E.G.S. PILLAY ENGINEERING COLLEGE (Autonomous)

Approved by AICTE, New Delhi

Affiliated to Anna University, Chennai | Accredited by NAAC with 'A++' Grade

Accredited by NBA (B.Tech-IT, B.E-CSE and ECE) (Tier-1)

NAGAPATTINAM – 611002

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING
R2023 - SECOND YEAR CURRICULUM

SEMESTER III

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	MAX. MARKS		
							CA	ES	TOTAL
THEORY COURSES									
2301MA302	Probability Theory and Stochastic process	BSC	3	1	0	4	40	60	100
2302CS305	Program Paradigms (Data Structures & Algorithm)	ESC	3	0	3	4.5	50	50	100
2302EC301	Signals and System	PCC	3	1	0	4	40	60	100
2302EC302	Digital Electronics	PCC	3	0	0	3	40	60	100
2302EC303	Electromagnetic Fields	PCC	3	0	0	3	40	60	100
2301GEX07	Environmental Sciences and Sustainability	BSC	1	0	2	2	50	50	100
PRACTICAL COURSES									
2302EC351	Digital Electronics Laboratory	PCC	0	0	3	1.5	60	40	100
OTHER COURSES									
2304GE301	Professional Development Course - I	EEC	0	0	2	1	100	--	100
2301LS301	Life Skills - III	LS	--	--	--	--	--	--	--
2304EC001	Value Addition Course	VAC	1	0	0	1	100	--	100
TOTAL						**23**	**510**	**380**	**900**

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	MAX. MARKS		
							CA	ES	TOTAL
ONE CREDIT COURSES									
2304EC002	Arduino Programming Autonomous Systems with Sensors and Actuators	OCC	1	0	0	1	100	--	100
2304EC003	Wireless Sensor Networks with Arduino and NRF24L01	OCC	1	0	0	1	100	--	100

2301MA302	PROBABILITY THEORY AND STOCHASTIC PROCESSES	L	T	P	C
		3	1	0	4

PREREQUISITE:

1. Advanced multivariate differential calculus and integral calculus
2. Matrices

COURSE OBJECTIVES:

1. To analyze the concepts of probability, random variables and distribution functions.
2. To acquire skill in handling situation with more than one random variable with time function.
3. To analyze the concepts of Covariance and correlation.
4. To analyze the concept of Markov process.
5. To acquire skills in Linear systems with random inputs.

COURSE OUTCOMES:

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

CO1:	Apply probability techniques to analyze the performance of Electronic systems.(K3)
CO2:	Apply standard distributions in describing real life phenomena.(K3)
CO3:	Solve problems involving more than one random variable. (K3)
CO4:	Make use of theorems related to random signals.(K3)
CO5:	Interpret the response of random input to linear time invariant systems.(K3)

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	-	1	-
CO2	-	1	-
CO3	-	1	-
CO4	-	1	-
CO5	-	1	-

COURSE CONTENTS:

MODULE I	PROBABILITY THEORY	9+3 Hours

Sets and set operations -Probability- Conditional probability and Bayes theorem-Discrete and continuous random variables – Moments – Moment generating functions –Real Time Problems.

MODULE II	ONE -DIMENSIOAL RANDOM VARIABLE	9+3 Hours

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression- Transformation of random variables.

MODULE III	TWO - DIMENSIONAL RANDOM VARIABLES	9+3 Hours

Control structure of dc drive; Armature voltage and field control of separately excited dc motor drive; Transfer function of separately excited dc motor and converter; Design of controllers- Speed controller and Current controller.

MODULE IV	**STOCHASTIC PROCESSES**	**9+3 Hours**
Classification -Stationary process – Markov process – transition probabilities – Limiting distributions – Poissonprocess.		
MODULE V	**SPECTRAL DENSITIES AND LINEARSYSTEMS WITH RANDOM INPUTS**	**9+3 Hours**
Auto correlation function - cross correlation function – Properties - power spectral density-cross spectral density- Properties - Linear time invariant system- system transfer function-Linear system with random inputs-Auto correlationand cross correlation functions of input and output.		
		TOTAL: 45+15=60 HOURS

REFERENCES:

1. H. Stark and J. Woods, ``Probability and Random Processes with Applications to Signal Processing," Third Edition, Pearson Education.

2. A. Papoulis and S. Unnikrishnan Pillai, ``Probability, Random Variables and Stochastic Processes," Fourth Edition, McGraw Hill.

3. K. L. Chung, Introduction to Probability Theory with Stochastic Processes, Springer International.

4. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability, UBS Publishers,

5. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Stochastic Processes, UBS Publishers.

6. S. Ross, Introduction to Stochastic Models, Harcourt Asia, Academic Press.

7. www.indiastudychannel.com.

2302CS305	PROGRAM PARADIGMS (DATA STRUCTURES & ALGORITHM)	L	T	P	C
		3	0	3	4.5

PREREQUISITE:

1. Introduction to Computer.
2. Programming in C

COURSE OBJECTIVES:

1. To Learn linear data structures – list, stack, and queue.
2. To understand and apply nonlinear data structures –Trees.
3. To understand and apply nonlinear data structures –Graphs.
4. To Learn the algorithm analysis techniques.
5. To Become familiar with different algorithm design techniques.

COURSE OUTCOMES:

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

CO1:	Implement abstract data types for linear data structures.
CO2:	Have a comprehensive knowledge of Trees and their implementations.
CO3:	Learn advanced data structures like Graphs and their implementations.
CO4:	Analyze the time and space complexity of algorithms.
CO5:	Design algorithms for various computing problems and analyze the different algorithm design Techniques for a given problem.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	2	1	2	-	-	-	-	-	-
CO2	2	1	3	2	2	2	-	-	-	-	-	-
CO3	2	1	3	2	2	2	-	-	-	-	-	-
CO4	3	1	3	2	2	2	-	-	-	-	-	-
CO5	3	1	3	2	2	2	-	-	-	-	-	-

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	1	-	-
CO2	1	-	-
CO3	1	-	-
CO4	1	-	-
CO5	1	-	-

COURSE CONTENTS:

MODULE I **LINEAR DATA STRUCTURES – LIST** **9 Hours**

Introduction, Data structure Types - Data structure operations - Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation —singly linked lists-– applications of lists – Polynomial Manipulation - Stack ADT – Queue ADT - Evaluating arithmetic expressions.

MODULE II **NON-LINEAR DATA STRUCTURES – TREES** **9 Hours**

General trees, Terminology, Representation of trees, Tree traversal- Binary tree, Representation, Expression tree,Binary tree traversal, Binary Search Tree: Construction, Searching, Insertion, Deletion, AVL trees: Rotation, Insertion, Deletion, B-Trees.

MODULE III **NON LINEAR DATA STRUCTURES – GRAPHS** **9 Hours**

Representation of Graphs – Breadth-first search – Depth-first search – Topological sort – Minimum SpanningTrees – Kruskal's and Prim's algorithm – Shortest path algorithm – Dijkstra'salgorithm.		
MODULE IV	**INTRODUCTION TO ALGORITHM**	**9 Hours**
Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and itsproperties – Mathematical analysis for Recursive and Non-recursive algorithms.		
MODULE V	**DIVIDE-AND-CONQUER AND DYNAMIC PROGRAMMING**	**9 Hours**
Divide and Conquer Methodology — Binary Search — Merge sort — Quick sort — Heap Sort -Knapsack Problem-Finding Max & Min. Dynamic programming -Warshall's and Floyd' algorithm – Optimal Binary Search Trees – 0/1 Knapsack Problem and Memory functions-Travelling Salesman Problem.		
		TOTAL: 45 HOURS
LIST OF EXPERIMENTS:		
1. Array and Linked list implementations of List ADTs		**1 Hours**
2. Array and Linked list implementation of Stack and Queue ADTs		**2 Hours**
3. Applications of List, Stack and Queue ADTs		**2 Hours**
4. Tree representation and traversal algorithms		**1 Hours**
5. Implementation of Binary Search Trees		**1 Hours**
6. Graph representation and Traversal algorithms		**1 Hours**
7. Implementation of single source shortest path algorithms		**1 Hours**
8. Implementation of minimum spanning tree algorithms		**1 Hours**
9. Implementation of Dijkstra's algorithms		**2 Hours**
10. Implementation of Searching and Sorting		**2 Hours**
11. Implementation of Travelling Salesman Problem.		**1 Hours**
		TOTAL: 15 HOURS
REFERENCES:		

1. H. Stark and J. Woods, ``Probability and Random Processes with Applications to Signal Processing,'' ThirdEdition, Pearson Education.

2. A. Papoulis and S. Unnikrishnan Pillai, ``Probability, Random Variables and Stochastic Processes,'' Fourth Edition, McGraw Hill.

3. K. L. Chung, Introduction to Probability Theory with Stochastic Processes, Springer International.

4. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability, UBS Publishers,

5. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Stochastic Processes, UBS Publishers.

6. S. Ross, Introduction to Stochastic Models, Harcourt Asia, Academic Press.

7. www.indiastudychannel.com.

2302EC301	SIGNALS AND SYSTEMS	L	T	P	C
		3	1	0	4

PREREQUISITE:

1. Mathematics (Ordinary Differential equations and Transforms)

COURSE OBJECTIVES:

1. To study and analyze the continuous and discrete-time signals and systems.
2. To make the students to have knowledge in both time domain and other transform domain representation.
3. To develop mathematical skills to solve problems involving convolution, Impulse response.

COURSE OUTCOMES:

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

CO1:	Analyze the properties of signals & systems.
CO2:	Apply Fourier Series and Fourier transform in Continuous time signal analysis.
CO3:	Apply Laplace transform in Continuous time signal analysis.
CO4:	Analyze continuous time LTI systems using Fourier and Laplace Transforms.
CO5:	Apply Fourier transform and Z transform in Discrete time signal analysis.
CO6:	Examine discrete time LTI systems using Z transform.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	1
CO2	3	3	2	-	-	-	-	-	-	-	-	1
CO3	3	3	2	-	-	-	-	-	-	-	-	1
CO4	3	3	2	1	-	-	-	-	-	-	-	1
CO5	3	3	2	-	-	-	-	-	-	-	-	1
CO6	3	3	2	1	-	-	-	-	-	-	-	1

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	-	3	-
CO2	-	3	-
CO3	-	3	-
CO4	-	3	-
CO5	-	3	-

COURSE CONTENTS:

MODULE I **CLASSIFICATION OF SIGNALS AND SYSTEMS** **9+3 Hours**

Basic Operation on the signals- Classification of Signals: Continuous Time and Discrete Time- Classification of systems: Continuous Time systems and Discrete Time Systems.

MODULE II **CONTINUOUS TIME SIGNAL ANALYSIS** **9+3 Hours**

Fourier Series representation of Periodic Signals- -Properties-Continuous Time Fourier Transform- Properties, Laplace Transform – Properties.

MODULE III **CONTINUOUS TIME SYSTEM ANALYSIS** **9+3 Hours**

Continuous Time LTI systems – Laplace Transform – Region of Convergence – Properties – Analysis and characterization of LTI systems using the Laplace Transform.

MODULE IV	**DISCRETE TIME SIGNAL ANALYSIS**	**9+3 Hours**
Sampling Theorem – Reconstruction of a signal from its samples – Aliasing – Discrete Time Fourier Transform - Properties, Z Transform –Properties.		
MODULE V	**DISCRETE TIME SYSTEM ANALYSIS**	**9+3 Hours**
Discrete Time LTI systems - Z-Transform – Region of Convergence – Properties – Inverse Z Transform-Analysis and characterization of LTI systems using the Z Transform.		
		TOTAL: 60 HOURS

REFERENCES:

1. *Simon Haykin and BarryVanVeen, "SignalsandSystems", John Willey & Sons, Inc., Second Edition, 2004.*
2. *B.P. Lathi, "Principles of Linear Systems and Signals", Second Edition, Oxford, 2009.*
3. *Hwei.P.Hsu, Schaum, " Outlines: Signals and Systems, Pearson Education, 2002.*
4. *Rodger E.Ziemer, William H.Tranter and D.Ronald Fannin "Signals and Systems Continuous andDiscrete", Fourth Edition.*
5. *https://onlinecourses.nptel.ac.in/noc24_ee36.*

2302EC302	DIGITAL ELECTRONICS	L	T	P	C
		3	0	0	3

PREREQUISITE:

1. Basic knowledge in logic gates and number systems.

COURSE OBJECTIVES:

1. To present the fundamentals of digital circuits and simplification methods.
2. To practice the design of various combinational and sequential digital circuits using logic gates.
3. To introduce semiconductor memories and programmable logic devices.
4. To practice the HDL programming for combinational and sequential circuits.

COURSE OUTCOMES:

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

CO1:	Use Boolean algebra, K-map and tabulation method to simplify Boolean functions.
CO2:	Construct different combinational circuits using logic gates.
CO3:	Develop different sequential circuits using logic gates and flip flops.
CO4:	Compare different semiconductor memory devices and build programmable devices using logic gates.
CO5:	Develop Verilog program for combinational and sequential circuits.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1
CO3	3	2	1	-	-	-	-	-	-	-	-	1
CO4	3	2	1	-	-	-	-	-	-	-	-	1
CO5	3	2	1	-	3	-	-	-	-	-	-	1

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

COURSE CONTENTS:

MODULE I **DIGITAL SYSTEMS & BOOLEAN ALGEBRA** **9 Hours**

Review of Number system-Boolean expression and minimization-Logic Gates and its implementation-Simplification of Boolean Functions using Boolean algebra, Karnaugh Map and Tabulation Method.

MODULE II **COMBINATIONAL CIRCUITS** **9 Hours**

Combinational Circuits–Analysis and Design Procedures–Circuits for Arithmetic Operations, Code Conversion–Decoders/Encoders–Multiplexers/DE multiplexers-Parity generators/checkers-Magnitude Comparator.

MODULE III **SEQUENTIAL CIRCUITS** **12 Hours**

Sequential logic-Basic latch-Flip-flops (SR, D, JK, T and Master-Slave)-Moore and Mealy model-Counters-Ripple counters-BCD and Binary-Synchronous counters, Registers-Shift registers-Registers, Hazards

MODULE IV	**MEMORY AND PROGRAMMABLE LOGIC**	**8 Hours**
Classification of memories (RAM, ROM, PROM, EPROM, EEPROM)-Programmable Logic Devices (PLA, PAL,FPGA)-Implementation of circuits using ROM, PLA, PAL.		
MODULE V	**VHDL**	**7 Hours**
Introduction –Hardware Description Language – HDL model for combinational circuits. - HDL model for sequential circuits.		
		TOTAL: 45 HOURS

REFERENCES:

1.Nagrath I.J. and Gopal.M, Control Systems Engineering, 5th Edition, New Age International Publishers, New Delhi, 2008.

2. Kuo, B.C, Automatic Control Systems, 8th Edition, John Wiley and Sons, New York, 2003.

2302EC303	ELECTROMAGNETIC FIELDS	L	T	P	C
		3	0	0	3

PREREQUISITE:

1.Electric and Magnetic fields, Gauss's law, Ampere's law, and Faraday's law, Electrostatic, Current, Magnetism, Electromagnetic induction.

COURSE OBJECTIVES:

1. To impart knowledge on the basics of static electric and magnetic field and the associated Laws.
2. To give insight into the propagation of EM waves and also to introduce the method Computational electromagnetic.
3. To analyze the time varying fields.
4. To impart knowledge on the basics of static electric and magnetic field and the associated Laws.

COURSE OUTCOMES:

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

CO1:	Explain the fundamentals of electromagnetic.
CO2:	Analyze field potentials due to static changes and static magnetic fields.
CO3:	Explain how materials affect electric and magnetic fields.
CO4:	Analyze the relation between the field sunder time varying situations.
CO5:	Discuss the principles of propagation of uniform plane waves.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1
CO3	3	2	1	-	-	-	-	-	-	-	-	1
CO4	3	2	1	-	-	-	-	-	-	-	-	1
CO5	3	2	1	-	-	-	-	-	-	-	-	1

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

COURSE CONTENTS:

MODULE I **STATIC ELECTRIC FIELDS** **9 Hours**

Co-ordinate system – Rectangular – Cylindrical and spherical co-ordinate system – Meaning of stokes theorem and divergence theorem – Coulomb’s law in vector form – Definition of electric field intensity – Electric field due to charges distributed uniformly on an infinite and finite line – Electric field on the axis of a uniformly charged circular disc – Electric flux Density – Gauss law – Proof of gauss law – Applications.

MODULE II	**STATIC MAGNETIC FIELDS**	**9 Hours**
The Biot- Savart law in vector form – Magnetic field intensity due to a finite and infinite wire carrying a current I – Magnetic field intensity on the axis of a circular and rectangular loop carrying a current I – Ampere's circuital law and simple applications – Magnetic flux density – The Lorentz force equation for a moving charge and applications – Force on a wire carrying a current I placed in a magnetic field.		
MODULE III	**ELECTRIC AND MAGNETIC FIELDS IN MATERIALS**	**9 Hours**
Poisson's and Laplace's equation– Electric polarization – Nature of dielectric materials – Definition of capacitance – Electrostatic energy and energy density – Boundary conditions for electric fields – Electric current – Current density–Continuity equation for current – Definition of inductance – Inductance of loops and solenoids–Definition of mutual inductance – Energy density in magneticfields.		
MODULE IV	**TIME VARYING ELECTRIC AND MAGNETIC FIELDS**	**9 Hours**
Faraday's law – Maxwell's equations in integral form and point form – Displacement current –Ampere's circuital law in integral form – Modified form of ampere's circuital law as Maxwell's first equation in integral form – Pointing vector and the flow of power – Power flow in a co-axial cable –Instantaneous average and complex pointing vector.		
MODULE V	**ELECTROMAGNETIC WAVES**	**9 Hours**
Derivation of wave equation – Wave equation in pharos form – Plane waves in free space and in a homogenous material – Wave equation for a conducting medium – Plane waves in lossy dielectrics – Propagation in good conductors – Skin effect – Linear elliptical and circular polarization – Reflection of plane wave from a conductor – Normal incidence – Dependence on polarization – Brewster angle.		
		TOTAL: 45 HOURS

REFERENCES:

1.Edward C. Jordan & Keith G. Balmain, Electromagnetic waves and Radiating Systems, Second Edition, Prentice-Hall Electrical Engineering Series, 2012.

2.M.N.O.Sadiku and S.V. Kulkarni, Principles of Electromagnetics, 6th edition, Oxford (AsianEdition), 2015.

3. NarayanaRao, N., "Elements of Engineering Electromagnetics", 6th Edition, Pearson Education, 2006.

4. Ramo, Whinnery and Van Duzer., "Fields and Waves in Communication Electronics", 3rd Edition, John Wiley and Sons, 2003.

2301GEX07	ENVIRONMENTAL SCIENCES AND SUSTAINABILITY	L	T	P	C
		1	0	2	2

PREREQUISITE:

1. Basic knowledge about the valuable environment.
2. Basic knowledge to conserve the precious environment.

COURSE OBJECTIVES:

1. Realize the interdisciplinary and holistic nature of the environment.
2. Understand how natural resources and environment affect the quality of life and stimulate the quest for sustainable development.

COURSE OUTCOMES:

At the end of the course the student will be able to

CO1:	Describe the importance of ecosystem.
CO2:	scribe the various environmental issues and its prevention.
CO3:	Organize various natural resources and the immediate need to conserve it.
CO4:	Select the various ways of conservation of biodiversity.
CO5:	Investigate the different types of pollution and its effects.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	3	-	-	-	-	-
CO2	2	1	-	-	-	-	3	-	-	-	-	-
CO3	3	2	1	1	1	1	3	2	2	2	3	2
CO4	3	2	1	1	1	1	3	2	2	2	3	2
CO5	3	2	1	1	1	1	3	2	2	2	3	2

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	-	-	-
CO2	-	-	-
CO3	-	-	-
CO4	-	-	-
CO5	-	-	-

COURSE CONTENTS:

MODULE I	ECOSYSTEM	8 Hours

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers. Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, rivers, oceans)

MODULE II	ENVIRONMENT AL ISSUES AND SOLUTIONS	7 Hours

Current Environmental Issues: Acid rain, Ozone layer depletion, Global warming, Green house effect.
Solutions: 12 principles of green chemistry-Rain water harvesting.

MODULE III	BIODIVERSITY	10 Hours

Introduction to biodiversity -genetic, species and ecosystem diversity – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

MODULE IV	NATURAL RESOURCES	10 Hours

Forest resources: Use and over-exploitation, deforestation- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground 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 nonrenewable energy sources, use of alternate energy sources. Energy Conversion processes Biogas – production and uses, anaerobic digestion – 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.

MODULE V	**ENVIRONMENTAL POLLUTION**	**10 Hours**

Definition – Source, causes, effects and control measures of: (a) Air pollution (b) Water pollution(c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution –(f) Nuclear pollution (g) Thermal pollution role of an individual in prevention of pollution.

TOTAL: 45 HOURS

REFERENCES:

1. *Trivedi.R.K., "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media, 3rd edition, BPB publications, 2010.*
2. *Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.*
3. *Dharmendra S. Sengar, "Environmental law", Prentice hall of India PVT LTD, New Delhi, 2007.*
4. *Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.*
5. *Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.*
6. *https://en.wikipedia.org/wiki/Carbon_capture_and_storage.*
7. *Ravikrishnan "Environmental Science and Engineering" Sri Krishna Hi-tech Publishing.*

2302EC351	DIGITAL ELECTRONICS LABORATORY	L	T	P	C
		0	0	3	1.5

PREREQUISITE:

1. Basic knowledge in gates and number systems.

COURSE OBJECTIVES:

1. To impart the students in the designing ability of combinational and sequential circuits.
2. To educate the students in the designing ability of synchronous and asynchronous sequential circuits.
3. To teach the students about software skill in VHDL / VerilogHDL.

COURSE OUTCOMES:

After completion of the course, Student will be able to

CO1:	Construct different combinational circuits using logic gates.
CO2:	Develop different sequential circuits using logic gates and flip flops.
CO3:	Develop verilog program for combinational and sequential circuits.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	1
CO2	3	3	3	3	-	-	-	-	2	-	-	1
CO3	3	3	3	3	-	-	-	-	2	-	-	1
CO4	3	3	3	3	3	-	-	-	2	-	-	1

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-

LIST OF EXPERIMENTS:

1. Verification of Boolean Theorems using basic gates.
2. Design, implementation and simulation of half adder and full subtractor.
3. Design, implementation and simulation of half subtractor and full subtractor.
4. Design, implementation and simulation of code converters.
5. Design, implementation and simulation of multiplexer and de-multiplexer.
6. Design, implementation and simulation of parity generator/checker.
7. Design, implementation and simulation of encoder and decoder.
8. Design, implementation and simulation of magnitude comparator.
9. Design, implementation and simulation of counters.
10. Design, implementation and simulation of shift register.

TOTAL: 45 HOURS

REFERENCES:

1. *Morris Mano and Michael D. Ciletti, "Digital Design", 5th edition, Prentice Hall of India,2012.*
2. *Samir Palnitkar, "Verilog HDL", 2nd Edition, Pearson Education, 2003.*
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