Scheme of Instruction and Syllabi

of

BE / B.TECH III to IV SEMESTERS

of

FOUR YEAR DEGREE COURSE

in

ELECTRONICS & COMMUNICATON ENGINEERING
(Under AICTE Model Curriculum)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
(Autonomous Institution under UGC, Affiliated to Osmania University)
Department of Electronics & Communication Engineering
Accredited by NBA and NAAC-UGC, Chaitanya Bharathi (Post), Gandipet,
Hyderabad – 500075

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Our Motto: Swayam Tejaswin Bhava

Vision, Mission and Quality Policy of the Institute

VISION

To be a centre of excellence in technical education and research.

MISSION

To address the emerging needs through quality technical education and advanced research.

QUALITY POLICY

Chaitanya Bharathi Institute of Technology imparts value based technical education and training to meet the requirements of student, industry, trade/ profession, research and developmental organisations for self-sustained growth of society.

Vision and Mission of Dept. of ECE

VISION

To develop the department into a full-fledged center of learning in various fields of Electronics & Communication Engineering, keeping in view the latest developments.

MISSION

To impart value based technical education and train students and to turn out full pledged engineers in the field of Electronics & Communication Engineering with and overall background suitable for making a successful career either in industry/research or higher education in India/Abroad.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Program Educational Objectives of B.E (ECE) Program

PEO1 Student will excel in analysing, design and development of systems in the area of Electronics and Communications.

PEO2 Student will have hand on experience in executing software related applications pertaining to Electronics and Communication Engineering.

PEO3 Student will carry out research in new technologies with modern relevant tools.

PEO4 Student will develop with professional ethics, effective communication skills and knowledge of societal impacts of computing technologies.

Program Specific Outcomes of B.E (ECE) Program

PSO1 Student will demonstrate the knowledge and understanding of basic principles of mathematics, science, electronic devices, networks and signal processing procedures in simulation, modelling, and describing the behaviour of analog and digital electronic circuit or system.

PSO2 Student will be able to select and apply appropriate techniques, resources and Hardware and Software tools for design, analysis and testing the various analog and digital electronic circuits and networks.

PSO3 Student will demonstrate self-confidence to work independently or in a team and his/her ability to analyze, synthesize, design and test analog & digital components, process, system or sub-systems of Electronics and Communication Engineering used in peace as well as war applications as per the specifications.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Program Outcomes of B.E (ECE) Program

Engineering graduate will be able to:

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, research literature, and analyse 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 public health and safety, and 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 modelling 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 and Sustainability	Understand the impact of the 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 multidisciplinary settings.
10.	Communication	Communicate effectively on complex engineering activities with the engineering community and with the 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 multidisciplinary environments.
12.	Life-Long Learning	Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
B.E (Electronics and Communication Engineering)

SEMESTER – III

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	18MT C07	Applied Mathematics	3	1	-	3	30	70	4
2	18CS C05	Basics of Data Structures	2	-	-	2	20	50	2
3	18EC C01	Electromagnetic Theory and Transmission Lines	3	-	-	3	30	70	3
4	18EC C02	Electronic Devices	3	-	-	3	30	70	3
5	18EC C03	Network Theory	3	-	-	3	30	70	3
6	18EC C04	Signals and Systems	3	-	-	3	30	70	3
7	18CE M01	Environmental Science	2	-	-	2	-	50	Non Credit
PRACTICALS									
8	18CS C06	Basics of Data Structures Lab	-	-	2	2	15	35	1
9	18EC C05	Electronic Devices Lab	-	-	2	2	15	35	1
10	18EC C06	Electronic Workshop and Networks Lab	-	-	2	2	15	35	1
11	18EG C03	Soft Skills	-	-	2	2	15	35	1
Total			**19**	**01**	**08**	**-**	**230**	**590**	**22**
Clock Hours per Week: 28									

L: Lecture T: Tutorial P: Practical D: Drawing
CIE: Continuous Internal Evaluation SEE: Semester End Examination

18MT C07

APPLIED MATHEMATICS
(For ECE and EEE)

Instruction	3 L+1T Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	4

Course Objectives: This course aims to:

1. Form PDE and solve Linear and Non-Linear equations.
2. Learn the Laplace, Inverse Laplace Transform and Z-Transforms.
3. Find roots of equations, interpolation and Numerical differentiation.
4. Learn Numerical solution of ODE and Engineering problems.
5. Learn fitting of distribution and predicting the future values.

Course Outcomes: On successful completion of this course the students shall be able to:

1. Understand the methods to find solution of linear and non-linear PDE and solution of wave equation.
2. Find Laplace, Inverse Laplace and Z-Transforms and solution of engineering problems.
3. Solve Non-Linear algebraic and transcendental equations to find interpolations when tabular values are given.
4. Find solution of initial value problems of ODE.
5. Understand the Methods for analysing the random fluctuations using probability distribution and also identify the importance of principle of Least squares approximations for predictions.

UNIT-I

Partial Differential Equations: Formation of Partial Differential Equations, Solution of Linear (Lagrange's) and Non-linear PDE of First order standard forms and Charpit's Method, Solutions of PDE by method of separation of variables, solution of one dimensional wave equation and its applications.

UNIT-II

Transform Theory: Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by partial fractions and residue method, solving ODEs by Laplace Transform method.Z-

transforms and its basic properties, inverse Z-transform and solutions of difference equation by Z-transform.

UNIT-III

Numerical Analysis: Solution of Algebraic and transcendental equations by Bisection method, Newton-Raphson method and Regula-Falsi method. Interpolation, Newton's forward and backward difference formulae.Newton's divided difference and Lagrange's formulae.Numerical Differentiation.

UNIT-IV

Numerical Solutions of ODE: Solutions of First Order Ordinary differential equations, Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator corrector methods

UNIT-V

Basic Statistics: Measures of Central tendency for continuous random variable, Moments, skewness and Kurtosis, Probability distributions: Normal (Gaussian), Rayleigh, Exponential and uniform distributions Correlation and regression. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas.

Text Books:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, "Numerical Methods", S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, "Introductory methods of numerical analysis", PHI, 4th Edition, 2005.
3. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 35th Edition, 2010.
4. Sheldon Ross, "A First Course in Probability", 9th Edition, Pearson publications, 2014.

Suggested Reading:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T, "Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2008.
3. S.C.Gupta, V.K.Kappoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.

18CS C05

BASICS OF DATA STRUCTURES

(Common to all Programs except CSE & IT)

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	20 Marks
Credits	2

Pre-requisite: Basic knowledge of programming language such as C or C++ is preferred (but not mandatory) and some
mathematical maturity also will be expected.

Course Objectives: This course aims to:

1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different sorting and searching techniques and their complexities.

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

1. Understand the basic concepts of data structures.
2. Understand the notations used to analyze the performance of algorithms.
3. Choose and apply an appropriate data structure for a specified application.
4. Understand the concepts of recursion and its applications in problem solving.
5. Demonstrate a thorough understanding of searching and sorting algorithms.

UNIT-I

Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms, Complexity, Time- space tradeoff.
Recursion: Introduction, format of recursive functions, recursion Vs. Iteration, examples.

UNIT-II

Linked Lists: Introduction, Linked lists and types, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays.

UNIT-III

Stacks and Queues: Introduction to stacks, applications of stacks, implementation and comparison of stack implementations. Introduction to queues, applications of queues and implementations, Priority Queues and applications.

UNIT-IV

Trees: Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Representations of Trees, Tree Traversals, Binary search Tree.

UNIT-V

Graphs: Introduction, Applications of graphs, Graph representations, graph traversals, Minimal Spanning Trees. **Searching and Sorting**: Linear searching, binary Searching, sorting algorithms- bubble sort, selection sort, quick sort, heap sort.

Text Books:

1. Narasimha karumanchi, Data Structures and Algorithms Made Easy, CareerMonk Publications, 2017
2. S. Sahni and Susan Anderson-Freed, Fundamentals of Data structures in C,E.Horowitz, Universities Press, 2nd Edition.
3. ReemaThareja, Data Structures using C, Oxford University Press.

Suggested Reading:

1. D.S.Kushwaha and A.K.Misra, Data structures A Programming Approach with C, PHI.
2. Seymour Lipschutz, Data Structures with C, Schaums Outlines, Kindle Edition

Online Resources:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. https://www.edx.org/course/foundations-of-data-structures
3. https://sites.google.com/site/merasemester/data-structures/data-structures-1#DS

18EC C01

ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

Instruction	3 LHours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Students should have prior knowledge about circuit theory, coordinate systems and vector calculus.

Course Objectives: This course aims to:

1. The mathematical fundamentals necessary for understanding the electromagnetic theory.
2. The electrostatics and magnetics along with Maxwell's equations for EM Waves.
3. The concepts of transmission lines

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

1. Comprehend mathematically the coordinate systems and solve simple static Electromagnetic problems using various laws and theorems.
2. Understand Maxwell's equations in different forms (differential and integral) and apply them to diverse engineering problems.
3. Demonstrate the Electromagnetic wave properties with respect to different transmission mediums.
4. Predict the behavior of reflection and refraction of the waves in different mediums.
5. Estimate the transmission line properties, reflection and matching concepts.

UNIT-I

Review of coordinate systems, Coulomb's Law, Electric field, Electric flux, flux density and Gauss Law. Potential and Potential gradient.Laplace's and Poisson's equations.Current, Current Density and Continuity of current equation.

UNIT-II

Biot-Savart's law, Ampere's law, Magnetic flux and Magnetic flux density. Gauss law for magnetic fields, Vector magnetic potential. Boundary conditions.Time varying fields, Maxwell equations: Integral form and Point form.

UNIT-III

Wave equations, Uniform plane waves in lossy and lossless medium. Skin Depth, Polarization, Instantaneous and average Poynting theorem and its applications. Reflection and Refraction of Plane Waves - Normal and Oblique Incidence for perfect Conductor and perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection.

UNIT-IV

Transmission Lines - I: Types, Parameters, Transmission Line Equations, Primary and Secondary Constants, Characteristics Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line. Impedance at any point on the transmission line.

UNIT-V

Transmission Lines - II: RF and UHF Lines, Open and short circuit lines and their significance. Properties of ë/2, ë/4 and ë/8 Lines. Distortion and distortion less transmission line, Concept of loading of a transmission line, Campbell's formula. Reflection and VSWR. Matching: Quarter wave transformer, Single Stub matching. Smith chart and its applications.

Text Books:

1. Matthew N.O. Sadiku, "Elements of Electromagnetics", 7th edition, Newyork Oxford University Press, 2018.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics", 8th edition, TMH, 2016.
3. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd edition, PHI, 2000.

Suggested Reading:

1. John D. Ryder, "Networks Lines and Fields", 2nd edition,PHI, 2015.
2. R.K. Shevgaonkar, "Electromagnetics Waves", Tata McGraw Hill India, 2005.

18EC C02

ELECTRONIC DEVICES

Instruction	3 LHours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Students should have the knowledge of semiconductor fundamentals.

Course Objectives: This course aims to:

1. The concepts of semiconductor devices like PN junction diode, Transistor, and special diodes.
2. The applications of diodes.
3. The various configurations, characteristics of transistors – BJT, JFET & MOSFET.

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

1. Recall the elementary concepts of diode and relate them to special devices. Students will also be able to define the working principles of BJT, FET
2. Classify and relate the performance of different types of rectifiers. Students will be able to compare and contrast the biasing techniques, different configurations, characteristics of BJT & FET
3. Examine different non-linear wave shaping circuits and draw an inference for their outputs. Students will be able to distinguish different types of rectifying circuits and amplifier circuits and their performance parameters.
4. Choose the best configuration for the specifications.
5. Understand the flow of IC fabrication.

UNIT – I

Semiconductor Diode Characteristics: The p-n junction Diode, Energy band diagram, Current equations, I-V characteristics, Temperature dependence, Diode resistance, Transition capacitance, Diffusion capacitance, Zener diode - Regulator, Schottky diode.

UNIT – II

Diode Applications: Diode as a circuit element, Clipping and Clamping circuits, Clamping circuit theorem. Half wave, Full wave and Bridge Rectifiers - their

operation, performance characteristics- ripple factor calculations, and analysis; Filters (L, C, LC and CLC filters).

UNIT – III

Bipolar Junction Transistor: Construction and Operation of NPN and PNP transistor, current components and current flow in BJT, Modes of transistor operation, Early effect, BJT input and output characteristics of CB, CE,CC configuration- h-parameters.

UNIT – IV

Field Effect Transistor: Junction Field Effect Transistor: The Pinch-off Voltage V_p, V-I characteristics of JFET.

MOSFETs: Enhancement & Depletion mode MOSFETs, V-I characteristics, MOSFET as resistance, Small signal models of MOS transistor, Biasing of MOSFETs, MOSFET as a switch.

UNIT – V

Elementary treatment of SCR- UJT- Diac- Triac - Tunnel diode.LED, Photodiode, Solar cell.Introduction to Integrated circuit fabrication process: Oxidation, Diffusion, Ion implantation, Photolithography, Etching, Metallization, Twin-tub CMOS process.

Text Books:

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

Suggested Reading:

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

18EC C03

NETWORK THEORY

Instruction	3 LHours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Knowledge on Elements of Electrical Engineering.

Course Objectives: This course aims to:

1. Make understand the concepts of Electric Circuits, Network Theorems and the transients.
2. Make understand the concept of steady state and applying phasor analysis to AC circuits and analyzing magnetic coupled circuits.
3. Familiarize resonant circuits, two port network parameters, concept of Passive Filters and Network Synthesis.

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

1. Understand the basics of electrical circuits with nodal, mesh analysis and network theorems.
2. Apply Laplace Transform for steady state and transient analysis.
3. Analyze the phasor representation for ac circuits and magnetic coupled circuits.
4. Describe resonance circuits, two port network parameters and their interconnections.
5. Synthesize various forms of electrical networks.

UNIT-I

Network Theorems: Network reduction techniques, Super Nodal and Super Mesh Analysis, Superposition, Thevenin's and Norton's theorems.Reciprocity, Maximum Power Transfer, Compensation, Millman's, Duality and Tellegen's Theorems using dependent and independent sources.

UNIT-II

Transients: Introduction, Study of initial conditions, DC transients RL, RC circuits, RLC circuits, Formulation of integral, differential equations. Circuit analysis using Laplace Transform and inverse Laplace Transform, Pole-Zero Plots, Zero Input Response, Zero State Response.

UNIT-III

Steady State Analysis of AC Circuits: Phasor and vector representations, impedance and admittance, Average power, Apparent Power, Complex Power, Power triangle.

Coupled circuits: Concept of self, mutual inductance, co-efficient of coupling, dot convention rules and analysis of simple circuits.

UNIT-IV

Frequency Domain Analysis: Concept of complex frequency, impedance and admittance functions, Series and parallel resonance, Q-factor, selectivity, bandwidth.

Two Port Networks: Z, Y, h, g, ABCD and Inverse ABCD parameters, equivalence of two port networks. Inter connection of two port networks.

UNIT-V

Filters: Introduction to Filters and classification of Filters (Low pass, High pass, Band pass and Band stop) and their design aspects. **Network Synthesis:** Elements of circuit synthesis, Foster and Cauerforms of LC, RC and RL networks.

Text Books:

1. William H.Hayt, Jr.,Jck E. Kemmerly and Steven M.Durbin, "Engineering Circuit Analysis", 8th edition, McGraw Hill, 2013.
2. Vanvalkenberg M.E, "Network analysis", PHI, New Delhi, 3rd Edition 2002.

Suggested Reading:

1. C.L.Wadhwai, "Network Analysis and Synthesis", 4th edition, New Age Publications, 2016.
2. Sudhakar. A. and Shyammohan, S. P., "Circuits and Network", Tata McGraw-Hill New Delhi, 1994.

18EC C04

SIGNALS AND SYSTEMS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Knowledge of Differential and Integral Calculus.

Course Objectives: This course aims to:

1. Know Signals and systems representation/classification and also the time and frequency domain analysis of continuous time signals with Fourier series, Fourier transforms and Laplace transforms.
2. Understand Sampling, time and frequency domain analysis of discrete time signals with DTFT and Z-Transforms.
3. Understand concepts of convolution and correlation integrals.

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

1. Define and Classify signals, systems and analyse the signals using Fourier series.
2. Understand signal spectrums and characterize the systems.
3. Assess the system stability, causality using ROC and Pole-Zero Plot.
4. Demonstrate conversion of continuous time signal to discrete time signal and obtain discrete system characteristics using DTFT and Z Transform.
5. Apply the Convolution concept to calculate the output of the system and compare the signals**.**

UNIT-I

Continuous Time Signals: Introduction to signals, their representations and classification. Introduction to systems and their classifications, Orthogonality of signals, Complete set of mutually orthogonal signals, Harmonic signals.

Signal Representation: Exponential Fourier series, Existence and Convergence. Symmetry conditions, Amplitude and Phase spectra. Power Spectral Density.

UNIT-II

Fourier Transforms: The direct and inverse Fourier transforms, Existence, Frequency spectrum and properties of Fourier Transforms, Fourier Transform of singularity functions and periodic signals. Energy Spectral Density, Filter

characteristics of linear systems, Distortion less system, Phase delay and group delay.

UNIT-III

Signal Representation by Generalized Exponentials: The Bilateral and unilateral Laplace transforms. Region of convergence and its properties. Properties of Laplace transform, Inverse Laplace transform, Laplace transform of periodic signals.

LTI System: Impulse response, System transfer function, Stability and Causality.

UNIT-IV

Discrete Time Signals: Sampling of continuous time signals. DTS representation.Discrete Time Fourier Transform and properties.

Z–Transform: The Direct Z-Transform, Region of convergence and its properties. S–Plane and Z–Plane correspondence, Z–Transform properties. Inverse Z–Transform, Discrete LTI system: impulse response and system transfer function. Stability and Causality.

UNIT-V

Convolution: Continuous convolution, Graphical interpretation and its properties. Discrete convolution and its properties.

Correlation: Continuous correlationCross correlation, Auto correlation and properties. Discrete correlationCross correlation, Auto correlation and properties.

Text Books:

1. B.P.Lathi, "Signals, Systems and Communications", BS Publications, 3rd Edition, 2008.
2. Simon Haykin, "Signals and Systems", Wiley India, 5th Edition,2009.

Suggested Reading:

1. Alan V. Oppenheim,Alan S. Willsky,S.HamidNawad, "Signals and Systems", PHI 2nd Edition, 2015.
2. M.J. Robert, "Fundamentals of signals and systems", McGraw Hill, 2008.

18CE M01

ENVIRONMENTAL SCIENCE

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	—
Credits	Non Credit

Course Objectives: This course aims to:

1. Identify environmental problems arising due to engineering and technological activities and the science behind those problems.
2. Become aware about the importance of eco system and biodiversity for maintaining ecological balance
3. To identify the importance of interlinking of food chain
4. Learn about various attributes of pollution management and waste management practices.
5. To make the students contribute for capacity building of nation for arresting and/or managing environmental disasters.

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

1. To define environment, identify the natural resources and ecosystems and contribute for the conservation of bio-diversity.
2. To suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
3. To relate the social issues and the environment and contribute for the sustainable development.
4. To follow the environmental ethics.
5. To contribute for the mitigation and management of environmental disasters.

UNIT-I

Environmental Studies: Definition, Scope and importance, need for public awareness.

Natural resources: Use and over utilization of Natural Resources - Water resources, Food resources, Forest resources, Mineral resources, Energy resources, Land resources.

UNIT-II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, role of producers, consumers and decomposers, energy flow in an ecosystem,

food chains, food webs, ecological pyramids, Nutrient cycling, Bio-geo chemical cycles, Terrestrial and Aquatic ecosystems.

UNIT-III

Biodiversity: Genetic, species and ecosystem biodiversity, Bio-geographical classification of India, India as a Mega diversity nation. Values of biodiversity, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India, methods of conservation of biodiversity.

UNIT-IV

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, marine pollution, soil pollution, noise pollution and Solid waste management, nuclear hazards

Environmental Legislations: Environment protection Act, Air, Water, Forest & Wild life Acts, issues involved in enforcement of environmental legislation, responsibilities of state and central pollution control boards

UNIT-V

Social Issues and The Environment: Water conservation methods: Rain water harvesting and watershed management, Environmental ethics, Sustainable development and Climate change: Global warming, Ozone layer depletion, forest fires, and Contemporary issues.

Text Books:

1. Y. Anjaneyulu, "Introduction to Environmental Science", B S Publications, 2004.
2. Suresh K. Dhameja, "Environmental Studies", S. K. Kataria& Sons, 2009.

Suggested Reading:

1. C. S. Rao, "Environmental Pollution Control Engineering", Wiley, 1991.
2. S. S. Dara, "A Text Book of Environmental Chemistry &Pollution Control", S. Chand Limited, 2006.

18CS C06

BASICS OF DATA STRUCTURES LAB

(Common to all Programs except CSE & IT)

Instruction	2 P Hours per Week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Pre-requisite: Knowledge on any Programming Language (C)

Course Objectives: This course aims to:

1. Design and construct simple programs by using the concepts of Data structures as abstract data type.
2. To have a broad idea about how efficiently pointers can be used in the implement of data structures.
3. To enhance programming skills and strengthen practical ability to apply suitable data structure for real time applications.

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

1. Implement the abstract data type.
2. Implement linear data structures such as stacks, queues using array and linked list.
3. Understand and implement non-linear data structures such as trees, graphs and its traversal techniques.
4. Implement various kinds of searching, sorting techniques.
5. Develop the suitable data structure for real world problem.

List of Experiments

1. Implementation of operations on arrays.
2. Implementation of Stack.
3. Implementation of Queue.
4. Implementation of basic operations on Single Linked List.
5. Implementation of Searching techniques.
6. Implementation of Sorting techniques.
7. Case study like Banking System, Students Marks Management, Canteen Management etc.

Text Books:

1. Brian W Kernighan, Dennis Ritchie, C Programming Language, PH PTR, 2nd Edition.
2. Richard M Reese, Understanding and Using C Pointers, O'Reily, 2013.

Online Resources:

https://nptel.ac.in/courses/106102064/

18EC C05

ELECTRONIC DEVICES LAB

Instruction	2 P Hours per Week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Prerequisite: Students have the knowledge of semiconductor fundamentals.

Course Objectives: This course aims to:

1. Know V-I characteristics of diodes and special semiconductor devices.
2. Design and performance evaluation of various diodes as rectifiers.
3. Understand the characteristics of transistor in various configurations.

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

1. Recall the elementary concepts of diode, BJT, FET.
2. Classify and relate the performance of different types of rectifiers. Compare and contrast different configurations and characteristics of BJT & FET.
3. Distinguish different types of rectifying circuits and their performance parameters.
4. Choose the best configuration for the specifications provided.
5. Understand the behavior of various special diodes.

List of Experiments:

1. V-I Characteristics of Silicon and Germanium diodes and measurement of static and dynamic resistances.
2. Zener diode characteristics and its application as voltage regulator.
3. Clipping and Clamping Circuits.
4. Design, realization and performance evaluation of half wave rectifiers without filters and with C & ð section filters.
5. Design, realization and performance evaluation of full wave rectifiers without filters and with C & ð section filters.
6. Plotting the characteristics of BJT in Common Base configuration and measurement of h-parameters.
7. Plotting the characteristics of BJT in Common Emitter configuration and measurement of h-parameters.
8. Plotting the characteristics of BJT in Common Collector configuration and measurement of h-parameters.

9. Plotting the characteristics of JFET in CS configurations and measurement of Transconductance and Drain resistance.
10. Characteristics of special semi-conductor devices-UJT and SCR.
11. Characteristics of LED and photo diode.
12. Characteristics of Tunnel diode.

Note: Wherever possible, Analysis and design of circuits shall be carried out using simulation tools.

Suggested Reading:

1. Robert Diffenderfer, "Electronic Devices Systems and Applications", Cengage Learning India Private Limited,2010.
2. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, "Basic Electronics, A Text - Lab Manual", 7th Edition, TMH 2001.
3. Mahesh Jain, "Practical semiconductors data manual No.3", BPB Publications, 1981.
4. Bharath electronics ltd, "Semiconductors data manual", IEC Publication 134, 1969.

18EC C06

ELECTRONIC WORKSHOP AND NETWORKS LAB

Instruction	2 P Hours per Week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Prerequisite: Knowledge of **b**asic Electrical components, circuits and equipment.

Course Objectives: This course aims to:

1. Understand the basic Concepts of Electric Circuits and equipment like CRO, Multimeter and LCR –Q meter
2. Verify network theorems.
3. Analyse Resonant circuits, Attenuators and passive filters.

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

1. Measure R, L, C components using electronic equipment.
2. Analyse DC, AC circuits and verify network theorems.
3. Determinethe two port network parameters.
4. Design and verification of attenuators and filters.
5. Simulate different circuits using the simulation software.

EXPERIMENTS LIST

1. Study of RLC components, Bread board, Regulated power supply, Function generator, CRO
2. Measurement of R, L, C components using colour code, multimeter and LCR - Q Meter.
3. Practice of Soldering and de-soldering for simple circuits.
4. Verification of Superposition theorem and Tellegen's theorem.
5. Verification of Maximum power transfer theorem.
6. Verification of Reciprocity theorem.
7. Verification of Compensation theorem andMillman'stheorem.
8. Verification of Transient Response in RC, RL circuits.
9. Design and Verification of Series Resonance.
10. Design and Verification of Parallel Resonance.
11. Determination of two-port network parameters (Z,Y,h,T).
12. Design and Verification of Attenuators.
13. Design andVerification of Constant-K high-pass filter.
14. Design andVerification of Constant-K low-pass filter.

Note: Experiments are to be simulated by using any simulation software.

Suggested Reading:

1. Thomas Petruzzellis, "Build Your Own Electronics Workshop", McGraw-Hill Companies, Inc., 2005.
2. A.M. Zungeru, J.M. Chuma, M. Mangwala , L.K. Ketshabetswe, "Handbook of Laboratory Experiments in Electronics and Communication Engineering" Vol. 2, 1st Edition, Notion press, 2017.

18EG C03

SOFT SKILLS

Instruction	2 P Hours per Week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives: This course aims to:

1. Imbibe an impressive personality, etiquette, professional ethics & values, effective time management & goal setting.
2. Understand the elements of professional update & upgrade through industry exposure in a mini-live project. Understand confidence building strategies and thereby to make effective presentations through PPTs.
3. Learn what constitutes proper grooming and etiquette in a professional environment. Acquire the necessary skills to make a smooth transition from campus to corporate.

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

1. Be assertive and set short term and long term goals. Also learn to manage time effectively and deal with stress.
2. Win in professional communication situations and participate in group discussions with confidence. Write abstracts.
3. Write effective resumes. Plan, prepare and face interviews confidently.
4. Adapt to corporate culture by being sensitive - personally and sensible - professionally. Draft an SOP.
5. Apply the soft skills learnt in the mini-live project, by collecting and analyzing data and making oral and written presentations on the same.

Exercise 1
Main Topics: Thinking Skills, Personality Development – Effective Time Management, setting realistic goals, self-confidence and assertiveness, stress management, moral values.
Flipped Sessions: Personal Sensitivity & Professional Sensibility (Reading & Discussion)
Writing Input: Writing to Express - Drafting & Delivering a Speech (Free Writing Exercise)

Exercise 2
Main Topics: Advanced Group Discussion with Case studies : Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.

Flipped Sessions: Importance of Professional Updating & Upgrading (Reading & Discussions)
Writing Input: Writing with Precision - Writing Abstracts

Exercise 3
Main Topics: Interview Skills – concept and process, pre-interview planning, opening strategies, answering strategies, mock interviews. Resume' writing – structure and presentation, planning, defining the career objective, projecting ones strengths and skills.
Flipped Sessions: Mock Interviews (Video Sessions &Practice)
Writing Input: Writing to Reflect - Resume Writing

Exercise 4
Main Topic: Corporate Culture – Grooming and etiquette, communication media, academic ethics and integrity
Flipped Sessions: Corporate Culture, Etiquette & Grooming (Video Sessions & Practice through Role-play)
Writing Input: Writing to Define - Writing an effective SOP.

Exercise 5
Main Topic: Mini Project – General/Technical. Research, developing a questionnaire, data collection, analysis, written report and project seminar.Elements & Structure of effective presentation. Presentation tools – Body language, Eye-contact, Props & PPT.
Flipped Sessions: Effective Presentations (Video & Writing Sessions, Practice through Emulation)
Writing Input: Writing to Record - Writing minutes of meeting.

Suggested Reading:

1. Madhavi Apte , "A Course in English communication", Prentice-Hall of India, 2007
2. Dr. Shalini Verma, "Body Language- Your Success Mantra", S Chand, 2006
3. Ramesh, Gopalswamy, and Mahadevan Ramesh, "The ACE of Soft Skills", New Delhi: Pearson, 2010
4. Van Emden, Joan, and Lucinda Becker, "Presentation Skills for Students", New York: Palgrave Macmillan, 2004

* Flipped Class-room: Students explore the concept first and then trainer explains it, students work on their own.

Web Resources:

1. https://www.goskills.com/Soft-Skills
2. https://www.trainerbubble.com
3. https://www.skillsconverged.com

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
B.E (Electronics and Communication Engineering)

SEMESTER – IV

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	18EC C07	Analog Circuits	3	-	-	3	30	70	3
2	18EC C08	Analog Communication	3	-	-	3	30	70	3
3	18EC C09	Antennas and Wave Propagation	3	-	-	3	30	70	3
4	18EC C10	Control Systems	3	-	-	3	30	70	3
5	18EC C11	Digital Systems Design	3	-	-	3	30	70	3
6	18EG M01	Indian Constitution	2	-	-	2	-	50	Non Credit
7	18EE M01	Indian Traditional Knowledge	2	-	-	2	-	50	Non Credit
PRACTICALS									
8	18EC C12	Analog Circuits Lab	-	-	2	2	15	35	1
9	18EC C13	Analog Communication Lab	-	-	2	2	15	35	1
10	18EC C14	Digital Systems Design Lab	-	-	2	2	15	35	1
Total			**19**	-	**06**	-	**195**	**555**	**18**
Clock Hours per Week: 25									

L: Lecture T: Tutorial P: Practical D: Drawing
CIE: Continuous Internal Evaluation SEE: Semester End Examination

18EC C07

ANALOG CIRCUITS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Student should have knowledge on Electronic Devices and Network Analysis.

Course Objectives: This course aims to:

1. Understand the applications of BJT & FET as a switch and an amplifier.
2. Analysis of BJT & FET in various configurations using small signal equivalent models and their frequency response.
3. Know concept of multistage, feedback amplifiers, multivibrators and power amplifier and their analysis.

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

1. Define the equivalent model of BJT, FET & MOSFET at low and high frequency.
2. Compare and Contrast different types of Multistage, Feedback, Power amplifiers, Multi-vibrators
3. Apply the concepts of BJT analysis in feedback amplifiers, multistage amplifiers
4. Categorize different types of feedback amplifiers, power amplifiers and Multi-vibrators.
5. Choose the best configuration for the specifications (like conversion efficiency in case power amplifiers, input and output impedance in case feedback amplifiers

UNIT-I

Biasing of Amplifiers: BJT biasing techniques, stability factors, Bias compensation techniques, Thermal runaway, Thermal stability, BJT as an amplifier and as a switch. JFET biasing-zero current drift biasing, biasing of FET, FET as an amplifier and as a switch. Biasing of MOSFETs, MOSFET as a switch.

UNIT-II

Single Stage Amplifiers: Analysis of BJT circuits using h-parameters in various configurations, their comparison (approximate and exact analysis), Millers Theorem and its duality- application circuits, frequency response. Analysis of

FET circuits using equivalent model for various configurations and their comparison.

UNIT-III

Multi Stage Amplifiers: Multi stage amplifiers: CE-CE, CE-CB, CC-CC, Bootstrap, High frequency equivalent circuit Analysis BJT (f_T, $f_{\hat{a}}$, and gain band-width product), Amplifier Frequency response, Multistage amplifiers: low frequency and High frequency analysis of RC coupled, Transformer coupled and Direct coupled amplifiers with BJT.

UNIT-IV

Feedback Circuits: Feed Back 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. Stability considerations.Oscillators: Positive feedback and conditions for sinusoidal oscillations, RC oscillator, LC oscillator, Crystal oscillator, Amplitude and frequency stability of oscillator.

UNIT-V

Large Signal Amplifies and Multivibrators: Large Signal Amplifiers: BJT as large signal audio amplifiers, Classes of operation, Harmonic distortion, power dissipation, efficiency calculations. Push-Pull audio power amplifiers under Class-A, Class-B operations, Heat Sinks.Analysis of Transistor Multivibrators: Bistable, Monostable and Astable circuits. Operation of regenerative comparator (Schmitt Trigger).

Text Books:

1. David Bell, "Fundamentals of Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2008.
2. Millman and Halkias, "Electronic Devices and Circuits" 2nd Edition, McGraw Hill Publication, 2007.
3. Jacob MillmanHerbert TaubMillman's, "Pulse, Digital and Switching Waveforms", Third Edition, McGraw Hill Publication, 2017.

Suggested Reading:

1. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", 2nd Edition, McGraw Hill Publication, 2009.
2. Robert L. Boylestad, "Electronic Devices and Circuit Theory", 10th Edition, PHI, 2009.
3. Donald Schilling, Charles Belove, TuviaApelewicz Raymond Saccardi, "Electronic Circuits: Discrete andIntegrated", TMH, 3rd Edition, 2012.

18EC C08

ANALOG COMMUNICATION

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: A prior knowledge of signals and systems is required.

Course Objectives: This course aims to:

1. Introduce the fundamentals of analog communication.
2. Provide the design details of various transmitters and receivers used in analog communication system.
3. Involve the students in analyzing performance of communication system by estimating noise.

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

1. Understand the need for modulation and various linear modulation schemes.
2. Infer the concepts of various nonlinear modulation schemes.
3. Design various transmitters and receivers.
4. Assess a random signal by computing various statistical properties.
5. Evaluate the performance of analog communication system through the estimation of noise.

UNIT – I

Linear Modulation Schemes: Need for Modulation, Double Side Band Suppressed Carrier Modulation, Balanced Modulator, Coherent Detector and Costas Detector. Conventional Amplitude Modulation, Phasor Diagram of AM, Switching Modulator, Envelope Detector.Hilbert Transform and its Properties.Single Side Band Modulation.Vestigial Side Band Modulation.

UNIT – II

Non-Linear Modulation Schemes: Angle Modulation, Frequency Modulation and Phase modulation, Concept of Instantaneous Phase and Frequency. Types of FM modulation: Narrow Band FM and Wide Band FM. FM Spectrum in Terms of Bessel Functions. Phasor Diagram of NBFM.Direct and Indirect (Armstrong's) methods of FM Generation.Foster–Seeley Discriminator for FM Detection.Introduction toPLL.

UNIT – III

Transmitters and Receivers: High Level and Low Level AM Transmitters. Principle and Operation of Tuned Radio Frequency receiver and Super Heterodyne Receivers.Selection of RF Amplifier.Choice of Intermediate Frequency. Image Frequency and its Rejection Ratio, Receiver Characteristics: Sensitivity, Selectivity, Fidelity. Double Spotting, Tracking and Alignment.Pre-emphasis and De-emphasis.

UNIT – IV

Random Process: Concept of random process, Stationarity and Ergodicity, Auto Correlation and its Properties, Power Spectral Density and its Properties. Linear System with Random inputs: Random Signal Response of Linear System, Auto Correlation of Response.

UNIT – V

Noise: Thermal Noise. White Noise and ColouredNoise.Noise Temperature. Noise in Two-Port Network: Noise Figure, Equivalent Noise Temperature and Noise Bandwidth. Noise Figure and Equivalent Noise Temperature for Cascaded Stages. S/N Ratios and Figure of Merit Calculations for AM, DSB-SC and SSB systems.Pulse Analog Modulation Schemes: Sampling of low Pass and Band Pass Signals. Types of Sampling. Pulse Modulation Schemes: PAM, PWM and PPM.

Text Books:

1. Simon Haykin, "Communication Systems",2nd Edition, WileyIndia,2011.
2. Herbert Taub, Donald L. Shilling and GoutamSaha, "Principles of Communication Systems", 3rd Edition, TMH, 2008.
3. Peyton Z. Peebles JR., "Probability Random Variables and Random Signal Principles", Tata McGrawHill, edition, 4/e, 2002.

Suggested Reading:

1. Singh, R.P. and Sapre, S.D., "Communication Systems", TMH, 2007.

18EC C09

ANTENNAS AND WAVE PROPAGATION

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Students should have prior knowledge about Electromagnetics theory and Maxwell's equations.

Course Objectives: This course aims to:

1. The basic principles of an antenna and its parameters for characterizing its performance.
2. The fundamental concepts of various types of antennas, arrays for customizing the pattern parameters.
3. The propagation behavior of the radio wave in both troposphere and ionosphere.

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

1. Understand the basic parameters of an antenna.
2. Extend current distribution concept in order to estimate the field patterns.
3. Appraise the concepts of broad side and end fire arrays.
4. Understand the working principle and characteristics of various antennas.
5. Study the behavior of radio waves in various modes of wave propagation.

UNIT-I

Principles of radiation, retarded potential. Isotropic, Directional and Omni-directional radiators.Basic antenna parameters: Radiation patterns, radiation intensity, far field, near field, gain and directivity, Antenna Polarization, effective aperture area and efficiency. Point sources, current distribution, Friis transmission formula.

UNIT-II

Analysis of Infinitesimal dipole, Half-wave dipole, quarter wave monopole, loop antenna and their far field patterns, calculation of radiation resistance and directivity.

UNIT- III

Concept of Antenna Array. Uniform linear array: Broadside and Endfire arrays and calculation of directivity and beamwidth. Two element array of Infinitesimal dipole.Qualitative treatment of nonlinear arrays: Binomial and Chebyschef arrays

UNIT-IV

Qualitative treatment of Helical Antennas: Normal and Axial mode patterns, wideband characteristics. Characteristics, radiation principles and applications of Rhombic Antenna, Yagi-Udaantenna, pyramidal Horn antenna, Parabolicantenna system, Log-Periodic antenna.Microstrip antennas: Radiation mechanism, different types, advantages and disadvantages. Design of rectangular Microstrip antenna.

UNIT-V

Ground wave propagation, Space and Surface waves, Tropospheric refraction and reflection, Duct propagation.Sky wave propagation: Critical frequency, Maximum Usable Frequency (MUF) and Skip distance, Line of sight propagation.

Text Books:

1. Constantine A. Balanis, "Antenna Theory: Analysis and Design", 4thEdition, John Wiley, 2016.
2. Edward C. Jordan and Kenneth G. Balmain, "Electromagnetic Waves and Radiating Systems", 2ndEdition, PHI, 2001.

Suggested Reading:

1. John D. Krauss, Ronald J. Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation", 4thEdition, TMH, 2010.
2. DennisRoody and John Coolen, "Electronic Communications", 4th Edition, Prentice Hall, 2008.

18EC C10

CONTROL SYSTEMS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: The student is expected to have knowledge of Laplace transform and electrical and electronic circuits.

Course Objectives: This course aims to:

1. Introduce various control systems and their equivalent mathematical models, block diagrams and signal flow graphs.
2. Familiarize students to time response analysis of different systems, frequency domain techniques to assess the stability of a system and different compensators / controllers to control a plant.
3. Introduce students to the concept of state space analysis of control system.

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

1. Find the transfer function of a system represented by a block diagram and signal flow graph.
2. Evaluate the time domain specifications and steady state error of a system.
3. Investigate stability of the system using different tests.
4. Compare various controllers and compensators.
5. Apply State Space Concept to analyse and design a control system.

UNIT-I

Control System Fundamentals: Classification of control systems, Open and Closed Loop control systems,Block diagram reduction and signal flow graphs, Mathematical modelling of a Mechanical system and conversion into electrical System.

UNIT-II

Time Response Analysis: Transfer function and Impulse Response, Types of Inputs, Transient Response of first and second Order System with different inputs, Time domain Specifications. Types of Systems, static error coefficients, error series, PD, PI and PID controllers.

UNIT-III

Routh-Hurwitz criteria for stability, Root Locus Techniques, Analysis of typical systems using root locus techniques, Effect of location of roots on system response.

UNIT-IV

Frequency Response Analysis: Frequency domain specifications,Bode plot, Principle of Argument, Nyquist plot and stability criterion, Gain and Phase Margins from the Bode and Nyquist diagrams. Lead and Lag compensators.

UNIT-V

State Space Analysis: Concept of State, StateVariable, State vector and State space. State space representations of linear time invariant systems, State transition matrix, Solution of state equation, Controllability,Observabilityand Design of control systems using state variable feedback.

Text Books:

1. I.J.NagrathandM.Gopal, "Control Systems Engineering", New Age International Publishers, 5/e 2012.
2. Benjamin C. Kuo, "Automatic Control Systems", 7/e, PHI, 2010.

Suggested Reading:

1. K. Ogata, "Modern Control Engineering", EEE, 5/e, PHI, 2003.
2. Richard C. Dorf and Robert H. Bishop, " Modern Control Systems", 11/e Pearson, 2008.
3. GopalMadan, "Digital control engineering" 1/e, New age publishers, 2008.

18EC C11

DIGITAL SYSTEM DESIGN

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Knowledge ofElectronic device concepts.

Course Objectives: This course aims to:

1. Learn various techniques for logic minimization.
2. Comprehend the concepts of various combinational circuits and sequential circuits.
3. Learn the Language fundamentals of Verilog HDL, also able to simulate and synthesizevarious digital modules.

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

1. The Various switching algebra theorems and minimization of switching functions.
2. The design and analysis of combinational logic circuits
3. Design and analysis of different types of flip-flops and sequential circuits including FSMs.
4. The Design of various combinational and sequential logic circuits using Verilog HDL.
5. The Simulation and synthesis of digital logic design using Verilog HDL.

UNIT-I

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Quine –McCluskey Tabular Minimization Method. Logic function realization: AND-OR, OR-AND and NAND/ NOR realizations.

UNIT-II

Introduction to Combinational Design: Binary Adders, Subtractors and BCD adder, Code converters Binary to Gray, Gray to Binary, BCD to excess3,BCD to Seven Segment display, Decoders, Encoders, Priority Encoders, Multiplexers,

Demultiplexers, Comparators Implementations of Logic Functions using Decoders and Multiplexers

UNIT-III

Sequential Logic Design:Latches,Flipflops,Difference between latch and flipflop, types of flipflops like S-R,D, T JK and Master-Slave JK FF, Edge triggered FF, flipflop conversions,set up and hold times, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM, Algorithmic State Machines charts. Clock generation.

UNIT-IV

Introduction to HDLs: VLSI Design flow, Basic Concepts of Verilog HDL, Data Types, System Tasks and Compiler Directives. Gate Level Modelling: Gate Types and Gate Delays. Dataflow Modeling: Continuous Assignment and Delays. Design of Stimulus Block.

UNIT-V

Behavioral Modeling: Structured Procedures, Procedural Assignments, Timing control, Conditional statements, Sequential and Parallel Blocks. Switch level Modelling. Introduction to tasks and functions.Design of Mealy and Moore state models using Verilog HDL.Introduction to Logic Synthesis.Concept of Programming using FPGA.

Text Books:

1. Morris Mano M. and Michael D.Ciletti, "Digital Design, With an Introduction to Verilog HDL", 5th edition, Pearson 2013.
2. Samir Palnitkar, "Verilog HDL,A guide to Digital design and synthesis", 2/e , Pearson Education, 2008.

Suggested Reading:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. Thomas L. Floyd, "Digital Fundamentals", Pearson, 11th edition, 2015.

18EG M01

INDIAN CONSTITUTION

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	-
Credits	Non credit

Course Objectives: This course aims to:

1. The history of Indian Constitution and how it reflects the social, political and economic perspectives of the Indian society.
2. Address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indiannationalism.
3. Have knowledge of the various Organs of Governance and Local Administration.

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

1. Understand the making of the Indian Constitution and its features.
2. Have an insight into various Organs of Governance - composition and functions.
3. Understand powers and functions of Municipalities, Panchayats and Co-operativeSocieties.
4. Be aware of the Emergency Provisions in India.
5. Understand the Right To equality, the Right To freedom and the Right To Liberty.

UNIT-I

Constitution of India - Introduction and salient features .Constitutional history. Directive Principles of State Policy - Its importance and implementation.

UNIT-II

Union Government and its Administration - Structure of the Indian Union: Federalism, distribution of legislative and financial powers between the Union and the States. Parliamentary form of government in India. President: role, power and position.

UNIT-III

Emergency Provisions in India - National emergency, President rule, Financial emergency

UNIT-IV

Local Self Government - District's Administration Head: Role and Importance. Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.Panchayati Raj: Introduction, Zilla Panchayat, Elected officials and their roles, CEO Zilla Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments). Village level: Role of Elected and officials.

UNIT-V

Scheme of The Fundamental Rights & Duties: Fundamental Duties - the legal status.

Scheme of The Fundamental Rights - To Equality, to certain Freedom Under Article 19, to Life And Personal Liberty Under Article 21.

Text Books:

1. The Constitution of India, 1950 (Bare Act), GovernmentPublication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, Framing of Indian Constitution, 1st Edition,2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis,2015.

Online Resources:

1. http://www.nptel.ac.in/courses/103107084/Script.pdf

18EE M01

INDIAN TRADITIONAL KNOWLEDGE

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	-
Credits	Non credit

Course Objectives: This course aims to:

1. Get a knowledge in Indian Culture
2. Know Indian Languages and Literature and the fine arts in India
3. Explore the Science and Scientists of Medieval and Modern India

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

1. Understand philosophy of Indian culture
2. Distinguish the Indian languages and literature
3. Learn the philosophy of ancient, medieval and modern India
4. Acquire the information about the fine arts in India
5. Know the contribution of scientists of different eras.

UNIT-I

Introduction to Culture: Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India

UNIT-II

Indian Languages, Culture and Literature:

Indian Languages and Literature-I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India.

Indian Languages and Literature-II: Northern Indian languages & literature

UNIT-III

Religion and Philosophy: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT-IV

Fine Arts in India (Art, Technology& Engineering): Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music,

Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India

UNIT-V

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

Text Books:

1. Kapil Kapoor, Text and Interpretation: The India Tradition,ISBN: 81246033375, 2005
2. Science in Samskrit, Samskrita Bharti Publisher, ISBN-13: 978-8187276333, 2007
3. S. Narain, Examinations in ancient India, Arya Book Depot, 1993
4. Satya Prakash, Founders of Sciences in Ancient India, Vijay Kumar Publisher, 1989
5. M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014

Suggested Reading:

1. Kapil Kapoor, Language, Linguistics and Literature: The Indian Perspective, ISBN-10: 8171880649, 1994.
2. Karan Singh, A Treasury of Indian Wisdom: An Anthology of Spiritual Learn, ISBN: 978-0143426158, 2016.

18EC C12

ANALOG CIRCUITS LAB

Instruction	2 P Hours per Week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Prerequisite: Knowledge on Electronic Devices Lab and Electronic Workshop and Networks Lab.

Course Objectives: This course aims to:

1. Design and analysis of Biasing circuits and Power Amplifiers.
2. Know frequency response and behavior of various Single Stage, Multistage and Feedback amplifiers.
3. Generation of analog signals using Oscillators and Multi-vibrators

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

1. Define the bandwidth of single stage and multistage amplifiers using BJT and FET.
2. Compare and contrast different types of Multi-stage configurations, Feedback, Power amplifier.
3. Apply the concepts of analysis of BJT and compare the results in the lab for multi-vibrators, feedback, multistage amplifiers.
4. Categorize different types of feedback amplifiers, power amplifiers.
5. Choose the best configuration for the specifications (like conversion efficiency in power amplifiers, input and output impedance, resonating frequency and band-width).

Experiments

1. BJT and FET biasing circuits.
2. Design and frequency response of Common Emitter BJT amplifier.
3. Design and frequency response of Single stage and Multistage RC - Coupled amplifier using FET.
4. Voltage series feedback amplifier.
5. Voltage shunt feedback amplifier.
6. Current series feedback amplifier.
7. Current shunt feedback amplifier.
8. RC Phase Shift Oscillator.
9. Hartley Oscillator and Colpitts Oscillator.
10. Design of Class-B power amplifier.

11. Design and development of Astablemultivibrator.
12. Design and development of Monostablemultivibrator.
13. Design and development of Schmitt Trigger.
14. Design and development of Voltage to Frequency converter.

Note: Wherever possible, Analysis and design of circuits should be carried out using SPICE tools.

Suggested Reading:

1. Robert Diffenderfer, "Electronic Devices Systems and Applications", Cengage Learning India Private Limited, 2010.
2. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, "Basic Electronics, A Text - Lab Manual", 7th Edition, TMH 2001.

18EC C13

ANALOG COMMUNICATION LAB

Instruction	2 P Hours per Week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Prerequisite: Knowledge on signal analysis and its representation is required.

Course Objectives: This course aims to:

1. Generate and detect various analog and pulse modulation schemes.
2. Develop and analyze the characteristics of PLL, Mixer and Pre-Emphasis & De-Emphasis circuits.
3. Estimate the power spectral density by analyzing the spectrum of a given signal.

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

1. Demonstrate the generation and detection of various analog modulatedsignals.
2. Understand the sampling concept and further they can generate and detect various pulse modulatedsignals.
3. Obtain and analyze frequency response of Pre-Emphasis and De-Emphasiscircuits
4. Understand Mixer, Radio receiver and PLLcharacteristics and also compare FDM and TDM.
5. Estimate the Power spectral density of noise and Signal to Noise ratio and further able to analyze spectrums of AMand FMsignals.

List of Experiments

1. AM signals generation anddetection.
2. Generation of DSB-SC using Balancedmodulator.
3. SSB Modulation and Demodulation.
4. FM generation anddetection.
5. Frequency response of Pre-Emphasis and De-Emphasiscircuits.
6. Evaluation of Radio Receivercharacteristics.
7. Sampling of continuous time signal and its Reconstruction(PAM).
8. Frequency division Multiplexing and De-Multiplexing.
9. Time division Multiplexing and De-Multiplexing.
10. PWM Modulation and Demodulation.
11. PPM Modulation and Demodulation.

12. Determination of PLLCharacteristics.
13. Analysis of MixerCharacteristics.
14. Spectral Analysis of AM and FM signals using Spectral Analyzer.

Suggested Reading:

1. A.M. Zungeru, J.M. Chuma, M. Mangwala , L.K. Ketshabetswe, "Handbook of Laboratory Experiments in Electronics and Communication Engineering", Vol. 2, 1st Edition, Notion press, 2017.

18EC C14

DIGITAL SYSTEM DESIGN LAB

Instruction	2 P Hours per Week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Prerequisite: Digital concepts and C language concepts**.**

Course Objectives: This course aims to:

1. Simulate and synthesize combinational logic circuits.
2. Simulate and synthesize sequential logic circuits.
3. Learn and implement procedure for any digital design.

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

1. Design a Digital circuit using Verilog HDL.
2. Understand various abstraction levels of a digital design.
3. Verify the functionality of a design using Test bench.
4. Simulate and synthesize combinational logic circuits.
5. Simulate and synthesize sequential logic circuits.

Write a Verilog HDL code to Simulate and synthesize the following in Gate level, Data flow and Behavioral Modeling styles.

1. Logic Gates.
2. Arithmetic Units: Adders and Subtractors.
3. Multiplexers and De-multiplexers.
4. Encoders, Decoders, Priority Encoder and Comparator.
5. Implementation of logic function using Multiplexers and Decoders.
6. Arithmetic and Logic Unit.
7. Flip-Flops.
8. Up, Down and UP/Down Counters.
9. Sequence Detector using Mealy and Moore type state machines.
10. Implementation of SSI Circuits using FPGA.

Suggested Reading:

1. Samir Palnitkar, "Verilog HDL,A guide to Digital design and synthesis", 2/e, Pearson Education, 2008.