Program Structure and Syllabus of B. Tech II Year

Electronics and Communication Engineering

(Academic Regulations - R24)

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B. TECH II YEAR I SEMESTER

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	EMA2110	Theoretical & Practical (PC)	Electronic Devices and Circuits	3	0	2	4
2	EMA2118	Theoretical (PC)	Electromagnetic Theory and Transmission Lines	3	1	0	4
3	EMA2115	Theoretical & Practical (PC)	Signals and Systems	3	0	2	4
4	EMA2117	Theoretical (PC)	Introduction to Probability Theory and Statistics	3	0	0	3
5	EMA2X19	Theoretical & Practical (PC)	Programming in Java	3	0	2	4
6	EVA2101	Experiential (PC)	Integrated Project - I	0	0	2	1
TOTAL				**15**	**1**	**8**	**20**

B. TECH II YEAR II SEMESTER

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	EMA2216	Theoretical & Practical (PC)	Analog Communications	3	0	2	4
2	EMA2X02	Theoretical (BS)	Discrete Mathematics	3	0	0	3
3	EMA2220	Theoretical & Practical (PC)	Electronic Circuit Analysis	3	0	2	4
4	EMA2225	Theoretical & Practical (PC)	Digital Circuits	2	0	2	3
5	EMA2X18	Theoretical & Practical (PC)	Programming in Python	3	0	2	4
6	EVA2X25	Practical (HS)	Dynamics of Group Discussion	0	0	2	1
7	EVA21X1	Theoretical (HS)	Environmental Studies	2	0	0	0
8	EVA2201	Experiential (PC)	Integrated Project - II	0	0	2	1
TOTAL				**16**	**0**	**12**	**20**

B. TECH III YEAR I SEMESTER

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PC	Digital Signal Processing	3	0	2	4
2		PC	Microprocessors & Microcontrollers and Interfacing	3	0	4	5
3		PC	Pulse and Integrated Circuits	3	0	2	4
4		PC	Linear Control Systems	3	0	0	3
5		OE - I	1. Introduction to Electric and Hybrid Vehicles 2. Introduction to Geographic Information System 3. Operating Systems	3	0	0	3
6		BS	Quantitative Aptitude and Logical Reasoning - I	0	0	2	1
TOTAL				**15**	**0**	**10**	**20**

B. TECH III YEAR II SEMESTER

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PC	VLSI Design	3	0	2	4
2		PC	Digital Communications	3	0	0	3
3		PC	Embedded Systems & IOT	3	0	2	4
4		HS	Project Management	2	0	0	2
5		PE - I	1.FPGA Based System Design 2. RTOS concepts for Automotive Applications 3. Computer System Architecture	3	0	0	3
6		HS	Verbal Ability and Critical Reasoning (VACR)	0	0	2	1
7		BS	Quantitative Aptitude and Logical Reasoning - II	0	0	2	1
8		PC	Mini Project	0	0	4	2
TOTAL				**14**	**0**	**12**	**20**

B. TECH IV YEAR I SEMESTER

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PC	Antennas and Microwave Engineering	3	0	2	4
2		PC	Cellular and Mobile Communication	3	0	2	4
3		PE – II	1. Digital Image Processing 2. Computer Networks 3. Low power VLSI	3	0	0	3
4		PE – III	1.Machine Learning and Artificial Neural Networks 2. Analog VLSI Design 3. Advanced Communications and Networks (OR) Industry Elective	2	1	0	3
5		PE – IV	1. Introduction to Cyber Security 2. Optical Communication 3. Satellite Communication	2	1	0	3
6		HS	Sustainable Development Goals/Professional ethics	1	0	0	1
7		PC	Summer Internship	0	0	0	2
TOTAL				**14**	**2**	**4**	**20**

B. TECH IV YEAR II SEMESTER

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		OE - II	1.German 2. French 3. Spanish	3	0	0	3
2		OE - III	1.Intellectual Property Rights 2.Introduction to Database Management Systems 3. Introduction to Deep Learning (or) Industry Elective	3	0	0	3
3		PR	Technical Seminar/ Comprehensive VIVA	0	0	4	2
4		PR	Project	0	0	24	12
TOTAL				**6**	**0**	**28**	**20**

Electronic Devices and Circuits

B. Tech II Year I Semester					Dept. of Electronics and Communication Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks %**		
EMA2110	Theoretical and Practical (PC)	L	T	P	C	CIE	SEE	Total
		3	0	2	4	50	50	100

Pre requisite:

APPLIED PHYSICS

Course Objectives

Course Objectives of Electronic Devices and Circuits are to:

1. To learn the characteristics of diode and how to make use of diode in different applications
2. To explain the operation and characteristics of transistors in different modes
3. To apply different biasing methods to make transistor stable
4. To explain the operation and design of FET amplifiers.
5. To analyse feedback amplifiers.

UNIT I

P - N JUNCTION DIODE AND RECTIFIERS: Review of P - N Junction Diode Volt - Ampere Characteristics, Transition and Diffusion Capacitances, Diode Equivalent Circuits, The P - N Junction as a Rectifier, Half wave Rectifier, Full wave Rectifier, Bridge Rectifier, Inductor Filters, Capacitor Filters, Voltage Regulation Using Zener Diode, Zener Diode Characteristics.

UNIT II

BIPOLAR JUNCTION TRANSISTOR AND FIELD EFFECT TRANSISTOR: The Junction Transistor, BJT Operation, Common Base, Common Emitter and Common Collector Configurations, Transistor as an Amplifier, The Junction Field Effect Transistor Pinch – Off Voltage – Volt – Ampere Characteristics, MOSFET Operation MOSFET Characteristics in Enhancement and Depletion Modes.

UNIT III

TRANSISTOR BIASING AND STABILIZATION: Operating Point, The DC and AC Load Lines, Need for Biasing, **Types of biasing methods:** Fixed Bias, Collector Feedback Bias, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization against Variation in V_{BE} and β, Bias Compensation Using Diodes and Transistors, Thermal Runway, Thermal Stability.

UNIT IV

BJT AND FET AMPLIFIERS: BJT Hybrid Model, Determination of h - Parameters from Transistor Characteristics, Comparison of CB, CE and CC Amplifier Configurations, The JFET Small Signal Model, FET Common Source Amplifier, Common Drain Amplifier, FET as Voltage Variable Resistor, Comparison of BJT and FET, The Uni - junction Transistor.

UNIT V

FEED BACK AMPLIFIERS: Concepts of feedback, Classification of feedback amplifiers, General characteristics of negative feedback amplifiers, Effect of Feedback on Amplifier characteristics, Problems.

Text Books:

1. Integrated Electronics Analog and digital circuits and systems – J. Millman, C. C. Halkias, and SatyabrataJit Tata McGraw Hill, 2nd Ed., 2007.
2. Electronic Devices and Circuits – R. L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9th Edition, 2006.
3. Introduction to Electronic Devices and Circuits - Rober T. Paynter PE, 2005.
4. Electronic Devices and Circuits – A. P. Godse Technical Publications. 2009.

Reference Books:

1. Electronic Devices and Circuits – T. F. Bogart Jr., J. S. Beasley and G. Rico, Pearson Education, 6th edition, 2004.
2. Principles of Electronic Circuits – S. G. Burns and P. R. Bond, Galgotia Publications, 2nd Edn., 2003.
3. Microelectronics – Millman and Grabel, Tata McGraw Hill, 2001.
4. Electronic Devices and Circuits – Dr. K. Lal Kishore, 2004, BSP

Course Outcomes

At the end of Electronic Devices and Circuits will be able to:

1. Apply the diode concepts in different applications
2. Understand the BJT, FET and revolutionary MOSFET that lead to the development of integrated circuits and study their construction and characteristics
3. Compare different biasing methods and compensation methods to make transistor stable
4. Design and analyse simple basic amplifiers using Hybrid model.
5. Design and analyse feedback amplifiers using BJTs.

Electronic Devices and Circuits Lab

Requirements

1. Regulated power supplies (RPS)
2. CRO's : 0-20MHZ
3. Function Generator : 0-1 MHZ
4. Multimeters
5. Decade Resistance Boxes / Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital) : 0-20μA, 0-50μA, 0-100μA, 0-200μA,0-10 mA
8. Voltmeters (Analog or Digital) : 0-50V,0-100V, 0-250V
9. Electronic Components : Resistors, Capacitors, BJTs, LCDs, Adriano's,
10. UJTs, FETs, LEDs, MOSFETs, diodes Ge and Si type, Transistors NPN, PNP type

Course Outcomes

After completing the course, students should be able to:

1. Understand electronic test equipment to characterize the behavior of devices and circuits.
2. Plot the characteristics of semiconductor devices to understand their functionality.
3. Design and test rectifiers with filters.
4. Design and test amplifier circuits and interpret the results.
5. Design and test of Feedback amplifiers circuits and interpret the results.

PART A:

ELECTRONIC WORKSHOP PRACTICE:

1. Identification, Specifications, Testing of R, L, C, Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB's.
2. Identification, Specification and Testing of Active Devices, Diodes, BJT's LOW power JFET's, MOSFET's, Power Transistors, LED's, Adriano's, UJT.
3. Study and operation of
   - Multi-meters (Analog and Digital)
   - Regulated Power Supplies
   - Function Generator
   - CRO

PART B:

(For Laboratory Examination – Minimum of 10 experiments)

List of Experiments

1. Forward & Reverse Bias Characteristics of PN Diode.
2. Zener diode characteristics and Zener as voltage Regulator.
3. Half Wave Rectifier with & without filters.
4. Full Wave Rectifier with & without filters
5. Input & output characteristics of Transistor in CB Configuration.
6. Input & output Characteristics of Transistor in CE Configuration.
7. FET characteristics.
8. Measurement of h- parameters of transistor in CB, CE, CC configurations
9. MOS characteristics
10. Current Shunt and Voltage Series Feedback Amplifiers.
11. Frequency Response of FET Amplifier (Common source).
12. Arduino based voltage regulator.
13. Switching circuit with Arduino to control LED
14. UJT Characteristics.

Electromagnetic Theory and Transmission Lines

B. Tech II Year I Semester					Dept. of Electronics and Communication Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks %**		
EMA2118	Theoretical (PC)	L	T	P	C	CIE	SEE	Total
		3	1	0	4	50	50	100

Pre requisites

APPLIED PHYSICS

Course Objectives

The objectives of this courses are to:

1. Understand the fundamental Laws of electrostatic and magnetostatic fields.
2. Understand the boundary conditions at the different media interfaces and applying the Maxwell's equations.
3. Conceptualize the wave propagation characteristics for different media.
4. Understand reflection and transmission phenomenon of waves at media interface.
5. Learn the basic parameters of transmission lines.

UNIT I

Coulomb's Law, Electric Field Intensity – Fields due to Continuous Charge Distributions Electric Flux Density, Gauss Law, Electric Potential - Relations between E and V, Biot - Savart's law, Ampere's Circuital law, Magnetic Flux Density, Magnetic vector Potential, Continuity Equation.

UNIT II

Time Varying Fields: Faraday's Law, Inconsistency of Ampere's Law and Displacement Current Density. Maxwell's Equations for time varying and static fields in all Forms, Conditions at a Boundary Surface - Dielectric-Dielectric and Dielectric-Conductor Interfaces.

UNIT III

Electromagnetic Waves: Wave Equation for dielectric and conductive media, Uniform plane electromagnetic waves, Propagation of electromagnetic waves in different media, skin depth, Poynting theorem.

UNIT IV

Plane Waves at a Media Interface, Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary.

UNIT V

Introduction to Transmission Lines, Equations of Voltage and Current on Transmission line, primary and secondary constants of a transmission line, Reflection Coefficient and Voltage Standing Wave Ratio (VSWR), Low loss& loss less and distortion less transmission lines, Input impedance of a transmission line-characteristics, Impedance Matching (Qualitative treatment) - Quarter wave transformer, stub matching, transmission line sections as circuit elements, Introduction to Smith Chart.

Text Books:

1. Elements of Electromagnetic – Matthew N. O. Sadiku, Oxford Univ. Press, 4th
2. R. K. Shev Gaonkar, Electromagnetic Waves, Tata McGraw Hill India, 2005
3. E. C. Jordan & K. G. Balmain, Electromagnetic waves & Radiating Systems, Pearson, 2nd Edition 2015

Reference Books:

1. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan (Tech.India Publications), New Delhi, 2001.

2. Narayana Rao, N: Elements of Engineering Electromagnetics, Pearson, 6th Edition 2006.
3. Engineering Electromagnetic – Nathan Ida, Springer (India) Pvt. Ltd., New Delhi, 2nd ed., 2005.
4. Networks, Lines and Fields – John D. Ryder, PHI, 2nd ed., 2003.

Course Outcomes

After completing the course, students should be able to:

1. Apply the fundamental laws and concepts of electrostatics and magnetostatics
2. Apply Maxwell's equations to solve equations of EM fields.
3. Characterize uniform plane waves and wave propagation.
4. Calculate reflection and transmission of waves at media interface.
5. Analyze the various characteristics of the transmission lines.

Signals and Systems

B. Tech II Year I Semester					Dept. of Electronics and Communication Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks %**		
EMA2115	Theoretical (PC)	L	T	P	C	CIE	SEE	Total
		3	0	2	4	50	50	100

Pre requisites

MATHEMATICS-I

Course Objectives

1. To understand signals and systems representations/classifications and also describe the time and frequency domain analysis of continuous time signals with Fourier series, Fourier transforms and Laplace transforms
2. To understand sampling theorem, with time and frequency domain analysis of discrete time signals using DTFT and Z transforms.
3. To analyze signals in time domain using convolution sum and integral.
4. To analyze Linear Time Invariant (LTI) Systems in time and Frequency domains.

UNIT I

Classification of Signals and Systems: Definition and classification of signals-Continuous, Discrete, Periodic, Aperiodic, Deterministic, Random, Even, Odd, Energy and Power, Elementary Signals-Step, Ramp, Impulse, Sinusoidal, Signum, Real and Complex Exponentials, Operations on Signals-Addition, Multiplication, Scaling, Shifting, Folding, Definition and classification of systems- Continuous, Discrete, Linear, Non Linear, Causal, Non Causal, Stable, Unstable, Time variant, Time Invariant, LTI systems.

UNIT II

Analysis of Continuous Time Signals: Fourier Series for periodic signals, Properties of Fourier Series, Dirichlet's Conditions, Trigonometric & Exponential Fourier Series, Fourier transform of standard signals, properties of Fourier transforms, Fourier transforms involving impulse function, Fourier transform of periodic signals, Laplace Transform-Definition , ROC , Properties , Inverse Laplace transform , The S-plane and BIBO stability , Transfer functions , System response to standard signals.

UNIT III

LTI Continuous Time Systems: Impulse response, Convolution integrals, difference equations, Analysis of continuous time LTI system using Fourier and Laplace transforms, Distortion less transmission through a system, Bandwidth of systems, relation between bandwidth and rise time.

UNIT IV

Analysis of Discrete Time Signals: Sampling of continuous time signals, Sampling theorem, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Fourier transform of Discrete time signals (DTFT) - Properties, Z Transform-Definition , ROC , Properties , Inverse Z transform.

UNIT V

LTI Discrete Time Systems: Impulse response, Convolution sum, difference equations, Analysis of discrete time LTI system using Fourier and Z transforms, recursive and non - recursive discrete time systems.

Text Books:

1. Signals, Systems & Communications - B. P. Lathi, BS Publications, 2003.
2. Signals and Systems - A. V. Oppenheim, A. S. Willsky and S. H. Nawab, PHI, 2nd Edn.1997.

Reference Books:

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition,2008.

2. Fundamentals of Signals and Systems Michel J. Robert, MGH International Edition, 2008.
3. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A. Riskin, Pearson education.3rd Edition, 2004. Publications, 2nd Edition, 2005.

Course Outcomes

Upon completion of the course, the student will be able to:

1. Define, represent and differentiate types of signals and systems in continuous, discrete time domains and can perform various mathematical operations on them.
2. Compute/Evaluate Fourier series of periodic signals and determine Fourier transform of various signals.
3. Analyze the properties of continuous time signals and systems using Laplace & Fourier transforms and determine the response of LTI system to known inputs.
4. Illustrate signal sampling and its reconstruction.
5. Analyze the properties of discrete time signals and systems using DTFT & Z transforms and determine the response of LTI system to known inputs.

Signals and Systems Lab

Pre requisites

1. Computer system with latest specifications.
2. Connected in lan (optional).
3. Operating system (windows xp or higher).
4. Matlab or scilab.

Course Objectives

1. To be able to describe signals mathematically and understand how to perform mathematical operations on signals. The operations should include operations on the dependent as well as independent variables.
2. To understand system properties - linearity, time invariance, presence or absence of memory, causality, bounded-input bounded-output stability, and invertability. Be able to identify whether a given system exhibits these properties and its implication for practical systems.
3. To be able to perform the process of convolution between signals and understand its implication for analysis of linear time-invariant systems. Understand the notion of an impulse response.
4. To be able to solve a linear constant coefficient differential equation using laplace transform techniques.
5. To develop basic problem - solving skills and become familiar with formulating a mathematical problem from a general problem statement.

Course Outcomes

After completing the course, students should be able to:

1. Describe the basics of matlab/scilab syntax, functions and programming.
2. Generate and characterize various continuous and discrete time signals.
3. Perform the basic operations on the signals.
4. Design and analyze linear time-invariant (lti) systems and compute its response.
5. Analyze the spectral characteristics of signals using fourier analysis, laplace transform and z - transform.

LIST OF EXPERIMENTS (12 EXPERIMENTS TO BE DONE):

LIST OF EXPERIMENTS:

1. Basic operations on matrices.
2. Generation of various signals and sequences (periodic), such as unit impulse, unit step, square, saw tooth, triangular, sinusoidal, ramp, sinc.
3. Operation on signal and sequence such as addition, multiplication, scaling, folding, shifting, computation of energy and average power.
4. Finding the even and odd parts of continuous signals/sequences, real and imaginary part of continuous signals/sequences.
5. Convolution between two signals and any two sequences.
6. Auto correlation and cross correlation between two signals and any two sequences.
7. Verification of linearity and time invariance properties of a given continuous /discrete system.
8. Computation of unit sample, unit step and sinusoidal response of the given lti system and verifying its physical realization and stability properties.
9. Gibbs phenomenon.
10. Finding the fourier transform of a given signal and plotting its magnitude and phase spectrum.
11. Waveform synthesis using laplace transforms.
12. Locating the zeros and poles and plotting the pole zero maps in s-plane and z-plane for the given transfer function.
13. Sampling theorem verification.
14. Removal of noise by auto correlation/ cross correlation.

Introduction to Probability Theory and Statistics

B. Tech II Year I Semester					Dept. of Electronics and Communication Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks %**		
EMA2117	Theoretical (PC)	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objectives

1. To equip students with the mathematical foundation skills to understand and solve probabilistic problems in signal processing and communication engineering.
2. To introduce random variables and their analysis using distributions, moments, and related statistical tools.
3. To analyze multiple random variables and their joint behaviour using distributions, expectations, and key properties.
4. To introduce statistical concepts, including data analysis, estimation, and sampling distributions.
5. To explore hypothesis testing, tests for means, proportions, and significance tests like T - test and F - test.

UNIT I

PROBABILITY: Probability Introduced through Sets, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Introduced through Axioms, Probability Introduced through Relative Frequency, classical definition of Probability, Mathematical Model of Experiments, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events.

UNIT II

RANDOM VARIABLE AND OPERATIONS ON SINGLE RANDOM VARIABLE: Definition of a Random Variable, Types of Random Variables, Conditions for a Function to be a Random Variable, Distribution and Density functions, Examples- Binomial, Poisson, Uniform Gaussian, Conditional Distribution and Conditional Density function, Expected Value of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Moment Generating Function.

UNIT III

MULTIPLE RANDOM VARIABLES AND OPERATIONS ON MULTIPLE RANDOM VARIABLES: Vector Random Variables, Joint Distribution and Joint Density Functions , Marginal Distribution and Marginal Density Functions, Statistical Independence, Conditional Distribution and Density functions, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem (Proof not expected),Expected Value of a Function of Joint Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Moment Generating Function, Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties.

UNIT IV

INTRODUCTION TO STATISTICS: Introduction to Statistics: Population and Samples, Describing Data sets, Summarizing Data sets, normal data sets, paired data sets and the Sample correlation coefficient, mean, mode, median, Sampling Distribution of mean (known and unknown) Proportions, Estimation: Point Estimation, Interval Estimation, Bayesian Estimation.

UNIT V

TEST OF HYPOTHESIS: Null Hypothesis, Hypothesis concerning one mean, Hypothesis concerning two means, Estimation of proportions, Hypothesis concerning one proportion, Hypothesis concerning several proportions, Significance tests: student's T - test, F - test.

Text Books:

1. Introduction to Probability and statistics for engineers and scientists-Sheldon M.Ross, 5th Edition2014.
2. Introduction to Probability and statistics – J. Susan Milton, Jesse C. Arnold, 4th Edition, Tata McGraw

Hill2009.
3. Probability, Random Variables and Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, 2001.TMH.
4. Probability, Random Variables and Stochastic Processes – Athanasius Papoulis and S. Unnikrishna Pillai, PHI, 4th Edition, 2002.

Reference Books:

1. Probability and random processes with stochastic processes- Mallikarjuna Reddy Cengae Learning, 4th edition, 2013.
2. Probability and Random Processes with Application to Signal Processing – Henry Stark and John W. Woods, Pearson Education, 3rd Edition.
3. Probability Methods of Signal and System Analysis. George R. Cooper, Clave D. MC Gillem, Oxford, 3rd Edition, 2012.
4. Statistical Theory of Communication - S. P. Eugene Xavier, New Age Publications, 2003.
5. Probability and Statistics - Shahnaz Bathul, 2006

Course Outcomes

After completing the course, students should be able to:

1. Apply basic probability concepts to solve problems involving conditional probability, total probability, and Bayes' Theorem.
2. Analyze discrete and continuous random variables using probability distribution and density functions.
3. Evaluate joint, marginal, and conditional distributions of multiple random variables.
4. Analyze data sets using statistics and apply estimation techniques.
5. Formulate the statistical hypotheses concerning means and proportions using appropriate significance tests.

Programming in Java

B. Tech II Year I Semester					Dept. of Electronics and Communication Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks %**		
		L	T	P	C	CIE	SEE	Total
EMA2X19	Theoretical and Practical (PC)	3	0	2	4	50	50	100

Pre requisites

- Data Structures

Course Outcomes

Course Objectives of Java Programming are to:

1. Apply OOP concepts to implement classes, objects in Java. [L3]
2. Develop Java applications using inheritance, polymorphism, and exception handling. [L3]
3. Implement modular code using packages and perform file operations with I/O streams. [L3]
4. Apply collections and multithreading for efficient and concurrent Java programs. [L4]
5. Implement functional - style solutions using Java lambdas and streams in real - world scenarios. [L3]

UNIT I

Java Basics: Introduction to OOPs concepts**,** History of Java, Java Virtual machine, Java features, data types, variables, scope and lifetime of variables. **Classes and Objects -** Class declaration, Object declaration, Reference variables, access control, constructors, this keyword, static keyword, garbage collection, passing parameters to methods, nested and inner classes, Arrays, Strings, String Builder, String Buffer.

UNIT II

Inheritance: Introduction, Types of Inheritances, Member access rules, super and final keywords **Polymorphism** - Introduction, Compile time polymorphism - Method overloading, Run time polymorphism - Method overriding, Dynamic method dispatch, abstract classes, interfaces.

Exception handling: Introduction, exception hierarchy, errors, and usage of try, catch, throw, throws and finally, built in exceptions, creating custom exception.

UNIT III

Packages: Understanding the creation and usage of custom packages, access control rules within packages, utilization of built - in Java packages, Date, Random, String Tokenizer, and Scanner.

I/O Streams: Input Stream, Output Stream, File Input Stream, File Output Stream, Object Input Stream, Object Output Stream, Reader, Writer, Buffered Reader, File Reader, and File Writer.

UNIT IV

Collections: Overview of Java Collection Framework, Collection Interfaces - Collection, Set, List, Map, Collection classes - Array List, Linked List, Hash Set, Tree Set, Hash Map, Tree Map.

Multi - threading: Introduction, thread life cycle, creating threads, threads priorities, synchronizing threads, inter thread communication.

UNIT V

Modern Java Features: Introduction to Functional Interfaces, Lambda Expressions, Method References, Stream API – operations: map, filter, reduce, collect, forEach, Optional Class, Built-in functional interfaces – Predicate, Consumer, Function, Supplier.

Text Books:

1. Herbert Schildt, “Java: The Complete Reference”, 12th Edition, Tata McGraw Hill Publications, 2020.

Reference Books

1. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.
2. Thinking in Java Fourth Edition, Bruce Eckel.

Online Resources

1. Java Programming Fundamentals: https://infyspringboard.onwingspan.com/web/en/app/toc/lex_29959473947367270000_shared/overview
2. Programming in Java: https://onlinecourses.nptel.ac.in

Programming in Java Lab

Week 1

1. Write a program to demonstrate execution of static blocks, static variables and static methods.
2. Write a Java program to read 10 integers into an array and print the maximum and minimum values.
3. Write a Java program to input a string and count the number of vowels, consonants, digits, and special characters

Week 2

1. Create a Bank Account class each account has an account Holder Name, account Number, and balance.
2. Create both no argument and parameterized constructors, and use 'this' keyword to initialize the values to class data members. to implement following Methods
    - Void createAccount()
    - Void deposit(int)
    - Void withDraw(int)
    - Void displayAccountDeatils();

Week 3

1. Write a Java program that defines a class containing a member inner class and a static nested class.
2. Demonstrate how to create objects of both types of inner classes and access their members.
3. Write a program for sorting a given list of names in ascending order.

Week 4

1. Write a program to implement single and multi-level inheritance.
2. Write a program to create an abstract class named Shape that contains two integers and an empty method named printArea (). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea () that prints the area of the given shape.

Week 5

1. Write a program to demonstrate the use of super and final keywords.
2. Design a Java program to implement multiple inheritance using interfaces to Create an interface Vehicle with methods like start (), stop (), and fuel Type (). Implement this interface in two classes: Car and Bike, each providing its own version of these methods. Allow users to create objects of Car and Bike, invoke their methods, and display appropriate outputs.

Week 6

1. Write a java program to handle multiple exception using try and catch block.
2. Create a custom exception class Invalid Age Exception that extends Exception. In the main () method, read the user's age and throw the exception if the age is less than 18. Use a try-catch block to handle the exception and display an appropriate message.

Week 7

Skill Test-1

Week 8

1. Write a program to create user defined package and demonstrate various access modifiers.
2. Write a java program to display the employee details using Scanner class.
3. Write a java to implement string tokenizer class.

Week 9

1. Write a Java program that reads the contents of a source text file and writes it to a destination text file using FileInputStream and FileOutputStream.
2. Write a Java program that demonstrates object serialization and deserialization.

Week 10

1. Create a Java program that uses an ArrayList to store a list of student names. Perform the following operations:
    - Add names to the list
    - Remove a name by value and by index
    - Update a name at a specific index
    - Display all names using both a for-each loop and an iterator
2. Create a HashSet to store a list of unique course names. Add, remove, and search for elements, and display all items using an enhanced for loop.
3. Create a HashMap to store student roll numbers as keys and their names as values. Perform operations to add, update, remove, and retrieve entries. Display all key-value pairs

Week 11

1. Write a Java program to simulate a bank account system where multiple threads attempt to deposit money into a shared account.
2. To implement the classic Producer-Consumer Problem using Java multithreading with proper inter-thread communication using wait() and notify() methods.

Week 12

1. Write Java programs on Lambda Expressions and Built-in Functional Interfaces.

Week 13

1. Write Java programs on functional style of programming using Stream API operations.
2. Write Java programs Optional class and Method Reference.

Week 14

Recap of the programs from Week 1 to Week 13

Week 15

Case Study Presentations

Week 16

Skill Test-2

Integrated Project - I

BTech II Year I Semester					Dept. of Electronics and Communication Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks %**		
EVA2101	Exploratory (PC)	L	T	P	C	CIE	SEE	Total
		0	0	2	1	80	20	100

Evaluation Guidelines for the course Integrated Project-I as mentioned below.

CIE/SEE	Assessment component	When	Marks
CIE	Project Report - Phase I	After the completion of 7 Weeks	40
	Project Report - Phase II	After the completion of 14 Weeks	40
SEE	Viva voce	Semester End	20
Overall	CIE assessments will be taken for 80 marks and SEE for 20 marks		

Analog Communications

B. Tech II Year II Semester					Dept. of Electronics and Communication Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks %**		
		L	T	P	C	CIE	SEE	Total
EMA2216	Theoretical and Practical (PC)	3	0	2	4	50	50	100

Pre requisite

SIGNALS AND SYSTEMS, ELECTRONIC DEVICES AND CIRCUITS

Course Objectives

1. To learn the basic concepts of amplitude modulation.
2. To study DSB-SC and SSB-SC modulation generation and detection methods.
3. To know about AM transmitters, receivers and their performance.
4. To study the concepts of angle modulation techniques and know their applications.
5. To familiarize with basic techniques for generating and demodulating various pulse modulated signals.

UNIT I

Amplitude Modulation: Introduction to communication system, need for modulation, amplitude modulation - definition, time domain and frequency domain description, power relations in AM waves, **Generation of AM waves:** square - law modulator, switching modulator. Detection of AM waves:-Envelope detector.

UNIT II

DSB - SC and SSB - SC Modulation: DSB - SC Modulation: Definition, time domain and frequency domain description. Generation of DSBSC Waves- balanced modulator. Demodulation of DSB - SC waves - coherent detection, COSTAS Loop. SSB - SC modulation- Definition, time domain and frequency domain description. Generation of SSB - SC waves, frequency discrimination method and phase discrimination method. Demodulation of SSB waves using synchronous detector, Introduction to vestigial side band modulation.

UNIT III

AM Transmitters and Receivers: AM transmitter block diagram and explanation of each block, AM receiver types - tuned radio frequency receiver, super heterodyne receiver. RF section and characteristics - Frequency changing and tracking, comparison of AM, DSB - SC, SSB - SC and VSB - SC Techniques, Applications of different AM systems.

UNIT IV

Angle Modulation: Basic concepts**, Frequency modulation:** Single tone frequency modulation, spectrum analysis of sinusoidal FM wave, narrow band FM, wide band FM, power and transmission bandwidth of FM wave. Comparison of FM and AM. **Generation of FM waves:** Direct method - parametric variation method (varactor diode, reactance modulator). **Indirect method:** Armstrong method. Detection of FM waves - balanced frequency discriminator, phase locked loop.

UNIT V

Noise and Pulse Modulation: Noise in analog communication system, noise in DSB and SSB system, noise in AM System, pre - emphasis and de – emphasis, Types of Pulse modulation, PAM (Single polarity, double polarity) PWM - Generation and demodulation of PWM, PPM - Generation and demodulation of PPM.

Text Books

1. H Taub & D. Schilling, Gautam Saha,"Principles of Communication Systems", TMH, 3rd edition, 2007.
2. R. P. Singh, SP Sapre, "Communication Systems", TMH, 2nd edition, 2007.

Reference Books:

1. George Kennedy and Bernard Davis, "Electronics & Communication System", TMH, 4th edition, 2009.
2. Simon Haykin, John Wiley, "Communication Systems", Wiley, 4th edition, 2008.
3. KN Hari Bhat & Ganesh Rao, "Analog Communications", Pearson Education India, 2nd edition, 2008.
4. B.P Lathi, "Communication Systems", BS Publication, 2006.

Course Outcomes

After completing this course, the student will be able to:

1. Understand the basic concepts of analog communication systems.
2. Differentiate various analog modulation and demodulation schemes and their spectral characteristics.
3. Analyze various functional blocks of radio transmitters and receivers.
4. Analyze the spectral characteristics of NBFM and WBFM and its applications
5. Evaluate the performance of analog communications in the presence of noise.

Analog Communications Lab

Prerequisite

1. Cro's - 0-20 m hz.
2. Function generators - 0- 1 m hz.
3. Trainer kits.
4. Tv receiver demo kit.
5. Software: matlab or equivalent.
6. Computers with latest specifications.

Course Objectives

1. To generate and detect modulated signals such as am,dsb - sc,fm signals.
2. To analyze the spectral characteristics of am and fm signals.
3. To familiarize the functionality of frequency synthesizer.
4. To demonstrate the generation and detection of pulse modulated signals.
5. To write matlab code for the generation and detection of various analog modulation techniques.

Course Outcomes

1. After completing the course, students should be able to
2. Demonstrate generation and detection of various analog modulation techniques
3. Study the functionality of frequency synthesizer and its applications.
4. Generate and detect pulse analog modulated signals such as pam, ppm and pwm and to analyze their performance.
5. Observe the spectral characteristics of am and fm signals.
6. Write matlab code for the generation and detection of am,ssb-sc and fm signals.

PART A:

All the experiments to be simulated using matlab or equivalent:

1. Amplitude modulation and demodulation
2. Ssb Sc modulation and demodulation
3. Frequency modulation and demodulation
4. Frequency synthesizer
5. Spectrum analysis of am and fm signals
6. Pulse position modulation and demodulation

PART B:

All the experiments to be verified in hardware:

1. Amplitude modulation & demodulation
2. Dsb-sc modulation & demodulation
3. Frequency modulation & demodulation
4. Frequency synthesizer
5. Pulse amplitude modulation and demodulation
6. Pulse width modulation & demodulation

Discrete Mathematics

B. Tech II Year II Semester					Dept. of Electronics and Communication Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks %**		
EMA2X02	Theoretical (BS)	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Outcomes

At the end of this course the students will be able to:

1. Analyze Statement Logic and Predicate Logic. (L4)
2. Apply the principles of Permutations and Combinations with repetition & without repetitions. (L3)
3. Solve Recurrence Relations by using generating functions. (L3)
4. Apply the knowledge of Relations and Graph Theory in the field of Computer Science. (L3)
5. Analyze the Algebraic Systems with their properties. (L4)

UNIT - I

Foundations: Basics, Sets and Operations of Sets, Fundamentals of Logic, Logical Inferences, First order logic and other methods of Proof, Rules of Inference for Quantified Propositions. **(Problems Only and Theorems without Proofs).**

UNIT - II

Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumerating Combinations and Permutations with & without repetitions, constrained repetitions, and Principle of Inclusion and Exclusion. **(Problems Only and Theorems without Proofs).**

UNIT - III

Recurrence Relations: Generating Functions, calculating coefficient of Generating Function, Solving Recurrence relations by substitution method and Generating Functions, The Method of Characteristic Roots, Solutions to inhomogeneous recurrence relations. **(Problems Only and Theorems without Proofs).**

UNIT - IV

Relations and Lattices: Relations adjacency matrices and Directed Graphs, Operations on Relations, Special Properties of Binary Relations, Equivalence Relations, Ordering Relations, Lattices. **(Problems Only and Theorems without Proofs).**

UNIT - V

Algebraic structures: Algebraic systems, examples and general properties, semi groups and monoids, groups, sub groups, homomorphism, isomorphism, Permutation groups and cyclic permutations. **(Problems Only and Theorems without Proofs).**

Text Books

1. Joe L. Mott, Abraham Kandel, Theodare P. Baker, “Discrete Mathematics for Computer Scientists and Mathematicians”, Second Edition, PHI, 2019.
2. J. P. Tremblay and P. Manohar, “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw Hill, 2007.

Reference Books

1. K. H. Rosen, “Discrete Mathematics and its Applications with Combinatorics and Graph Theory”, 7th Edition, Tata McGraw Hill.
2. S. K. Chakraborthy and B.K. Sarkar,” Discrete Mathematics “, Oxford, 2011.
3. C. L. Liu and D. P. Mohapatra, “Elements of Discrete Mathematics-A Computer Oriented Approach”, 3rd Edition, Tata McGraw Hill.

Electronics Circuits Analysis

B. Tech II Year II Semester					Dept. of Electronics and Communication Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks %**		
EMA2220	Theoretical and Practical (PC)	L	T	P	C	CIE	SEE	Total
		3	0	2	4	50	50	100

Pre requisite:

ELECTRONIC DEVICES AND CIRCUITS

Course Objectives

1. To classify analyze and Design the amplifiers at Low Frequencies using Approximate Hybrid Model.
2. To learn the concepts of frequency response and analyze the BJT and MOS Amplifiers at Low and High Frequencies.
3. To analyze the CE amplifier with SC current gain at High frequencies using the Hybrid-Pi Model.
4. To classify, analyze and study the performance of multistage amplifiers.
5. To classify large signal amplifiers and determine their efficiency.
6. To classify and analyze the Tuned amplifiers and Oscillators.

UNIT I

SINGLE STAGE AMPLIFIERS: Classification of Amplifiers, Distortion In Amplifiers, Analysis of CB, CE and CC Amplifiers Using Approximate Hybrid Model, Miller's Theorem And Its Dual, Design of CE Amplifier

UNIT II

FREQUENCY RESPONSE OF BJT and MOS AMPLIFIERS: Frequency Response of BJT & MOS Amplifiers, Analysis at Low And High Frequencies, Hybrid - Pi Model of BJT, CE Short Circuit Current Gain, Alpha, Beta Cut - Off Frequencies.

UNIT III

MULTI STAGE AMPLIFIERS: Different Coupling Schemes Used in Amplifiers - RC Coupled Amplifiers, Transformer Coupled Amplifiers and Direct Coupled Amplifiers, Analysis of Cascaded RC Coupled BJT Amplifiers, Cascode Amplifiers, Darlington Pair, Effect of cascading on Gain and Bandwidth.

UNIT IV

LARGE SIGNAL AMPLIFIERS: Classification, Class A Large Signal Amplifiers - Efficiency of Series fed and Transformer Coupled Class A Power Amplifiers, Harmonic distortion, Class B Amplifier - Efficiency of Push - Pull Amplifier, Complementary Symmetry Class B amplifiers, Cross-Over Distortion, Heat Sinks.

UNIT V

TUNED AMPLIFIERS AND OSCILLATORS: Classification of Tuned Amplifiers, Quality Factor, Analysis of Single Tuned Amplifiers. OSCILLATORS: Conditions for oscillations - Barkhausen criterion, Principle of operation: RC Phase Shift Oscillator, Hartley Oscillator and Colpitts Oscillator.

Text Books

1. Fundamentals of Micro Electronics by Behzad Razavi, 2nd ed.,2013, Wiley.
2. Electronic devices and circuits - -S.Salivahana, N. Suresh kumar, A vallavaraj, 2nd ed.,2011.
3. Integrated electronic- Jacob Millman & Christor C Halkias, 2nd ed.,2008, TMH.

Reference Books:

1. Introductory electronic devices and circuits- Robert T. Paynter, 7th ed.,2009, Pearson Education India.
2. Electronic circuit analysis- K.Lal Kishore , 2004, BSP Publication.
3. Electronic devices & circuit David A Bell-5th ed,.Oxford university press,1999.
4. Design of Analog CMOS Integrated Circuits – Behzad Razavi, 2008, TMH.

Course Outcomes

After completing the course, students should be able to:

1. Design and analyze the single-stage amplifiers at Low Frequencies using the Approximate Hybrid Model.
2. Analyze the BJT Amplifiers at High Frequencies using the Hybrid–Pi Model and determine α and β cutoff frequencies.
3. Analyze Multi stage amplifiers and determine their frequency parameters.
4. Explain the applications of a large signal amplifier and the importance of heat sinks.
5. Analyze the effects of cascading single-tuned amplifiers on Bandwidth and understand the concept of oscillators.

Electronics Circuits Analysis Lab

Requirements

1. For software simulation of Electronic circuits.
    i. Computer System with latest specification.
    ii. Connected in LAN (Optional).
    iii. Operating system (Windows XP).
    iv. Suitable Simulations Software.
2. For Hardware simulations of Electronic Circuits.
    i. Regulated Power Supply (0-30V).
    ii. CRO's.
    iii. Function Generators.
    iv. Millimetres. Components.

Course Objectives

1. To design and test the various amplifier circuits.
2. To understand the operation of the amplifier circuits by plotting the frequency response curve.
3. To operate and test the feedback amplifier circuits and interpret the results.
4. To generate the signals for the desired frequency using oscillator circuits.
5. To operate the large signal amplifiers and find the efficiency.

Course Outcomes

After completing the course, students should be able to:

1. Design and test various amplifier circuits and to find the gain.
2. Calculate the lower and upper 3 dB frequencies and Bandwidth of the amplifier circuits.
3. Design and test the feedback amplifier circuits and interpret the results.
4. Design and test the oscillator circuits and interpret the results.
5. Design and test the large signal amplifier circuits and interpret the results.

List of Experiments (12 EXPERIMENTS TO BE DONE)

I:

DESIGN VERIFICATION USING SIMULATION TOOLS (ANY 6 EXPERIMENTS)

1. Common Emitter Amplifier.
2. Common Base Amplifier.
3. Two Stage RC Coupled Amplifier.
4. Colpitts Oscillator.
5. Cascade Amplifier.
6. Wien Bridge Oscillator using Transistors.
7. RC Phase Shift Oscillator using Transistors.
8. Class A Power Amplifier (transformer coupled).
9. Class B Complementary Symmetry Amplifier.
10. Common Gate (JFET) Amplifier.

II:

TESTING IN THE HARDWARE LABORATORY (6 EXPERIMENTS)

A) Any Three circuits simulated in simulation laboratory

B) Any Three of the following

Class A Power Amplifier (with transformer load)

1. Class C Power Amplifier.

2. Single Tuned Voltage Amplifier.
3. Hartley Oscillators.
4. Darlington Pair.
5. Common Collector Amplifier.

Digital Circuits

B. Tech II Year II Semester					Dept. of Electronics and Communication Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks %**		
EMA2225	Theoretical and Practical (PC)	L	T	P	C	CIE	SEE	Total
		2	0	2	3	50	50	100

Pre reuisite

Electronics Devices & Circuits

Course Objectives

This course provides in-depth knowledge of digital logic and its Verilog representation. The main objectives are:

1. To learn various number systems, conversions, binary codes and functionality of logic gates.
2. To understand different simplification methods for minimizing Boolean functions.
3. To design and analyze various combinational and sequential logic circuits.
4. To understand the concepts of sequential machines, enabling to analyze sequential systems in terms of state machines.

UNIT I

NUMBER SYSTEMS AND CODES: Number systems, Conversions of number systems, signed, unsigned numbers and complements -1's, 2's, 9's and 10's. Binary arithmetic: addition, subtraction. Binary weighted and non-weighted codes, BCD addition and subtraction, Error detecting and error correcting codes

UNIT II

BOOLEAN ALGEBRA: Logic gates, Postulates and theorems: representation of switching functions, SOP and POS, Karnaugh map representations, minimization of Boolean function using k - maps (up to 4 variables) and Tabular method

UNIT III

COMBINATIONAL CIRCUITS: Introduction, Design procedure**,** Half-Adder, Full - Adder, Half - Subtractor, Full - Subtractor, 4 - bit adder / Subtractor, Encoder, Decoder, multiplexer, de - multiplexer, code converters - binary to gray, gray to binary, BCD to excess - 3 and excess - 3 to BCD, Comparator - 1 bit, 2 bit and 4 bit.

UNIT IV

SEQUENTIAL CIRCUITS: Introduction, Design procedure, memory elements: latch and flip – flops - SR, D, JK, T, race around condition – Master - Slave JK FF, flip - flop conversions, Flip - Flop operating characteristics. Shift registers - SISO, SIPO, PISO, PIPO and Universal shift register. Design of synchronous counters: binary counters- up, down, up/down, MOD-n counters, Ring counter and Johnson counter.

UNIT V

SEQUENTIAL MACHINES: Melay and Moore machines, state equivalence, machine minimization using partitioning technique.

PROGRAMMABLE LOGIC DEVICES (PLDs): Introduction, PLDs: PROM, PAL, PLA - Basic structures, realization of Boolean functions.

Text Books

1. M. Morris Mano and Michael D. Ciletti, "Digital Design", 4th Edition, Pearson Education, 2013.
2. Z. Kohavi and N. K. Jha, "Switching and Finite Automata Theory", 3rd Edition, McGraw Hill, 2010.

3. Stephen Brown and Zvonko Vranesic, “Fundamentals of Digital Logic with Verilog Design”, 3rd Edition, McGraw-Hill.

Reference Books:

1. Leach, Malvino, Saha, “Digital Principles and Applications”, 8th Edition Mc-Graw Hill, 2014.
2. A. Anand Kumar, “Switching Theory and Logic Design”, PHI learning, 3rd edition.
3. Fredriac J Hill, Gerald R Peterson, “Introduction to Switching Theory and Logic Design”, 3rd Edition, John Willey and Sons Inc.
4. J. Bhasker, “Verilog HDL Primer”, BS publications 2008.
5. Charles H.Roth Jr., “Fundamentals of Logic Design”, 7th edition, Cengage Learning, 2013.

Course Outcomes

Up on completion of the course, the student will be able to:

1. Classify different number systems and apply to generate various codes.
2. Use the concept of Boolean algebra in minimization of switching functions.
3. Design different types of combinational logic circuits.
4. Apply knowledge of flip-flops in designing of shift registers and counters.
5. Design and analyze the circuits using Finite state machines and minimization of state machines.

Digital Circuits Lab

Requirements

1. Hardware Trainer Kits
2. Computer System with latest specifications of Xilinx- Vivado (Verilog HDL)

Course Objectives

1. To understand various pin configurations of the Digital ICs used in the laboratory.
2. To conduct the experiments and verify the truth tables of various logic circuits.
3. To design sequential and combinational logic circuits and verify their properties.
4. To design of any sequential/combinational circuit using Hardware Description Language.

Course Outcomes

After completing the course, students should be able to:

1. Understand the pin configuration of various digital ICs used in the lab.
2. Conduct the experiment and verify the properties of various logic circuits.
3. Analyze the sequential and combinational circuits.
4. Design of any sequential/combinational circuit using Hardware/ HDL.

LIST OF EXPERIMENTS:

PART A

Design and verify the following using hardware Trainer kits/equipment.

1. Design all the logic gates and verify their truth tables.
2. Design a Half adder, full adder & verify its truth table.
3. Design and implement 8x1multiplexer.
4. Design and implement 8 to 3 encoder and 3 to 8 decoder.
5. Design and construct basic flip-flops.
6. Design and construct of Decade Counter.

PART B

Write a Verilog HDL for the following and simulate the same using CAD tools.

1. Introduction to Verilog HDL: Verilog as HDL, Levels of Design Description, Language Constructs, Simulation & Synthesis.
2. Verilog HDL code to realize all the logic gates.
3. Verilog HDL code to realize a half adder, full adder.
4. Verilog HDL code to realize 8 to 1 multiplexer and 1 to 8 demultiplexer
5. Verilog HDL code to realize 8 to 3 encoder and 3 to 8 decoder.
6. Verilog HDL code to realize 4-bit comparator.
7. Verilog HDL code to realize basic flip-flops.
8. Verilog HDL code to realize a 4-bit binary up/down Counter.

Programming in Python

B. Tech II Year II Semester					Dept. of Electronics and Communication Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks %**		
EMA2X18	Theoretical and Practical (PC)	L	T	P	C	CIE	SEE	Total
		3	0	2	4	50	50	100

Course Outcomes

At the end of this course, students will be the able to:

1. Develop skills in handling control flow using conditionals and loops. (L4)
2. Analyze various String handling functions and data structures. (L4)
3. Design programs on object-oriented programming concepts. (L4)
4. Solve the problems by using Inheritance and polymorphism. (L3)
5. Illustrate programs on Exception Handling and various packages. (L3)

UNIT I

Introduction to Python: Features of Python literal constants, variables and identifiers, Data Types, Operators, Expressions, type conversions. Decision control statements: Conditional branching statements, loop structures/iterative statements, nested loops, break, continue and pass statements, Standard I/O Operations. **Functions and Modules**: Declaration and Definition Function Calling, More on Defining Functions, Recursive Functions, Modules and Packages.

UNIT II

Strings and Regular Expressions: String Operations, Built-in String Methods and Functions, slice operation, functions in Regular Expression. **Sequence:** List: Introduction, nested list, list operations, list comprehensions. **Tuples:** Introduction, basic operations, advantages of Tuple over list. **Mappings:** Dictionaries, Sets: Introduction and operations, Frozen set, Byte, Byte array.

UNIT III

FILE HANDLING: Introduction, Opening and closing files, reading and writing files, file positions renaming and deleting files. **Implementation of classes and objects:** Classes and Objects, Class Method and Self Argument. The _init_m e t h o d , Class Variables and Object Variables, The del method, Public and Private Data Members, Private Methods, Built-in Functions to Check, Get, Set and Delete Class Attributes, Garbage Collection (Destroying Objects).

UNIT IV

Implementation of Inheritance in Python: Inheriting Classes in Python, Types of Inheritance, Abstract Classes. **Operator Overloading in Python**: Introduction, Implementing Operator Overloading, Overriding Methods. **Exception Handling in Python**: Introduction, Exception hierarchy, Handling Exception, Multiple except Blocks and Multiple Exceptions, Finally Block.

UNIT V

NumPy: NumPy ND array, Data Types, Functions of NumPy Array, Mathematical Functions on Arrays in NumPy. **Pandas:** Pandas Features, Dataset in Pandas, Data Frames, Manipulating the Datasets, Describing a Dataset, group by Function, Filtering, Missing Values in Pandas, Concatenating Data Frames.

Import data from csv file. **Introduction to Matplotlib:** Plot, Scatterplot, Introduction to Tkinter, Date and Time Packages.

Text Books

1. Reema Thareja, Python Programming using Problem Solving Approach, Second Edition, Oxford Higher Education, 2022.
2. James Payne, Beginning Python using Python 2.6 and Python 3,1st Edition

Reference Books

1. Charles Dierach, Introduction to Computer Science using Python, 2013.

Online Resources

1. https://www.programiz.com/python-programming
2. https://www.javatpoint.com/python-tutorial
3. https://www.geeksforgeeks.org/python-programming-language

Programming in Python Lab

Week 1 Loops and Operators

1. Installation and Environment set up of Python and Programs on Data types
2. Demonstrate the working of following functions
   a) id( )
   b) type( )
   c) range( )
3. Demonstrate the following Operators in Python with suitable examples.
   a) Arithmetic Operators
   b) Relational Operators
   c) Assignment Operator
   d) Logical Operators
   e) Bit wise Operators
   f) Ternary Operator
   g) Membership Operators
   h) Identity Operators
4. Write a program that reverses the digits of a number, adds the reversed number to the original, and checks, if the sum is a palindrome the process is to be stopped. If the sum is not a palindrome, repeat the process (reverse the sum, add it to the original sum, and check again) until the sum becomes palindrome.
5. Demonstrate the following control transfer statements in Python with suitable examples.
   a) Break
   b) Continue
   c) pass
6. Write Python programs to print the following Patterns:

```
A
A B
A B C
A B C D
A B C D E
```

```
E E E E E E E E E
 D D D D D D D
  C C C C C
   B B B
    A
```

```
4
4 3
4 3 2
4 3 2 1
4 3 2 1 0
4 3 2 1
4 3 2
4 3
4
```

Week 2 Conditional Statements, Functions

1. Write a program to calculate the total amount of money in the piggy bank, given coins of Rs10, Rs5, Rs2, and Rs1.
2. Write a program to convert a floating-point number into the corresponding integer.
3. Write a program to prepare a grocery bill. For that, enter the name of the items purchased, the quantity in which it is purchased, and its price per unit. Then, display the bill in the following

format:
**********BILL**********
Item Name Item Quantity Item Price
****

Total amount to be paid
****
Write a program that shows how to return multiple values from a function
1. Write a program to demonstrate various argument types.

Week 3 Strings, Regular Expression

1. Perform following operations on strings

i) len( )	ii) strip( )	iii) rstrip( )	iv) lstrip( )	v) find( )
vi) rfind( )	vii) index( )	viii) rindex()	ix) count( )	x) replace()
xi) split( )	xii) join( )	xiii) upper( )	xiv) lower( )	xv) swapcase()
xvi) title( )	xvii) capitalize( )	xviii) startswith()	xix) endswith()	

2. Write a program for performing slice operation on strings.
3. Write a program to slice a given String into two parts: the first half and the second half. If the string has an odd length, the second half will have one more character than the first half.
4. Write a Regular Expression to represent all RGM language (Your own language) identifiers.

   Rules:
   a) The allowed characters are a-z, A-Z, 0-9, #.
   b) The first character should be a lower-case alphabet symbol from a to k
   c) The second character should be a digit divisible by 3.
   d) The length of identifier should be at least.
5. Write a program to check whether the given string is RGM language identifier or not?
6. Write a Regular Expression to represent all 10 digit mobile numbers.

   Rules:
   a) Every number should contain exactly 10 digits.
   b) The first digit should be 7 or 8 or 9
7. Write a program to check whether the given number is valid mobile number or not?

Week 4 Lists, Tuples

1. Demonstrate the different ways of creating list objects with suitable example programs.
2. Demonstrate the following functions/methods which operates on lists in Python with suitable examples:
   a) list( )
   b) len( )
   c) count( )
   d) index ( )
   e) append( )
   f) insert( )
   g) extend()
   h) remove( )
   i) pop( )
   j) reverse( )
   k) sort( )
   l) copy( )
   m) clear( )
3. Demonstrate the following with suitable example programs:

i) List slicing ii) List Comprehensions

3. Write a program to store fibonacci numbers in a list and sum even terms.
4. Inventory Management System In this case study, manage an inventory system. The inventory items will be stored as tuples containing the item name and price (immutable), and the list of items in the inventory will be stored as a list for dynamic changes.
   - Demonstrate the different ways of creating tuple object with suitable example programs.
   - Demonstrate the following functions/methods which operates on tuples in Python with suitable

   Examples:

   a) len( )
   b) count( )
   c) index( )
   d) sorted( )
   e) min ( )
   f) max( )
   g) cmp( )
   h) reversed( )

Week 5 Dictionaries

1. Demonstrate the different ways of creating dictionary objects with suitable example programs.
2. Demonstrate the following functions/methods which operates on dictionary with suitable examples:
   a) dict( )
   b) len( )
   c) clear( )
   d) get( )
   e) pop( )
   f) popitem( )
   g) keys( )
   h) values()
   i) items( )
   j) copy( )
   k) update( )
3. Write a program to unzip a list of tuples into individual lists and convert them into a dictionary.
4. Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

E-Commerce Product Catalog Management Manage the product catalog for an e-commerce website. The catalog needs to store information about each product, including its ID, name, price, category, and available stock.

Should be able to:

- Add new products.
- Update the details of existing products.
- Search for a product by its ID.
- Calculate the total value of products in stock (based on price and stock).

Week 6 Files

1. Write a Program for Handling Files.
2. Write a program to Count the Frequency of Characters in a Given File
3. Write a program to Compute the Number of Characters, Words, and Lines in a File.

Case Study:

Customer Feedback Management System Using Files

Collect Feedback: Collects feedback from the customer and stores it in a file.

Read Feedback: Reads and displays all feedback entries.
Search Feedback: Searches for feedback entries by customer name.
Summarize Feedback: Counts how many feedback entries are positive or negative based on keywords like "good," "excellent," "bad," and "poor."

Week 7 Class, Objects

1. Write a program to create Class variables and instance variable and illustration of self - variable
    i. Robot
    ii. ATM Machine
2. Write a program to differentiate private and public variables in a class.
3. Write a program to demonstrate built -in functions to check, sget, set and delete class attributes.

Week 8 Inheritance, Polymorphism

1. Write Programs to demonstrate Inheritance and Polymorphism .
2. Create a Person class with attributes like name and age, and a Student class that inherits from Person and adds an attribute grade.
3. Create a Shape class with methods like area() and perimeter(). Derive Circle, Rectangle, and Triangle classes, each implementing specific calculations.
4. Use constructors (__init__()) in both parent and child classes. Demonstrate how the child class initializes both its own attributes and inherited attributes using super().
5. Create a program where the child class overrides a method of the parent class, such as display_details().
6. Overload operators like + or * in a class to perform custom operations, e.g., adding two objects of a Vector class.
7. Create a base class Product and child classes Electronics, Clothing, and Grocery with a polymorphic method get_discount().
8. Create a base class Transport and subclasses Car, Bus, and Bicycle, each overriding a method like fuel_cost().

Week 9 Exception Handling

1. Write Programs demonstrating various techniques of exception handling , such as:
    - Basic exception handling (try, except).
    - Handling multiple exceptions.
    - Raising custom exceptions.
    - Handling exceptions with files.

Week 10

1. Write a NumPy program to compute the cross product of two given vectors.
2. Write a program to perform mathematical operations on Numpy arrays.
3. Write a program to perform stack Operations using NumPy.
4. Write a program to perform Queue Operations using NumPy

Case Study: Sales Data Analysis using NumPy.

A company wants to analyze its sales data for the past year across multiple regions and product categories. The data consists of daily sales figures, and the company needs to:

i. Analyze the sales performance across different months.
ii. Find the highest and lowest sales days.
iii. Calculate the average sales for each region and product category.
iv. Perform statistical analysis like variance and standard deviation.

Week 11

1. Demonstration of Pandas Package
2. Write a Program to convert a panda module series to python list.
3. Write a program to convert a Numpy array to a pandas series.

Case Study: Employee Performance Analysis using Pandas Problem Statement:

A company wants to analyze the performance of its employees over the past year based on various metrics such as:

- Sales performance.
- Number of projects completed.
- Customer satisfaction scores.

The company has a dataset that contains employee information, such as:

- Employee ID
- Name
- Department
- Sales performance
- Number of projects completed
- Customer satisfaction score

4. Create a project to get the citation from Google scholar using title and year of publication and volume, pages of journal.

Week 12 Package

1. Demonstration of Matplotlib Package
2. Case Study: Sales Data Visualization using Matplotlib

Problem Statement:

A company has sales data for multiple regions over the past year.

1. The data includes:
   - Monthly sales figures for each region.
   - Sales figures for each product category within each region.
2. The company wants to visualize the following:
   - **Overall sales trends**: A line graph showing the sales trend over the months.
   - **Sales comparison across regions**: A bar graph to compare sales in different regions.
   - **Category-wise sales distribution**: A pie chart showing the share of sales for different categories in each region.
   - **Monthly sales distribution across regions**: A stacked bar chart showing how each region contributed to the overall monthly sales.

Week 13

Review

Dynamics of Group Discussion

B. Tech II Year II Semester					Dept. of Electronics and Communication Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks %**		
EVA2X25	Practical (HS)	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Course Outcomes

At the end of this Dynamics of group discussion course, students will be able to:

1. Collaborate with others to generate creative solutions to problems and make informed decisions as a group
2. Present ideas confidently and persuasively, using appropriate language and nonverbal cues
3. Resolve conflicts and disagreements diplomatically
4. Demonstrate ethical behavior and responsibility in communication during group discussions.
5. Apply group discussion skills to real-world scenarios.

UNIT I

Introduction to Group Discussions, Importance of GDs, Major Areas of GD: Subject knowledge, Clarity of thought and expression.

UNIT II

Types of GD: Topical, Case Studies, Abstract.

UNIT III

Differences between GDs and Debates, Team Behavior and Leadership Skills

UNIT IV

Active Listening Skills, Note-taking skills.

UNIT V

Practice GD: Non-Verbal communication, Etiquette: Do's and Don'ts of GD.

Reference Books:

1. Anand, Ganguly. Group Discussion for Jobs and Admission Arihanth publications,2020
2. Praba, l Frank Excel at Group Discussions by, Paperback, 2020.
3. Group Discussion on Current Topics by P. N. Joshi Paperback, 2024
4. Mukta Mahajani, Let's Talk by Amazon, 2020
5. Master the Group Discussion and Personal Interview: Complete Discussion on the topics asked by reputed B-schools & IIMs by Sheetal Dasarda, 2019.

Environmental Studies

B. Tech II Year II Semester					Dept. of Electronics and Communication Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks %**		
EVA21X1	Theoretical (HSMC)	L	T	P	C	CIE	SEE	Total
		2	0	0	0	-	-	-

Course Objectives

Course Objectives of Environmental Studies are to:

1. To introduce knowledge about the environment.
2. To introduce students to the concepts of pollution, biodiversity.
3. To develop an awareness about global environmental problems.
4. To learn to protect environment and awareness on legal issues
5. To learn about importance of sustainable development and role of IT in environment.

Course Outcomes

At the end of Environmental Studies course students will be able to:

1. Understand fundamental physical and biological principles that govern naturalprocesses.
2. Understand fundamental concepts from the social sciences and humanitiesunderlying environmental thought and governance.
3. Integrate and apply perspectives from across the natural sciences, social sciences, and the humanities in the context of complex environmental problems.
4. Communicate integrated perspectives on complex environmental problems in theform of written and oral argument to both professional and lay audiences.
5. Design and conduct independent research that contributes to environmentalthought and/or problem solving.

UNIT I

Multidisciplinary nature of environmental studies: Definition, scope andimportance – need for public awareness.

Ecosystems: Concept of an ecosystem – classification, structure and function of differentecosystems - producers, consumers and decomposers. - energy flow in the ecosystem -ecological succession - food chains, food webs and ecological pyramids.

Biodiversity and its conservation: Introduction - Definition: genetic, species and ecosystem diversity. - bio-geographical classification of India - value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as amega-diversity nation - hot-spots of biodiversity - threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. ICUN categories of biodiversity and RED DATA book - conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT II

Natural Resources: Renewable and non-renewable – natural resources and associated problems: forest resources – use and over – exploitation, deforestation,– timber extraction, mining, dams and other effects on forest and tribal people: water resources –use and over utilization of surface and groundwater – floods, drought, conflicts over water,dams – benefits and problems – Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources - Food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer- pesticide problems, water logging, salinity. - Energy resources: growing energy needs, renewable and non-renewable energy

sources use of alternate energy sources. Land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification. role of an individual in conservation of natural resources: equitable use of resources for sustainable lifestyles.

UNIT III

Environmental pollution: Definition, cause, effects and control measures of different kinds of pollution (Air, Water, Soil, Marine, Noise, Thermal, Nuclear, e –waste)

Carbon capture & sequestration – different storage sources, major disadvantages, environmental effects

Social issues and the environment: From unsustainable to sustainable development - urban problems related to energy -water conservation, rain water harvesting, and watershed management. -climate change, global warming, ozone layer depletion, nuclear accidents and holocaust.

UNIT IV

Waste Management Technology: Solid waste management: causes, effects and control measures of urban and industrial wastes. - role of an individual in prevention of pollution, disaster management: floods, earthquake, cyclone and landslides.

Wastewater and sewage treatment technology: primary, secondary and tertiary treatments. bioremediation, phyto-remediation, ZLD (zero liquid discharge), membrane technology. application of GIS and GPS system in environmental science.

Environmental Policy, Rules and Regulations. EIA (Environmental Impact Assessment) & EMP (ENVIRONMENTAL Management Plan) – Environment Protection Act. - Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act - Wildlife Protection Act –Forest Conservation Act. - Public awareness

UNIT V

Towards sustainable future: concept of sustainable development, threats of sustainability, population and its explosion, over exploitation of resources, strategies for achieving sustainable development. environmental education, conservation of resources. urban sprawl, sustainable cities and sustainable communities, human health. Role of IT in environment, environmental ethics, concept of green building, basic principles of green engineering, clean development mechanism (CDM), low carbon life cycle, polluters-pay principle.

Text Books:

1. Erach Bharucha, “Textbook of Environmental Studies for Undergraduate Courses”, University Press Private Limited., Reprinted in 2005.
2. Rajagopalan, R., “Environmental Studies: From Crisis to Cure”, 2nded, Oxford University Press., 2005.

Reference Books:

1. Richard T. Wright, “Environmental Science: Towards a Sustainable Future”,10th ed, PHL Learning Private Ltd, New Delhi., 2008.
2. Gilbert M. Masters, and Wendell, P. Ela, “Environmental Engineering and Science”.

Integrated Project - II

BTech II Year II Semester					Dept. of Electronics and Communication Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks %**		
EVA2101	Exploratory (PC)	L	T	P	C	CIE	SEE	Total
		0	0	2	1	80	20	100

Evaluation Guidelines for the course Integrated Project-I as mentioned below.

CIE/SEE	Assessment component	When	Marks
CIE	Project Report - Phase I	After the completion of 7 Weeks	40
	Project Report - Phase II	After the completion of 14 Weeks	40
SEE	Viva voce	Semester End	20
Overall	CIE assessments will be taken for 80 marks and SEE for 20 marks		