P- and N-type semiconductors.

Junction Diode : PN Junction formation, Characteristics, biasing- band diagrams and current flow, Diode current equation, Diode as a circuit element, small signal diode models, Diode switching characteristics, effect of temperature on diode characteristics, Breakdown mechanisms in diodes, Zener Diodes and Zener voltage regulator.

UNIT-II

PN Diode Applications: Half wave, Full wave and Bridge rectifiers - their operation, performance characteristics, and analysis; Filters-L, C, LC and CLC filters, used in power supplies with FWR and their ripple factor calculations, design of Rectifiers with and without Filters.

UNIT-III

Bipolar Junction Transistor: Transistor Junction formation , Transistor biasing-band diagram for NPN and PNP transistors, current components and current flow in BJT, Modes of transistor operation, Early Effect, BJT V-I characteristics in CB,CE,CC configuration, BJT biasing techniques, operating point stabilization against temperature and device variations, Bias stabilization and compensation techniques.

UNIT-IV

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

UNIT-V

Junction Field Effect Transistors (JFET): JFET formation, operation & current flow, V-I characteristics of JFET, Low frequency small signal model of FETs. Analysis of CS amplifier.

MOSFETs: Enhancement & Depletion mode MOSFETs, Current equation, V-I characteristics. MOS capacitor. MOSFET Applications, SCR VI characteristics.

Reference Books:

1. Jacob Millman, Christos C.Halkias, and Satyabrata Jit, *Electronic Devices and Circuits*,3rd edition, McGrwHill Education, 2010.
2. Robert Boylestad and Louis Nashelsky, *Electronic Devices and Circuit Theory*,11th ed, Pearson India Publications,2015.
3. B. G. Streetman and S.K. Banerjee, *Solid State Electronic Devices*, 7th edition, Pearson, 2014.

Suggested Readings:

1. D. Neamen, D. Biswas , *Semiconductor physics and Devices*, McGrawHill Education.
2. S.M. Sze and K.N. Kwok, *Physics of semiconductor devices*, 3rd edition, John Wiley 7 sons, 2006.
3. S Salivahanan, N Kumar, and A. Vallavaraj, *Electronic Devices and Circuits*, 2nd ed., McGraw Hill Education, 2007.

Course Code	Course Title						Core / Elective
SPC302EC	Electromagnetic Theory and Transmission Lines						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
–	3	1	–	–	40	60	3

Course Objectives:

1. To comprehend the basic laws of static electricity, magnetism and their applications.
2. To give insights of fundamental concepts of static and time-varying electromagnetic fields.
3. To discuss the propagation and polarization characteristics of electromagnetic waves in conducting and dielectric media.
4. To familiarize basic transmission line theory.
5. To understand analysis of RF transmission line characteristics using Smith chart.

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

1. Apply knowledge of physics and mathematics to solve problems related to static electricity, and magnetism.
2. Apply knowledge of physics and mathematics to solve problems related to time-varying electromagnetic fields.
3. Analyze the propagation and polarization characteristics of an EM signal across various media.
4. Interpret basic design of transmission lines.
5. Evaluate impedance characteristics at any point on the transmission line and determine transmission line parameters using Smith chart.

UNIT-I

Electrostatics: Coulomb's law, Classification of charges, electric field intensity, Gauss law and applications, electric potential, work and energy, Laplace's and Poisson's equations with their solutions, Uniqueness theorem, Polarization, Electric dipole, Calculation of capacitance for simple configurations,.

Magnetostatics: Biot-Savart's law, Classification of currents, Ampere's Circuital Law, Determination of magnetic field, Scalar and vector magnetic potentials, Lorentz's force equation, Ampere's force law, Force between current carrying conductors, Stoke's theorem, Magnetic dipole, and Boundary conditions.

UNIT-II

Time-Varying Electric and Magnetic Fields: Continuity equation, electromotive force, Faraday's Law of Electromagnetic Induction, Conductors and dielectrics, Convection and displacement current, Displacement Current Density, Inductance, Energy density, LIH media, Maxwell's Equations for different dielectric conditions.

UNIT-III

Uniform Plane Electromagnetic Wave: Poynting theorem, Poynting vector and its applications, instantaneous, average and complex power, Wave equations, Uniform plane waves in free space and in conducting medium, wave polarization, wave propagation in lossless and lossy dielectrics, wave propagation in good conductors and dielectrics.

Reflection and Refraction of Plane Waves: Normal and oblique incidence on dielectric and conducting medium, Parallel and perpendicular polarization, critical angle of incidence and total reflection, Brewster angle.

UNIT-IV

Transmission-Line Theory: Overview of T and ˜ networks. Types of Transmission Lines- Two wire 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

The Line at Radio Frequencies: Parameters of open-wire line and coaxial line at high frequencies, Reflection and VSWR, Impedance at any point on the transmission line-Input impedance. RF and UHF lines, transmission lines as circuit elements. Properties of ˜/2, ˜/4 and ˜/8 Lines. Matching: Stub matching. Smith chart and its applications.

Reference Books:

1. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics," 7th edition, Tata McGraw Hill, 2006.
2. Edward C. Jordan and Keith G. Balmain, "Electromagnetic Waves and Radiating Systems," 2nd edition, Pearson, 2015.
3. John D. Ryder, "Networks Lines and Fields," 2nd edition, Pearson, 2015.

Suggested Readings:

1. Matthew N.O. Sadiku, "Principles of Electromagnetics," 6th Edition, Oxford University Press, 2016
2. Shevgaonkar R. K.., "Electromagnetic Waves," McGraw Hill Education India, 2005.

Course Code	Course Title						Core / Elective
SPC303EC	Digital System Design						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
–	3	–	–	–	40	60	3

Course Objectives:

1. To give insights of number systems and their conversions, switching functions and logic design.
2. To analyze the given logic equation and simplify using K-map and tabular method.
3. To explain the operation and design of combinational and arithmetic logic circuits.
4. To analyze the sequential circuits, flip-flop and convert one flip-flop to the other.
5. To comprehend functional characteristics of digital circuits using Verilog HDL.

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

1. Identify and convert different number systems.
2. Simplify Boolean equations using K-map and tabular method.
3. Design and analyze combinational logic circuits.
4. Design and analyze sequential logic circuits.
5. Apply Verilog HDL & appropriate EDA tools for digital logic design and simulation.

UNIT-I

Number system and Codes: Binary, Octal, Hexa, Decimal numbers, Number base conversion, signed binary numbers: 1's Complement, 2's complement, Types of codes: BCD, Excess -3 code, Gray code

Boolean Algebra: Properties of Boolean algebra, Basic Laws and Theorems, DeMorgan's theorem, Canonical and Standard Forms, Logic gates.

UNIT-II

Minimization of Switching Functions: Map method, Optimized implementation of logic functions using K-Map and Quine- McCluskey Tabular method.

Logic Design and realization: Design with basic logic gates, code conversions, Don't- Care Conditions, NAND/NOR Realizations, Exclusive-OR functions.

UNIT-III

Combinational Logic Design: Comparators, Multiplexers, Demultiplexers, Encoder, Priority Encoder, Decoder, 7-segment Display, Half and Full Adders, Subtractors, Ripple Carry Adder, Carry Look Ahead Adder, BCD Adder, Parity Generator and Checker. Implementing Boolean functions with IC 74151, IC 74153, IC 74138.

UNIT-IV

Sequential Circuits: Memory element, S-R, J-K and D Latch operation, Race around condition, Master Slave J-K Flip Flop, Flip-Flop types: S-R, J-K, D, T, Flip flop conversions, Registers and Counters. Implementing counters with IC 7476, IC 7474, IC 7490, IC 7492, IC 7493.

Finite state machine – Moore, Melay, State table, State diagram, Design of a sequence detector

UNIT-V

VLSI Design flow, overview of Verilog HDL, module definition, different modeling styles in Verilog HDL: Dataflow, Behavioural and Structural Modelling, Verilog HDL codes for combinational circuits.

Reference Books:

1. M. Morris Mano and Michael D.Ciletti "Digital Design," Pearson, 5th Edition, 2013.
2. Zvi Kohavi, "Switching and Finite Automata Theory," 2nd Edition, 2015.
3. Samir Palnitkar, "Verilog HDL A guide to digital design and Synthesis," Pearson, 2nd Edition, 2015.
4. R.P Jain. "Modern Digital Electronics", Tata McGraw-Hill Education, Jun 1, 2003.

Suggested Readings:

1. D.V. Hall, "Digital Circuits and Systems," Tata McGraw Hill, 1989.
2. Charles Roth, Digital System Design, Tata McGraw Hill, 2nd Edition, 2012.

Course Code	Course Title						Core / Elective
SES315EC	Data Structures Lab						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
Programming for Problem Solving (SES101CS) & Programming for Problem Solving lab (SES111CS)	2	–	–	2	40	60	3

Course Objectives:

1. To familiarize with various data representation techniques in the real world.
2. To comprehend linear and non-linear data structures.
3. To discuss various algorithms based on their time and space complexity.

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

1. Understand the concept of data structures, C Programming and apply algorithm for solving problems like sorting, searching, insertion and deletion of data.
2. Understand linear data structures for processing of ordered or unordered data.
3. Explore various operations on dynamic data structures like single linked list, circular linked list and doubly linked list.
4. Explore the concept of nonlinear data structures such as trees and graphs.
5. Understand the binary search trees, hash function, and concepts of collision and its resolution methods.

List of Experiments

1. Write a C program that uses functions to

a. create a singly linked list of integers.
b. delete a given integer from the above linked list.
c. display the contents of the above list after deletion.
d. check whether two given lists are containing the same data.

2. Write a C program that uses functions to

a. create a double linked list of integers.
b. delete a given integer from the above double linked list.
c. display the contents of the above list after deletion.
d. find the largest element in a given doubly linked list.

3. Write a C program

a. to implement stack using linked list.
b. that uses stack operations to convert a given infix expression into its postfix equivalent, implement the stack using an array.
c. to reverse the elements of the stack using recursion.

4. Write C programs to implement a double ended queue ADT using

a. array
b. double linked list

5. Write a C program that uses functions to

a. create a binary search tree of characters.
b. traverse the above binary search tree recursively in post order.
c. count the number of nodes in the binary search tree.

6. Write a C program that uses functions to

a. create a binary search tree of integers
b. traverse the above binary search tree non recursively in in order

7. Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order.

a. Insertion sort
b. Merge sort

8. Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order.

a. Quick sort
b. Selection sort

9. Write a C program to perform the following operation:

a. Insertion into a B-Tree

b. Heap Sort

10. Write a C program to implement all the functions of a dictionary (ADT) using hashing.

11. Write a C program for implementing Knuth-Morris-Pratt pattern matching algorithm.

12. Write C programs for implementing the following graph traversal algorithms:

a. Depth first traversal

b. Breadth first traversal

Suggested Readings:

1. Gilberg and Forouzan, Data Structure - A Pseudo code approach with C, Thomson publication.
2. Data Structure in C, Tanenbaum, PHI publication/Pearson Publication.
3. Pai, Data Structures & Algorithms; Concepts, Techniques & Algorithms, Tata McGraw Hill.

Course Code	Course Title						Core / Elective
SPC311EC	Electronic Devices Lab						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
–	–	–	–	2	40	60	1

Course Objectives

1. To study the characteristics of PN Junction diode, Zener Diode and their applications.
2. To describe the characteristics of BJT and FET.
3. To design biasing circuits for BJT amplifier.
4. To plot the frequency response of BJT and FET amplifiers
5. To use simulation software for design and analysis of circuits.

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

1. Understand the characteristics of diodes.
2. Analyze the characteristics of BJT in different configurations
3. Understand biasing techniques for BJT.
4. Analyse the frequency response of BJT and FET.
5. Perform simulation of rectifier and amplifier circuits.

List of Experiments

1. V-I Characteristics of Silicon and Germanium Diodes and measurement of static and dynamic resistances.
2. V-I Characteristics of Zener diode and measurement of static and dynamic resistances.
3. Zener diode application as voltage regulator.
4. Design, realization and performance evaluation of half wave rectifiers without and with filters.
5. Design, realization and performance evaluation of full wave rectifiers without and with filters.
6. V-I characteristics of BJT in CB configuration.
7. V-I characteristics of BJT in CE configuration.
8. V-I characteristics of FET in CS configuration.
9. BJT Biasing circuit design.

10. Frequency response of Common Emitter BJT amplifier.
11. Frequency response of Common Source FET amplifier.
12. V-I characteristics of UJT

Note: Simulation of ANY THREE should be performed using MULTISIM / PSPICE / Open Source Software.

Suggested Readings:

1. Paul B. Zbar, Albert P. Malvino, *Michael A. Miller, Basic Electronics, A Text - Lab Manual,* 7th Edition, TMH 2001.
2. Electronic Devices Laboratory Manual of Stanley College of Engineering and Technology for Women.
3. Datasheets of Devices.

Course Code	Course Title						Core / Elective
SPC312EC	Digital System Design Lab						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
–	–	–	–	2	40	60	1

Course Objectives

1. To discuss verification of combinational and sequential circuits.
2. To describe about design and verification of combinational and sequential circuits.
3. To explain techniques for design and verification of digital circuits using Verilog HDL.
4. To give insights of digital systems and finite state machines.
5. To verify the Verilog codes by writing appropriate test benches.

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

1. Design and verify the combinational logic circuits.
2. Design and verify the sequential logic circuits.
3. Apply the constructs and conventions of the Verilog HDL programming.
4. Design and analyze digital systems and finite state machines.
5. Perform functional verification by writing appropriate test benches.

List of Experiments:

CYCLE-I:

1. Verification of Basic gates using TTL ICs like AND, OR, NOT, EX-OR,NAND and NOR gates
2. Design and verify code convertors using gates
3. Design and verify half adder, full adder using gates
4. Design and verify half subtractor and full subtractor using gates
5. Flip-Flop Verification using IC's
6. Convert D- FF to T -FF
7. Design Decade Counter
8. Design of Synchronous counter

CYCLE-II:

9. Design of 4-bit Ripple Carry Adder using Verilog and simulate using test bench
10. Design of ALU using Verilog and simulate using test bench.
11. Design of 4-bit comparator using 2-bit comparator and additional logic
12. Design of synchronous up-down counter

Note: Cycle-II should be performed using Vivado 2014.4/ Modelsim software tool.

Suggested Readings:

1. M.Morris Mano & Michael D.Ciletti-Digital Design, Pearson, 5th edition, 2013.
2. Samir Palnitkar -Verilog HDL A guide to digital design and Synthesis, Pearson, 2nd edition, 2015.
3. Digital System Design Laboratory Manual of Stanley College of Engineering and Technology for Women.

B.E. IV 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 Hours	
Theory Courses										
1.	SPC401EC	Analog Electronic Circuits	3		-	3	40	60	3	3
2.	SPC402EC	Signals & Systems	3		-	3	40	60	3	3
3.	SPC403EC	Integrated Circuits and Applications	3	1	-	4	40	60	3	4
4.	SPC404EC	Computer Organization and Architecture	3		-	3	40	60	3	3
5.	SPC405EC	Antennas and Wave Propagation	3		-	3	40	60	3	3
Practical / Laboratory Course										
1.	SPC411EC	Analog Electronic Circuits Lab	-	-	2	2	40	60	3	1
2.	SPC412EC	Integrated Circuits Lab			2	2	40	60	3	1
3.	SPC413EC	Antenna Lab			2	2	40	60	3	1
*4.	*SPW412EC	***Internship- 1**	The students have to undergo an Internship of 4 week duration after IV- Semester SEE				*50			*1
		Total	**15**	**1**	**6**	**22**	**320**	**480**	**24**	**19**

* Credits will be awarded after evaluation in Semester - V.

IV Semester Detailed Syllabus

Course Code	Course Title						Core / Elective
SPC401EC	Analog Electronic Circuits						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
Electronic Devices and Circuits (SPC301EC)	3	–	–	–	40	60	3

Course Objectives:

1. To describe frequency response of amplifiers over different frequency ranges.
2. To formulate the concept of negative feedback amplifiers
3. To design different types of oscillators.
4. To analyse large signal amplifiers using graphical methods.
5. To familiarize with the types of RF tuned amplifiers.

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

1. Analyse frequency response of small signal amplifiers.
2. Compare and analyse the types of feedback amplifiers.
3. Design and analyze oscillators at audio and radio frequencies.
4. Distinguish and design various classes of power amplifiers.
5. Compare the performance of single, double and stagger tuned amplifiers.

UNIT-I:

Small signal amplifiers: Introduction to Hybrid-pi model, Classification of amplifiers, types of coupling in multistage amplifiers, mid-frequency, Low and high frequency analysis of single-stage RC coupled amplifier using BJT and JFET, multi-stage RC coupled amplifier-qualitative treatment, Transformer Coupled amplifier.

UNIT-II:

Feedback amplifiers: The feedback concept, General characteristics of negative feedback amplifier, Effect of negative feedback on input and output impedances, Voltage and current, series and shunt feedbacks, local versus global feedback.

UNIT-III:

Oscillators: Positive feedback and Barkhausen conditions for sinusoidal oscillations, RC Oscillators: RC phase-shift and Wein-bridge, LC Oscillators: Hartley, Colpitts and Crystal oscillator. Frequency and amplitude stability of oscillators.

Regulators: Transistorized series and shunt regulators.

UNIT-IV:

Large Signal Amplifiers: BJT as large signal audio amplifier, Classes of operation, harmonic distortion, power dissipation, efficiency calculations. Design considerations of transformer coupled and transformerless push-pull audio power amplifiers under Class-A, B, AB, C, and D operations-Qualitative analysis.

UNIT-V:

RF Voltage Amplifiers: Analysis and design of single tuned and double tuned amplifiers with BJT, selectivity, gain and bandwidth. Comparison of multistage, single tuned amplifiers and double tuned amplifiers. Introduction to stagger tuned amplifiers.

Reference Books:

1. Jacob Millman, Christos C. Halkias, and Satyabrata Jit, *Electronic Devices and Circuits*, 3rd ed., McGraw Hill Education, 2010.
2. David A. Bell, *Electronic Devices and Circuits,* 5th ed., Oxford University Press, 2009.
3. S Salivahanan, N Kumar, and A. Vallavaraj, *Electronic Devices and Circuits*, 2nd ed., McGraw Hill Education, 2007.

Suggested Readings:

1. Donald A.Neamen, Electronic Circuits: Analysis and Design, 3rd edition, McGraw Hill, 2006.
2. Allen Mottershead, Electronic Devices and Circuits: An introduction, 2009.

Course Code	Course Title						Core / Elective
SPC402EC	Signals and Systems						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
–	3	–	–	–	40	60	3

Course Objectives:

1. To give insights of classification of signals, representation techniques and enumerate the types of systems.
2. To formulate the mathematical tools such as Fourier Transform and Laplace Transform.
3. To comprehend Fourier analysis of signal, Z-transform and its applications.
4. To familiarize about convolution and correlation between signals.
5. To summarize the transformation techniques

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

1. Define and differentiate types of signals and systems in continuous and discrete time domains.
2. Explain the properties of Fourier transform for continuous time signals
3. Apply continuous time Fourier Transform and Laplace Transform for analysis of system behavior.
4. Perform Fourier analysis of discrete time signals
5. Construct Z-transforms for discrete time signals to solve difference equations

UNIT-I:

Classification of Signals and Systems: Elementary continuous time signals, Basic operations on continuous-time signals

Types of Systems: Continuous time & discrete time systems, Lumped Parameter and distributed parameter systems, Static and dynamic systems, Causal and Non-causal systems, Time-Variant & Time-Invariant, Stable and unstable systems.

UNIT-II:

Representation of signals: Analogy between Signals and Vectors, Orthogonality & completeness

Fourier Series Analysis: Fourier series- Existence of Fourier series, Trigonometric& Exponential Fourier Series, computational formulae, Symmetry conditions, complex Fourier spectrum.

UNIT-III:

Fourier Transform: Direct & inverse FT, existence of FT, Properties of FT, FT of standard signals, frequency spectrum. Fourier analysis of discrete time Fourier transform - DTFT, properties of DTFT, Transfer function

Linear Convolution of signals: Graphical Interpretation, Properties of Convolution.

Correlation between signals: Auto and cross correlation, graphical interpretation, properties of correlation

UNIT-IV:

Laplace Transform: The direct Laplace Transform, Region of Convergence, existence and properties of Laplace Transform, inverse Laplace Transform, solution of differential equations, system transfer function, Comparison of Fourier and Laplace Transform.

UNIT-V:

Z-Transform: Sampling Theorem, aliasing, reconstruction for bandlimited signals, under and over sampling, basic operations on discrete time signals. The direct Z-Transform, Region of Convergence, Z-plane & S-plane correspondence, inverse Z-transform, properties of Z-Transforms, Convolution Sum of signals, Classification on discrete time systems, properties of systems, Solution to linear difference equations, Linear constant coefficient systems, system transfer function.

Reference Books:

1. B. P. Lathi, Linear Systems and Signals, Oxford University Press, 2nd Edition, 2009.
2. A. V. Oppenheim, A.S. Willsky – Signals & Systems – 2nd Edition, Prentice Hall.
3. P. Ramesh Babu, R. Ananada Natarajan-Signals and Systems-4thedition,Scitech publications

Suggested Readings:

1. Rodger E. Ziemer, William H Trenter, D. Ronald Faninn – Signals & Systems – 4th Edition, Pearson 1998.
2. Douglas K. Linder. Introduction to Signals and Systems, MC Graw Hill, 1999.
3. P. Ramakrishna Rao, Signals and Systems, 2e, TMH.

Course Code	Course Title						Core / Elective
SPC403EC	Integrated Circuits and Applications						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
Electronic Devices and Circuits (SPC301EC)	3	1	–	–	40	60	4

Course Objectives:

1. To give insights of the behavior of linear, non-linear wave shaping circuits
2. To analyze multivibrators and time-base generators.
3. To understand the operation of differential and operational amplifiers.
4. To illustrate the functionalities of OPAMP.
5. To evaluate the performance of 555 timer, ADC and DAC

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

1. Construct different linear and non-linear networks and analyze their response to different input signals
2. Design and analyze multi vibrators and sweep circuits using transistors
3. Analyze DC and AC characteristics for Single/Dual input Balanced/Unbalanced output configurations using BJTs.
4. Understand the applications of OPAMP.
5. Experiment with the applications of 555 timer, D/A and A/D converters.

UNIT-I

Linear Wave Shaping: High pass, Low pass RC circuits and their response for sinusoidal, step, pulse, square inputs. RC network as a differentiator and integrator, Attenuators.

Non-Linear Wave Shaping: Diode clippers, clipping at two independent levels, Transfer characteristics of clippers, Clamping operation, clamping circuits, Clamping circuit theorem.

UNIT-II

Multi-vibrators: Design and Analysis of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using transistors.

Time base generators: General features of a time base signal, methods of generating voltage, time base waveform.

UNIT-III

Differential amplifiers: Classification, DC and AC Analysis of Single/Dual input Balanced and Unbalanced output configurations using BJTs. Level Translator.

Operational Amplifier: OPAMP Block diagram, ideal and practical OPAMP, DC and AC characteristics of OPAMP

UNIT-IV

OPAMP Applications (µA741): Inverting and Non-Inverting Amplifiers, Integrator and Differentiator, Summing amplifier, Precision rectifier, Astable and Monostable, Schmitt trigger and its applications. Active filters: Low pass, high pass, band pass and band stop. Log and Anti Log Amplifier

UNIT-V

555 Timer: Functional Diagram, Monostable, Astable and Schmitt Trigger Applications. Fixed and variable voltage regulators (7805, LM315), PLL (IC565) and its Applications.

Data Converters: Digital-to-Analog Converters (DAC): Weighted resistor, inverted R-2R ladder, Analog-to-digital converters (ADC): dual slope, successive approximation, flash, Specifications.

Reference Books:

1. J. Millman and H. Taub, '*Pulse, Digital and Switching Waveforms'* - McGraw-Hill, 1991.
2. Ramakanth A. Gayakwad, '*Op-Amps and Linear Integrated Circuits'* Pearson, 2018, 4th Ed.
3. D.Roy Chowdhury, Shail B.Jain, '*Linear Integrated Circuits'*, 4/e, New Age International (P) Ltd., 2008.

Suggested Readings:

1. David A. Bell, '*Solid State Pulse circuits,'* PHI, 4th Ed., 2002.
2. S Salivahanan and V S Kanchana Bhaaskaran, 'Linear Integrated Circuits,' McGrawHill, 3rd Ed., 2018.

Course Code	Course Title						Core / Elective
SPC404EC	Computer Organization and Architecture						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
Digital System Design (SPC303EC)	3	–	–	–	40	60	3

Course Objectives:

1. To describe data representation, computer arithmetic, basic structure and operation of a digital computer.
2. To describe the basic structure and operation of a digital computer.
3. To discuss the different ways of communicating with I/O devices and standard I/O interfaces.
4. To describe the hierarchical memory system and to enumerate issues affecting modern processors.
5. To understand issues affecting modern processors.

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

1. Perform mathematical operations on fixed and floating point digital data.
2. Illustrate the operation of a digital computer.
3. Understand I/O interfacing of a computer.
4. Interface microprocessor with memory devices.
5. Understand latest trends in microprocessors.

UNIT-I

Data Representation and Computer Arithmetic: Introduction to Computer Systems, Organization and architecture, evolution and computer generations; Fixed point representation of numbers, digital arithmetic algorithms for Addition, Subtraction, 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 Computer 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 interface. 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, I/O channel.

UNIT-V

Memory Organization: Memory hierarchy, Primary memory, Auxiliary memory, Associative memory,

Cache memory: mapping functions, Virtual memory: address mapping using pages, Memory management.

Reference Books:

1. Morris Mano, M., "Computer System Architecture," 3/e, Pearson Education, 2005.
2. William Stallings, "Computer Organization and Architecture: Designing for performance," 7/e, Pearson Education, 2006.
3. B. Govindarajalu, "Computer Architecture and Organization: Design Principles and Applications," McGraw Hill Education; 2nd edition, 2017.

Suggested Readings:

1. John P. Hayes, "Computer Architecture and Organization," 3/e, TMH, 1998.
2. Hebbar, "Computer Architecture", Macmillan, 2008.

Course Code	Course Title						Core / Elective
SPC405EC	Antennas and Wave Propagation						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
Electromagnetic Theory and Transmission Lines (SPC302EC)	3	–	–	–	40	60	3

Course Objectives:

1. To give insights about basic principles of antennas and introduce the antenna terminologies.
2. To comprehend the working principles of wire antennas,
3. To familiarize about the non-resonant antennas
4. To give insights of antenna arrays and techniques for measurement of antennas characteristics.
5. To explain the various modes of radio wave propagation.

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

1. Understand the basic principles of antennas and learn the antenna terminology.
2. Apply the design considerations of different types of wire antennas and make proficient in analytical skills for understanding practical antennas.
3. Analyse the non-resonant antennas for various ranges of frequencies and get updated with latest developments in the smart antennas.
4. Apply the principles and design considerations of antennas as well as antenna arrays, measure standard antenna parameters and obtain awareness about radiation hazards.
5. Understand and compare various modes of radio wave propagation used for different applications.

UNIT-I

Antenna Fundamentals: Introduction, principle of radiation, isotropic radiator, basic antenna parameters: radiation pattern, beam area, radiation intensity, beam efficiency, directivity, gain, resolution, antenna apertures, effective length and effective area, Friis transmission equation, fields from oscillating dipole, antenna field zones, antenna polarization, front–to-back ratio, antenna theorems, antenna impedance and antenna temperature. Retarded potential: Scalar and vector magnetic potential, Lorentz and Coulomb gauge conditions.

UNIT-II

Thin Linear Wire Antennas: Introduction, current distributions, radiation from infinitesimal/ short dipole or an alternating current element, half-wave dipole and quarter wave monopole, loop antennas-small loop, comparison of far fields of small loop and short dipole, far field pattern of circular loop with uniform current, radiation resistance of loops, slot antennas, helical antennas- helical geometry, helix modes: transmission and radiation, practical design considerations for monofilar helical antenna in axial modes, wideband characteristics of monofilar helical antenna radiating in axial mode, radiation efficiency.

UNIT-III

Non-Resonant Antennas: Comparison between resonant and non-resonant antennas, Long-wire antennas: V-antenna and Rhombic Antenna, Yagi-Uda Antenna, Folded dipole antennas, Broadband and frequency-independent concept, Log-periodic Antenna, Aperture Antennas-Huygen's principle, Babinets principle, Radiation from Horns and design considerations, Parabolic Reflector and Cassegrain Antennas, Lens Antennas, Micro Strip Antennas- Basic characteristics, feeding Methods, Design of Rectangular Patch Antennas, Smart Antennas-Fixed weight and Adaptive Beam forming.

UNIT-IV

Antenna Arrays: Array of point sources, two element array with equal and unequal amplitudes, different phases, linear n-element array with uniform distribution, Broadside and End fire arrays, Principle of Pattern Multiplication, Effect of inter element phase shift on beam scanning, Binomial array. EFA with Increased Directivity, Derivation of their characteristics and comparison; Effects of Uniform and Non-uniform Amplitude Distributions.

Antenna Measurements: Introduction, Basic Concepts-Reciprocity, Near and Far fields, Source of Errors, Antenna Test Site. Measurement setup and distance criterion for directional patterns, gain (absolute and comparison methods) and impedance, Radiation Hazards.

UNIT-V

Wave Propagation: Ground, space and surface wave propagation, Troposphere refraction and reflection, Duct propagation, Sky wave propagation, Regular and irregular variations in ionosphere, Line of Sight (LOS) propagation.

Reference Books:

1. John. D. Kraus, Ronald J. Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation", McGraw-Hill, 4th Edition, 2010.
2. Constantine A. Balanis, "Antenna Theory: Analysis and Design", 3rd Edition, John Wiley, 2005.
3. Edward C. Jordan and Keith G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, PHI, 1968.

Suggested Readings:

1. Robert E. Collin, "Antennas and Radiowave Propagation", McGraw-Hill, 1985.
2. K.D. Prasad, "Antennas and Wave Propagation", Satya Prakashan, Tech India Publications, New Delhi, 2001.
3. Girish.Kumar and K.P.Ray, Broadband Microstrip Antennas, Artech House, 2003.
4. A.R.Harish and M. Sachidananda, "Antennas and Wave Propagation", Oxford University Press, 2007.

Course Code	Course Title						Core / Elective
SPC411EC	Analog Electronic Circuits Lab						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
Electronic Devices and Circuits (SPC301EC) & Electronics Devices Lab (SPC311EC)	–	–	–	2	40	60	1

Course Objectives:

1. To plot the frequency response of BJT, FET amplifiers.
2. To find the frequency response of feedback amplifiers.
3. To design oscillator circuits and transistor regulators.
4. To calculate efficiencies of power amplifiers.
5. To draw the frequency response of tuned amplifiers.

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

1. Calculate gain and bandwidth of BJT and JFET amplifiers.
2. Design feedback circuits.
3. Design oscillator circuits transistor regulator circuits.
4. Design and analyze power amplifier circuits.
5. Implement tuned amplifiers.

List of Experiments

1. Two-Stage RC Coupled CE BJT Amplifier
2. Two-Stage RC Coupled CS JFET Amplifier
3. Voltage Series Feedback Amplifier
4. Voltage Shunt Feedback Amplifier
5. Current Series Feedback Amplifier
6. RC Phase-Shift Oscillator
7. Hartley and Colpitts Oscillator

8. Design of Class-A power amplifier
9. Design of Class-B power amplifier
10. Series Transistorized Regulators
11. Shunt Transistorized Regulators
12. RF Tuned Amplifier

Note: Simulation of any **THREE** should be performed using PSPICE/ Multisim/ open source software.

Suggested Reading:

1. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, Basic Electronics,A Text - Lab Manual, 7th Edition, TMH 2001.
2. Analog Electronic Circuits Laboratory Manual of Stanley college of Engineering and Technology for Women.
3. Datasheets of Devices.

Course Code	Course Title						Core / Elective
SPC412EC	Integrated Circuits Lab						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
Integrated Circuits and Applications (SPC403EC)	–	–	2	2	40	60	1

Course Objectives:

1. To describe the implementation of high pass and low pass circuit, clipping and clamping circuits and study it's performance
2. To design and test bi-stable, mono-stable and astable multi-vibrators.
3. To define the characteristics of a schmitt trigger and study it's performance
4. To understand and analyze PLL Circuit
5. To analyze and study DAC and ADC circuits

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

1. Design and analyze linear and non-linear wave shaping circuits.
2. Design and analyze multivibrator circuits..
3. Design and analyze Schmitt trigger circuit
4. Design and analyze PLL
5. Design and analyze DAC Circuits

List of Experiments

Cycle-I:

1. Low Pass and High Pass RC Circuits
2. Two level Clipping circuit and Clamping circuits
3. Collector Coupled Bistable Multivibrators
4. Collector Coupled Monstable Multivibrators
5. Collector Coupled Astable Multivibrators
6. Schmitt Trigger Circuit

Cycle-II:

7. Measurement of OPAMP Static Parameters
8. OPAMP Applications : a) Inverting and Non-inverting b) Integrator and Differentiator
9. Active filters (Low Pass and High Pass-first and second order)
10. Astable and Mono stable multi vibrator using NE555 IC
11. Astable and Monostable multivibrator using μA741
12. PLL using NE565
13. R-2R Ladder network-DAC

Note: A minimum of **TEN** experiments must be conducted in the semester.

Suggested Readings:

1. Robert Boylestad and Louis Nashelsky, 'Electronic Devices and Circuit *Theory'*, 5th Edition, Prentice-Hall of India Private Limited, New Delhi, 1995.
2. David A. Bell, Laboratory Manual for '*Electronic Devices and Circuits'*, 4th Edition, Prentice-Hall of India Private Limited.
3. Integrated Circuits Laboratory Manual of Stanley College of Engineering and Technology for Women.

Course Code	Course Title						Core / Elective
SPC413EC	Antenna Lab						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
Antennas and Wave Propagation (SPC405EC)	–	–	–	2	40	60	1

Course Objectives:

1. To familiarize with design and simulation of basic antennas.
2. To explain the design and simulation method of microstrip antenna arrays.
3. To describe the design and simulation method of log periodic antenna.
4. To explain the design and simulation of microstrip antennas and arrays with defected ground structure.
5. To illustrate the design and simulation of microstrip antennas using different dielectric materials.

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

1. Estimate the radiation characteristics of three element Yagi-Uda antenna.
2. Calculate bandwidth, gain, virtual size reduction of microstrip antennas.
3. Calculate bandwidth, gain, virtual size reduction and mutual coupling of microstrip antenna arrays.
4. Construct the radiation pattern of log periodic antenna.
5. Analyze the performance of rectangular microstrip antenna on the basis of polarization, dielectrics and feeding techniques used.

List of Experiments:

1. Implementation of radiation characteristics of a 3 element Yagi-Uda antenna.
2. Implementation of radiation characteristics of a half wave dipole.
3. Implementation of radiation characteristics of a quarter wave monopole.

4. Design and simulation for study of performance characteristics of a rectangular microstrip antenna for different feeding techniques.
   i. Strip Line feed.
   ii. Probe feed.

5. Design and simulation for analysis of the performance characteristics of a rectangular microstrip antenna with slots on the radiating patch.

6. Design and simulation for analysis of performance characteristics of a rectangular microstrip antenna with slots loaded in the ground plane.

7. Design and simulation for study of the performance characteristics of a rectangular microstrip antenna for circular polarization.

8. Design and simulation for analysis of the performance characteristics of a rectangular microstrip antenna for different dielectric materials.

9. Design and simulation for analysis of the performance characteristics of a rectangular microstrip antenna array (2, 4 and 8 elements) using the following feeding methods.
   i. Corporate feed
   ii. Series feed.

10. Design and simulation for analysis of the performance characteristics of a rectangular microstrip antenna array with slots loaded in the ground plane.

11. Design and simulation for analysis of the performance characteristics of a rectangular microstrip antenna array with slots loaded in the ground plane and in between the radiating patches.

12. Design and simulation for analysis of the performance characteristics of helical/log periodic antenna.

Software Required: HFSS/Mentor Graphics IE3D.

Note: A minimum of **TEN** experiments must be conducted in the semester.

Course Code	Course Title						Core / Elective
SPW412EC	Internship-1						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
–	–	–	–	–	50	–	1

Course Objectives:

1. To provide students with a skill based training.
2. To expose students to a theory-to-practice environment in an industry.
3. To enhance practical and professional skills.
4. To provide training in soft skills, technical report writing and presentations.
5. To expose students to team-work towards achieving the objectives of the project work.

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

1. Acquirepractical experience of hardware/software design and development in industrial/R&D environments.
2. Understand working practices in an industrial/R&D environment.
3. Prepare reports and deliver effective presentations.
4. Demonstrate effective written and oral communication skills.
5. Innovate in various engineering disciplines and nurture their entrepreneurial ideas.

Summer Internship is an important activity of an engineering programme wherea studentisprovided a skill based training. This is introduced as a part of the curriculum for encouraging students to work on problems of interest that is specific to an industry. Internship-1is aimed at providing a primary exposure of industrial project work. This offers the student an opportunity to use the knowledge, gained through fundamental theory and laboratory courses studied in classrooms,forreal-time implementation.

Every individual student must enrol for internship in an industryfor a period of 4 weeks. The student must submit the internship enrolment details like name and address of the industry, broad area of internship etc. to the Internship Coordinator at the end of the first month after commencement of Semester-IV.The industry must be a Government/Private or any designated R&D organization. This will be during the summer vacation following the completion of the Semester-IV of theB.E. programme. One faculty member (Internal Guide) will be provided to

each student to monitor the continuous progress of the project work and to interact with the industry Coordinator.

After the completion of the Internship-1, each student will be required to submit technical (i) report and (ii) presentation of the work carried out to the Internship Review Committee (IRC) of the department for evaluation.

A Continuous Internal Evaluation (CIE) of Internship-1 for total 50 marks will be done by the Internal Guide (25 Marks) followed by the IRCof the department (25 Marks). One faculty member will co-ordinate the overall activities related to Internship-1.

Note: Credits of Internship-1 will be awarded after evaluation in Semester-V.

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 modern 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

STANLEY COLLEGE OF ENGINEERING AND TECHNOLOGY FOR WOMEN (AUTONOMOUS)

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

ABIDS, HYDERABAD - 500 001, Telangana.