SRI SIDDHARTHA ACADEMY OF HIGHER EDUCATION
(DEEMED TO BE UNIVERSITY), Accredited A+ Grade by NAAC
SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHEME OF TEACHING AND EXAMINATION FOR BE DEGREE COURSE
Academic Year 2025-26 `

Vision

Mould quality technocrats in the field of Electronics and Communication with human values to cater the societal needs

Mission

- To impart high-quality academic environment.
- To provide training in new tools and technologies.
- To facilitate continuous learning and research environment.
- To inculcate professionalism with ethical values, with little impact on environment.

Program Educational Objectives:

PEO-1: Proficient to apply the knowledge gained in mathematics, science and engineering to the field of electronics and communication engineering for the synthesis and analysis of systems

PEO-2: Competent to pursue higher studies and research, with effective communication

PEO-3: Aware of new technologies in the domain field, apply the same for the societal requirement minimizing the impact on environment and ethical practices in their domain

Knowledge and Attitude Profile (Washington Knowledge)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, reuse of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
WK9: Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc., with mutual understanding and respect, and of inclusive attitudes.

Program Outcomes:
Engineering Graduates will be able to

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO2: Problem Analysis: Identify, formulate, review research literature and analyse complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO6: The Engineer and The World: Analyse and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5 and WK7).
PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Specific Outcomes (PSOs)

- The ability to identify, analyze and design systems related to modern engineering hardware and software tools, in Electronics and Communication Engineering in the areas of electronics, communication, image processing, VLSI, signal processing and embedded systems for solving day to day problems.
- Impact the awareness about the impact of professional engineering solutions in societal and environmental context, professional ethics and be able to communicate effectively.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
(NBA Accredited)

SCHEME OF TEACHING AND EXAMINATION FOR NEP 160 CREDITS (2022 Scheme) BE DEGREE COURSE

III Semester B E **Academic Year: 2025-26**

Sl No	Course Code		Course Title	Teaching Dept.	L	T	P	S	Total	Credits	CIE Marks	SEE Marks	Total Marks	Exam Hrs
1	BS	22ES301	Integral Transforms and Numerical Techniques	MA	42	-	-	48	90	3	50	50	100	3
2	PC	22EC302	Network Theory	EC	42	-	-	48	90	3	50	50	100	3
3	PC	22EC303	Digital Circuit Design using Verilog	EC	42	-	28	50	120	4	50	50	100	3
4	PC	22EC304	Analog Electronic Circuits	EC	42	-	28	50	120	4	50	50	100	3
5	PC	22EC305	Signals and Systems	EC	42	-	-	48	90	3	50	50	100	3
6	PC	22EC306	Electronics and Communication Skill Lab-1	EC	14	-	28	18	60	2	50	50	100	3
7	HS	22SK307	Skill Development– I (Communication and soft skills)	HS	-	-	28	2	30	1	50	-	50	-
8	HS	22CI308	Constitution of India	HS	14	-	-	16	30	1	50	-	50	-
				Total	**238**	**0**	**112**	**280**	**630**	**21**				-

L- Lecture. T-Tutorial, P-Practical/Drawing, CIE-Continuous Internal Evaluation, SEE-Semester End Examination , S-Self Learning. XX-Branch Code

Credit Distribution: BS: Basic Science-03, PC: Professional Core-16, HS: Humanity Science-02, Total-21 Credits.

Department: Electronics and Communication Engineering			**Semester:**	3
Subject: Integral Transforms and Numerical Techniques (Common to BM, EC, EE and ET)				
Subject Code:	22ES301	**L – T – P - S:**	42-0-0-48 (In Hrs)	
			Credits:	3

Sl. No	Course Objectives
This course will enable the students to :	
1	**Introduce** the concept of Numerical methods.
2	**Introduce** the concept of Fourier series and Fourier transforms to study behaviour of periodic functions arising in Engineering field.
3	**Describe** the concept of Curve fitting and Regression lines.
4	**Illustrate** the applications of Laplace Transform and Inverse Laplace transform in control Theory.

Module	Description	Hrs
I	**Numerical solution of Ordinary differential equations of first order and first degree**: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order, Milne's and Adams-Bashforth Predictor and Corrector methods (only formulae) -problems. **Numerical Integration:** Simpson's $1/3^{rd}, 3/8^{th}$ rule, Weddle's rule, (without proof) - problems.	**08**
II	**Laplace Transforms:** Basic definition, Laplace transforms of elementary functions, Properties of Laplace transforms, Laplace transforms of Periodic function, Unit step function (All results without proof)-Problems only. **Inverse Laplace transforms**: Basic definition, Evaluation of inverse Laplace transforms by standard methods. Convolution theorem - Problems only. Solutions of second order linear differential equations using Laplace transforms method.	**09**
III	**Statistical Methods:** Definition of Correlation-Karl Pearson's coefficient of correlation–problems. Regression lines (All results without proof)–Problems.	**08**

	Curve fitting: Curve fitting by the method of least squares- Fitting of the straight line, second degree parabola and exponential form of the curve $y = ab^x$ (All results without proof) –Problems.	
IV	**Fourier Series:** Periodic function, Dirichlet's conditions. Fourier series of even and odd functions. Fourier series of periodic functions with period 2π and 2l -problems only. Applications to Engineering problems: Fourier series for Periodic square wave, Full wave rectified form, Saw-tooth wave with graphical representation. Half range Fourier series- problems. Practical harmonic analysis - problems.	**09**
V	**Fourier Transforms:** Infinite Fourier transforms, Fourier Sine and Cosine transforms. Inverse Fourier transforms and simple problems. **Z-Transforms:** Basic definitions of Z-transform, Standard Z-transforms, Damping rule, Shifting rule, Initial value and Final value theorems(without proof)-problems. Inverse Z-transform-problems. Application to difference equations using Z-transforms.	**08**

Note:

Text Book 1: Module-I: 32.3 to 32.10, 30.7, 30.8, 30.10 ; Module-II: 21.3 to 21.5, 21.12, 21.14, 21.15, 21.17 ; Module-III: 25.7.25.14, 24.5, 25.6 ; Module-IV: 10.1 to 10.11; Module-V: 23.1 to 23.6, 23.15, 23.16.

Text Book 2 : Module-I:19.2; Module-II: 5.1 to 5.5; Module-IV: 10.1 to 10.4 ; Module-V : 10.9,10.10 .

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Higher Engineering Mathematics	B.S. Grewal	44th Edition Khanna Publications, 2021.ISBN:9788193328491
2	Advanced Engineering Mathematics	E. Kreyszig, John Wiley & Sons	10th Edition JonWiley &Sons, 2018. ISBN: 9781119446842

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Advanced Engineering Mathematics	C. Ray Wylie, Louis C. Barrett, McGraw-Hill Book Co	6th Edition. 2017, ISBN:9780070722064
2	A Text Book of Engineering Mathematics	N.P.Bali and Manish Goyal	10th Edition Lakshmi Publishers, 2022, ISBN: 9788131808320.
3	Higher Engineering	B.V.Ramana, Tata	11th Edition, Tata McGraw-

	Mathematics	McGraw-Hill	Hill, 2017, ISBN:9780070634190
4	Higher Engineering Mathematics	H. K. Das and Er. Rajanish Varma	3rd Edition, S Chand Publication, 2014, ISBN: 9788121938907

Course Outcomes:

Description	
CO1	**Understand** the basic concepts of Numerical and Statistical methods, Laplace transforms, Inverse Laplace transforms, Fourier series, Fourier transforms and Z- transforms. (L1)
CO2	**Outline** the concepts of numerical methods, Laplace transforms and integral transforms. (L2)
CO3	**Demonstrate** Fourier series and Fourier transforms to study behaviour of periodic functions problems and Statistical methods arising in Engineering fields. (L2)
CO4	**Apply** the principles of Laplace transform, concepts of Numerical Methods and Fourier Series in solving Engineering Problems. (L3)
CO5	**Analyze** the computations associated with Z- transforms, Numerical Integration, Correlation, regression lines and Statistical Methods in Engineering fields. (L3)

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2											
CO2	3	2	1										
CO3	3	3	2								1		
CO4	3	3	2	1							1		
CO5	3	2		1							1		

Department: Electronics and Communication Engineering			**Semester:**	3
Subject: Network Theory				
Subject Code:	22EC302	**L – T – P - S:**	42-0-0-48	(In Hrs)
			Credits:	3

Sl. No.	Course Objectives
1	**Explain** the basic Laws of Electric Circuits and Network Theorems.
2	**Understand** the network reduction techniques and Laplace transforms.
3	**Learn** the concepts of Resonance and Network Topology applied to circuits.
4	**Show** Two port network models in terms of Z, Y, h and T-parameters.

Module	Description	Hrs
I	**FUNDAMENTAL CONCEPTS OF NETWORKS**: Introduction to Voltage and current sources, Kirchhoff's Laws, source Transformation and shifting, Loop Variable Analysis, Node Variable Analysis, Network reduction using star to delta conversion (DC circuits only). Text 1:3.1-3.5, Text2:2.1,2.2,2.3	10
II	**NETWORK THEOREMS**: Introduction, Superposition theorem, Reciprocity theorem, Thevenin's theorem, Norton's theorem, Mill man's Theorem, Maximum power transfer theorem (DC circuits only). Text 1: 4.5,Text 2:9.4	8
III	**NETWORK TOPOLOGY AND RESONANCE IN CIRCUITS**: Introduction, Graph of a network, Concept of tree and links, Incidence matrix, tie-set and cut set schedules, Duality, Series resonance- Variation of Current and Voltage with Frequency, Selectivity and Bandwidth-factor, Circuit magnification factor, Parallel resonance-Selectivity and Bandwidth, Maximum Impedance Conditions with C,L and f variable. Text 1:2.1-2.4, 3.7	8
IV	**INITIAL CONDITIONS AND LAPLACE TRANSFORMATION**: Introduction to initial conditions in elements, Transients, Initial value and final value theorem, Wave form synthesis of periodic & non periodic signals. Text 1: 5.1-5.3,7.1-7.3, 7.8	8

V	**TWO PORT NETWORK**: Introduction to single & two port Networks, Relationship between Two-port variables, open circuit impedance parameters, Short circuit admittance parameters, Hybrid parameters and Transmission parameters, Relationships between Z and Y parameter sets. Text 1: 9.1,9.2	8

Text Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	Network Analysis	M. E. Van Valkenburg	Third edition, 2016
2	Engineering Circuit Analysis	Hayt, Kemmerly and Durbin	6th Edition, 2002

Reference Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	Networks and systems	Roy Choudhury	2nd edition, 2014
2	Network Analysis and Synthesis	Franklin F. Kuo	Second edition (2006)
3	Electrical Networks	Ravish R singh	Tenth reprint 2013

Course Outcomes:

Course outcome	Description
CO1	**Solve** electrical circuit Parameters using mesh and node voltage analysis.(L3)
CO2	**Interpret** different network theorems to simplify a given electrical Network. (L2)
CO3	**Apply** Laplace Transform Technique and Initial conditions for the circuits, periodic and non-periodic waveforms. (L3)
CO4	**Summarize** the resonance parameters and solve two port network parameters of a given electrical circuit. (L2)
CO5	**Extend** Network reduction and topological methods to find different network parameters. (L2)

Course Articulation Matrix:

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3		2										
CO2	3	2			2								
CO3	2												
CO4	2	2											
CO5	3	1											

Department: Electronics and Communication Engineering			**Semester**:	3
Subject: Digital Circuit Design using Verilog				
Subject Code:	22EC303	**L – T – P - S:**	42 – 0 – 28 – 50 (In Hrs)	
			Credits:	4

Sl. No	Course Objectives
1	**Introduce** basic concepts of the Boolean expression simplification method and Hardware description language (Verilog) used to design the digital system.
2	**Study** logic processes and logical operations to design combinational and sequential circuits.
3	**Learn** concepts of Verilog models for digital circuit design.
4	**Acquire** knowledge of various logic families of digital IC Technology.

Module	Description	Hrs
I	**Introduction to digital systems:** Introduction**,** Canonical forms, Karnaugh maps-2, 3 and 4 Variables, incompletely specified functions (Don't Care terms), Simplifying Max term equations. Introduction of HDL: Typical design flow, Verilog data types, Modules and ports, Gate types, Gate delays, Verilog operators. Different types of modelling (Data flow, Behavioural & Structural in brief) Text 1- 3-3.5,3.6.7,3.7,3.8, 4-4.4 to 4.6, Text 2: 1.3, 3.2, 4.1, 4.2, 5.1, 5.2, 6.4	**10**
II	**Combinational Circuits**: Introduction**,** Decoder, Encoder, Multiplexer, Binary adder and subtractor, Parallel adder and subtractor, Carry look ahead adder, Decimal adder, Comparator. HDL Concepts: Verilog Models (Structural & Data flow model) for Combinational Circuits. Text 1-.5.1 to 5.6, Text 2:5.1, 5.1.3, 5.1.4, 6.1, 6.5.	**8**
III	**Sequential Circuits I** : Introduction**,** he basic bistable element, latches, Clocked S-R flip flop, clocked JK flip flop, Master-Slave J-K flip flop, D and T Flip flop, characteristic equations. HDL Concepts: Verilog statements (if else, case, loops, always). Verilog Models for Sequential Circuits (Behavioural). Text 1- 6.1,6.2,6.3,6.4,6.6, Text 2: 7.1, 7.2, 7.4, 7.5, 7.6, 7.9	**8**
IV	**Sequential Circuits II** : Introduction**,** Shift registers, Counters, Asynchronous	**8**

	and synchronous counter, Design of synchronous counter. HDL Concepts: Verilog Models for Synchronous sequential circuits - BCD Counter. Text 1-6.7,6.8,6.9	
V	**Digital IC Technology**: Gate Performance considerations: Noise margins, Fan- Out, Propagation Delays, Power Dissipation, Transistor-transistor logic(TTL), The CMOS Logic. Programmable logic Devices: PROMs, PLAs, PAL. Text 1: 3.10, 5.7,5.8.5.9,5.10, A.5, A.7, A.11	**8**

Lab Contents:

Sl. No.	Experiment Description
1	Realize and verify Half / full adder and Half / full subtractor using basic and ex-or gates using trainer kit
2	Develop and verify the Verilog code for the given Boolean expressions and Half / full adder using different types of modelling
3	Realize and verify parallel adder /subtractor using IC 7483, half/full subtractor with MUX IC 74153 using trainer kit.
4	Develop the Verilog code for the following combinational circuits in gate level/data flow any type of modelling. – MUX, DEMUX, encoder, decoder.
5	Realize and verify SR flip and MS JK Flip flop using trainer kit/simulator.
6	Develop and verify Verilog code using behavioural modelling for sequential circuits-flip-flops.
7	Realize and verify 3 bit asynchronous up/down counter using trainer kit/simulator.
8	Develop and verify the Verilog code for 3 bit binary up/down counter.
9	Realize and verify the decoder to drive 7 segment LED display using trainer kits.
10	Develop the Verilog code for comparator (n-bit), and BCD counter.

Text Books:

Sl. No.	Book title	Author	Volume and Year of Edition
1	Digital Principles and Design	Donald D. Givone	2017, McGraw-Hill , I edition
2	Verilog HDL	Samir Palnitkar	2009, Pearson Education, II Edition

Reference Books:

Sl. No.	Book title	Author	Volume and Year of Edition
1	Digital Logic Applications and Design	John M Yarbrough	2015, Thomson learning 2006
2	Digital Systems Design using Verilog	Charles H. Roth. Jr	2015, Thomson Learning, Inc, I edition

3	Digital principles and Applications	Donald P Leach, Albert Paul Malvino	2016, Tata Mc graw Hill, 8th Edition/

Course Outcomes:

Course outcome	Descriptions
CO1	**Simplify** Boolean equations using K-map techniques. (L1)
CO2	**Design** combinational circuits based on simplified Boolean expressions.(L3)
CO3	**Analyze** and design sequential circuits(L3)
CO4	**Outline** the characteristics of various logic families and methodology to design digital computational blocks.(L2)
CO5	**Apply** Verilog modelling for functional verification of digital logic design(L3)

Course Articulation Matrix:

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2						1				
CO2	3		1		2				1				
CO3	1	1			2								
CO4	2		2						1				
CO5					2								

Department: Electronics and Communication Engineering	**Semester:**	3

Subject: Analog Electronic Circuits				
Subject Code:	22EC304	**L – T – P - S:**	42-0-28-50 (In Hrs)	
			Credits	4

Sl. No.	Course Objectives
1	**Summarize** the basics of semiconductor physics and electronic devices.
2	**Describe** the mathematical models of BJTs, MOSFETs.
3	**Learn** the design concepts and demonstrate the diode circuits and amplifiers.
4	**Introduce** the applications of analog electronic circuits.

Module	Description	Hrs
I	**Design of Diode Applications**: Introduction, applications of diode, Full wave rectifier with C Filter, Clippers and Clampers. Problems and Solutions. MOS Field-Effect Transistor (MOSFETs): Introduction, Device Structure & Physical Operation, Derivation of iD-VDS Relationship, Symbol, iD –VDS characteristics, Operation as a switch, Operation as a Linear Amplifier. Problems and Solutions. Text1: 2.5.2, 2.6.1, 2.6.2, 4.1.1 to 4.1.3, 4.1.6, 4.2.1 to 4.4.4	**9**
II	**MOS Field-Effect Transistor (MOSFETs) amplifier**: Introduction, Small Signal Operation and Models and MOSFET Amplifiers: MOSFETs- Small Signal Analysis, Trans-conductance gm, The T-equivalent Circuit model. Common Source amplifier, Common Source amplifier with Source Resistance, Common Drain Amplifier. Problems and Solutions. Frequency response of CS amplifier: MOS Differential Pair: Operation with a Common-Mode Input Voltage and Differential Input voltage. Small Signal Operation of the MOS Differential Pair: Differential Gain and CMRR, differential amplifier with active load – the active loaded MOS differential pair. Text1:4.6.4 to 4.6.6, 4.7.3,4.7.4,4.7.6,8.1.1,8.1.2,8.2.1,8.2.2, 8.5.2	**9**
III	**Feedback Amplifier and oscillators**: Introduction, Feedback Amplifiers: General feedback structure, Properties of Negative feedback. Basic four feedback topologies. Concept of Positive feedback, LC Oscillators, and Crystal Oscillator (Qualitative). Operational Amplifier: Introduction, Op-amp parameters, common mode and supply rejection ratio, offset voltages and currents, Input and output impedances, Slew rate. Text1:7.1.1, 7.2.1 to 7.2.4, 7.3.1 to 7.3.4, 7.3.8,Text2: 3.2	**8**
IV	**Operational Amplifier applications**: Introduction, Comparator, zero crossing detectors, Inverting Schmitt trigger, Non inverting Schmitt trigger	**8**

	circuit, small signal rectifiers(Precision half wave rectifiers, precision full wave rectifiers), Active filters First and Second order Low Pass Filters, High Pass Filters, Band Pass Filters. Problems and Solutions. Text 2: 9.1to 9.4,9.12.2,8.2 to 8.4,8.5,8.6,8.8,8.8.1,8.8.2, 8.9, 8.9.1,8.9.2, 8.10	
V	**Waveform generators and power amplifier**: Introduction, RC-phase shift oscillator, Wien bridge oscillator, Basic 555 timers, timer used as A stable and Mono stable Multi vibrator circuits. Classification of power amplifiers, Transformer coupled Class A amplifier & Class B Push-pull amplifier, Class C Amplifier. Text -2:8.12, 8.13, 10.4, 10.4.1, 10.4.3, 10.4.4, 12.1, 12.2.5,12.2.6	**8**

LAB CONTENT:

Sl. No.	Experiment Description
1	Design the clipping circuit for given reference voltage: a. To pass +ve peak above reference level (say 3V) b. To pass -ve peak below reference level (say -3V) c. To remove +ve peak above some reference level (3V) and -ve peak below reference level (say -3V)
2	Design the clapping circuit for given reference voltage: a. Positive peak clamped to +ve reference level (say 2V) b. Positive peak clamped to -ve reference level (say -2V) c. Negative peak clamped to +ve reference level (say 2V) d. Negative peak clamped to -ve reference level (say -2V)
3	Plot the I/O characteristics of MOSFET
4	Implement single stage RC coupled amplifier using MOSFET/Transistor.
5	Design of analog RC phase shift oscillator circuit to oscillate at given operating frequency using Multisim (simulation)
6	Design of analog Hartley and Colpitts oscillator circuit to oscillate at given operating frequency using Multisim (simulation)
7	Design and test of Schmitt trigger circuit for given values of triggering points (UTP and LTP).
8	Design a 1st-order active low pass/ high pass filter for a given cut-off frequency and verify the roll off.
9	Design and test Astable multivibrator circuit using 555 timers for f=1kHz, duty cycle 70% and Vout= 5V
10	Design and test Monostable multivibrator circuit using 555 timers.

Text Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	Microelectronic Circuits, Theory and Applications	Adel s. Sedra kenneth c. Smith	5th Edition,Oxford, 2014
2	Op-Amp and linear integrated circuits.	Ramakanth A Gayakawad	3 rd Edition, Pearson Education, 2015

Reference Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	Fundamentals of Microelectronics	Behzad razavi	2nd Edition, Whiley, 2006

Course Outcomes:

Course outcome	Descriptions
CO1	**Outline** the fundamental concepts and principles of analog electronic components such as rectifiers, amplifiers, and oscillators. (L2)
CO2	Perform small signal **analysis** of analog circuits to understand their behaviour under linear operating conditions. (L2)
CO3	**Design** analog electronic circuits including rectifiers, amplifiers, and oscillators based on specified requirements and constraints. (L3)
CO4	**Demonstrate** the operation and applications of analog devices such as amplifiers, oscillators, and timers in real-world scenarios. (L3)
CO5	**Interpret and evaluate** the performance parameters of analog circuits using standard test specifications and measurement techniques. (L4)

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1		2	3		1								
CO2		2	2										
CO3	2	2											
CO4					2								
CO5	2							2	1				

Department: Electronics and Communication Engineering			**Semester:**	3
Subject: Signals and Systems				
Subject Code:	22EC305	**L – T – P - S:**	42-0-0-48 (In Hrs)	
			Credits:	3

Sl. No.	Course Objectives
1	**Introduce** the basic signal processing operations by applying mathematical models.
2	**Study** the representation and properties of signals and systems in time and frequency domains.
3	**Understand** the behaviour of an LTI System.
4	**Learn** the different transformations techniques on Signals.

Module	Description	Hrs
I	**Introduction to Signals and Systems:** Introduction to Signals and Systems: Definition of Signals, Classification of signals, Basic operations on Signals, elementary Signals. Definition of Systems, System Viewed as Interconnection of Operations, Properties of Systems: Statement with Examples (Excluding numerical problems on Properties). Text: 1.1 to 1.8	**9**
II	**Time domain representations of Linear Time Invariant Systems:** Introduction, Convolution Sum and Convolution Integral. Interconnections of LTI System, Differential and Difference Equation Representation of LTI Systems and solving difference equation, Block diagram representation for LTI system using Differential and Difference Equation. Text: 2.1 to 2.6, 2.9 to 2.10	**9**
III	**Fourier representation of Non-Periodic Signals**: Introduction, Fourier Transform representation of Continuous time Signals (FT), Properties and Significance of FT. Fourier Transform representation of Discrete time Signals (DTFT), Properties of DTFT. Text: 3.1 to 3.3, 3.6. to 3.18	**8**
IV	**Applications of Fourier Transform Representations:** Introduction, Frequency Response of LTI systems, Fourier Transform Representation for discrete time signals, Frequency domain analysis of simple R-L-C circuits, Sampling theorem. Text: 4.1 to 4.6	**8**
V	**Z-Transform and its applications:** Introduction, Z-transform, Properties of ROC, Properties of Z-transforms, Inverse of Z-transforms (Partial Fraction Expansion method). Transform Function, Unilateral Z-transform and its application to solve difference equations. Text: 7.1 to 7.10	**8**

Text Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	Signals and Systems	Simon Haykin and Barry Van Veen,	Wiley India Edition. 13 978-81-265- 1257-7, 3nd Edition, 2020 (Reprint)

Reference Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	Fundamentals of Signals & Systems	Michael Roberts	Tata McGraw-Hill, 6, 2nd edition 2019
2	Signals and Systems (with MATLAB Programs)	Sanjay Sharma	S.K. Kataria& Sons, New Delhi, 2, 2018
3	Signals and Systems	Ganesh Rao and SatishTunga	Pearson Technical Publishers, 12, 2019 (Reprint)

Course Outcomes:

Course outcome	Descriptions
CO1	**Utilize** the knowledge of mathematics and Engineering fundamentals to Identify and characterize different classes of signals (L2)
CO2	**Apply** convolution techniques and difference/differential equations to analyze the behaviour of Linear Time Invariant (LTI) systems.
CO3	**Analyze** non periodic signals in frequency domain.(L3)
CO4	Use Z-Transform methods to **solve** discrete-time system equations and assess system stability and behaviour.
CO5	**Demonstrate** the use of Fourier techniques in analyzing LTI system responses and RLC circuits in the frequency domain.

Course Articulation Matrix:

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2											
CO2	2	2											
CO3		2	2	2									
CO4	2	2	1	1									
CO5		2	2										

Department: Electronics and Communication Engineering		**Semester:**	3

Subject: Electronics and Communication Skill lab-1 (Introduction to simulation software- MATLab and Python)				
Subject Code:	22EC306		**L – T – P - S:**	14-0-28-18 (In Hrs)
			Credit	2

Sl. No.	Course Objectives
1	**Learn** the basic programming constructs in Python.
2	**Understand** the basics of MATLAB and Simulate the generation and operations of signals.
3	**Verify** and simulate different network theorems using Matlab simulink.

LAB CONTENT:

Sl. No.	Experiment Description
1	Identification and solving of simple real life problems like Electricity Billing using python.
2	Identification and solving of simple real life or scientific or technical problems like Retail shop billing using python.
3	Implementing real-time/technical applications using Lists and Tuples of python. (Items present in library/Components of a car/ Materials required for construction of a building)
4	Exploring open-CV python tool to create blank image, to draw line, circle and rectangle in it etc.
5	Generate matrix and perform basic operation on matrices using MATLAB Software.
6	Generation of various signals and sequences (periodic and aperiodic), such as unit impulse, unit step, square, saw tooth, triangular, sinusoidal and ramp signals using MATLAB Software.
7	Perform addition and multiplication of two different signals using MATLAB Software.
8	Perform scaling, shifting and folding of different signals using MATLAB Software.
9	Verification of Ohm's law, Kirchhoff's voltage law and Kirchhoff's current law using Matlab simulink.
10	Verification of Thevenin's theorem, Norton's theorem and maximum power transfer theorem Matlab simulink..

Text Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	MATLAB for Engineers	Holly Moore	6th Edition, 2018
2	Automate the Boring Stuff with Python: Practical Programming for Total Beginners	Al Sweigart	2nd Edition, 2019

Reference Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	Essential MATLAB for Engineers and Scientists	Brian Hahn, Daniel T. Valentine	7th Edition, 2021
2	MATLAB: A Practical Introduction to Programming and Problem Solving	Stormy Attaway	6th Edition, 2022
3	Multisim for Engineers	James W. Nilsson, Susan A. Riedel	1st Edition, 2007

Course Outcomes:

Course outcome	Description
CO1	**Develop** programs to generate and perform various operations on signals using MATLAB and prepare an analysis report (L3).
CO2	**Solve** simple real time problems using python programming and prepare result analysis report (L3).
CO3	**Verification** of different network reduction techniques using multisim simulation software and prepare an experimental analysis report (L3).
CO4	**Extend** python tool in open cv to learn fundamentals of image and prepare an analysis report (L2)
CO5	**Make use of** Matlab tool to solve simultaneous equations and different operations on matrices and prepare an analysis report (L2)

Course Articulation Matrix:

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1		2				1				
CO2		2	2	1	2				1				
CO3	3	1	1		2								
CO4		2	1										
CO5	3		1										

Department: Electronics and Communication Engineering			Semester:	3
Subject: Skill Development-I (Communication and soft Skills)				
Subject Code:	22SK307	**L – T – P - S:**	**- - 28-2 (In Hrs)**	
			Credits:	**1**

Sl. No	Course Objectives
1	To **develop** effective communication skills for academic, professional, and social interactions.
2	To **cultivate** assertive communication and presentation skills for impactful expression.
3	To **enhance** teamwork abilities, interpersonal relationships, and non-verbal communication.
4	To **strengthen** group discussion, motivation, leadership, and stress management skills for employability.
5	To **prepare** students for interviews, professional practices, and ethical responsibilities in workplace environments.

Module	Description	Hrs
I	**Communication Skills**: Basics, Method, Means, Process and Purpose, Basics of Business Communication, Written & Oral Communication, Listening. Communication with Confidence & Clarity- Interaction with people, the need the uses and the methods, Getting phonetically correct, using politically correct language, Debate & Extempore **Bloom's Taxonomy Level: L_1 – Remembering, L_2 – Understanding.**	6 hrs
II	**Assertive Communication-** Concept of Assertive communication, Importance and applicability of Assertive communication, Assertive Words, being assertive. **Presentation Skills** Discussing the basic concepts of presentation skills, Articulation Skills, IQ & GK, How to make effective presentations, body language & Dress code in presentation, media of presentation	5 hrs

	Bloom's Taxonomy Level: L_1 – Remembering, L_2 – Understanding.	
III	**Team Work**: Team Work and its important elements Clarifying the advantages and challenges of team work Understanding bargains in team building Defining behaviour to sync with team work Stages of Team Building Features of successful teams. **Body Language & Proxemics**: Rapport Building - Gestures, postures, facial expression and body movements in different situations, Importance of Proxemics, Right personal space to maintain with different people. **Bloom's Taxonomy Level: L_1 – Remembering, L_2 – Understanding**.	5 hrs
IV	**Group discussion, Motivation and Stress Management** a. Theory & Evaluation : Understanding why and how is the group discussion conducted. b. Techniques of group discussion. c. Discussion on FAQs of group discussion d. Body language during group discussion. Self-motivation, group motivation, leadership abilities, Stress clauses and stress busters to handle stress and de-stress; Understanding stress - Concept of sound body and mind, Dealing with anxiety, tension, and relaxation techniques. Individual Counseling & Guidance, Career Orientation. Balancing Personal & Professional Life **Bloom's Taxonomy Level: L_1 – Remembering, L_2 – Understanding**	6 hrs
V	**Interview Skills, Professional Practice** a. Personal and Group Interviews. b. Mock Interviews - Questions asked & how to handle them. c. Body language in interview. d. Etiquette, Dress code in interview e. Behavioral and technical interviews. f. Practice on stress interviews, technical interviews, General HR interviews **Professional Practice**: Professional Dress Code, Time Sense, Respecting People & their Space, Relevant Behavior at different Hierarchical Levels. Positive Attitude, Self Analysis and Self-Management. Professional Ethics values to be practiced, standards and codes to be adopted as professional engineers in the society for various projects. Balancing Personal & Professional Life. **Bloom's Taxonomy Level: L_1 – Remembering, L_2 – Understanding**.	6 hrs

Text Books:

Sl No.	Text Book title	Author	Volume and Year of Edition
1	Communication Skills for Engineers	Sunita Mishra, C.Murali Krishna	Pearson, 2nd Edition, 2011
2	Business Communication	Meenakshi Raman, Prakash Singh	Oxford University Press, 2012

Reference Books:

Sl No.	Text Book title	Author	Volume and Year of Edition
1	Technical Communication	Meenakshi Raman	Oxford Publishers, 2004

	Principles and Practices,	and Sangeeta Sharma,	
2	Tools for Talking When Stakes are High,	Kerry Patterson, Joseph Grenny, Ron McMillan, Crucial Conversation	McGraw-Hill Publication, ISBN: 9780071772204
3	Business Etiquette: A Guide for the Indian Professional	Shital Kakkar Mehra	HarperCollins, 2012

Course Outcomes:

Course outcome	Descriptions
CO1	Demonstrate effective oral and written communication with clarity and confidence. **(Apply)**
CO2	Apply assertive communication and presentation skills in academic and professional contexts. **(Apply)**
CO3	Exhibit teamwork, collaboration, and appropriate non-verbal communication in group settings. **(Apply/Analyze)**
CO4	Participate actively in group discussions, applying leadership, motivation, and stress management techniques. **(Analyze)**
CO5	Perform effectively in interviews and professional practices by demonstrating etiquette, ethics, and workplace readiness**. (Apply/Create)**

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1									3	3	2		
CO2									3	3	2		
CO3									3	3	2		
CO4									3	3	2		
CO5									3	3	3		

Department: Electronics and Communication Engineering			Semester:	3
Subject: Constitution of India				
Subject Code:	22CI308	**L – T – P - S:**	**14-0-0-16 (In Hrs)**	
			Credits:	1

Sl. No.	Course Objectives
1	**Familiarize** with salient features and preamble of the constitution of India. Including fundamental rights of the citizen of India and types of Fundamental rights
2	**Understand** the relevance of directive principles under part-IV, and the responsibilities of the individuals towards society.
3	**Learn** the powers and functions of the Legislature, Executive, and judicial bodies.
4	**Awareness** about the fundamental duties, electoral process, emergencies and amending procedures.

COURSE TOPICS:

Module	Description	Hrs
I	Introduction, Meaning and definitions. Salient features, Sources, Constituent Assembly, Drafting Committee. Preamble to the constitution of India.	3
II	Fundamental rights under part III – details of exercise of rights, Scopes & Limitations and, important cases.	3
III	Relevance of directive principles of state policy under part-IV Fundamental duties and their significance-part-IV A .	3
IV	Union Executive- President, Prime minister, Parliament and Supreme Court of India. State Executive – Governors, Chief Ministers, State legislature and High Courts.	3
V	Constitutional Special Provisions for Scheduled Castes and Tribes, Women, Children and backward classes. Emergency provisions under Part XVIII. Electoral process, Amendment procedure, 42nd, 44th, 74th, 76th, and 91stConstitutional amendments.	2

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Introduction to the Constitution of India" (student edition)	DurgaDas Basu,	EEE, 19th/20th Edn.,2001
2	An Introduction to Constitution of India	MV Pylee.	Volume-1 Vikas Publishing, 2002

Reference Books:

Sl No.	Text Book title	Author	Volume and Year of Edition
1	An Introduction to Constitution of India"	Brij kishore Sharma,	prentice-Hall of India, Volume-12002
2	Constitution of India and Professional Ethics	V. Rajaram	Second Edition New Age International Publication. 2011

Course Outcomes:

Course outcome	Descriptions
CO1	**Have** general knowledge and legal literacy and thereby to take up competitive examinations. (L1)
CO2	**Understand** the freedom, rights and restrictions including directives, and fundamental duties.(L1)
CO3	**Understand** the importance of the three main organs of the constitution, Viz-the legislature, the executive and the judiciary.(L1)
CO4	**Understand** the power and functions of political institutions established throughout the country. (L1)
CO5	**Understand** the constitutional special provisions, electoral procedure, and important amendments.(L1)

Course Articulation Matrix:

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1						2	1	3	3	2			
CO2						2	2	3	3	2			
CO3						2	3	3	2	2			
CO4						2	2	3	3	2			
CO5													

SRI SIDDHARTHA ACADEMY OF HIGHER EDUCATION
(DEEMED TO BE UNIVERSITY), Accredited A+ Grade by NAAC
SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
(NBA Accredited)
SCHEME OF TEACHING AND EXAMINATION FOR NEP 160 CREDITS (2022 Scheme) BE DEGREE COURSE
IV Semester B E **Academic Year: 2025-26**

SI No	Course Code		Course Title	Teaching Dept.	L	T	P	S	Total	Credits	CIE Marks	SEE Marks	Total Marks	Exam Hrs
1	BS	22ES401	Probability and Advanced Linear Algebra	MA	42	-	-	48	90	3	50	50	100	3
2	PC	22EC402	Fields and Waves	EC	42	-	-	48	90	3	50	50	100	3
3	PC	22EC403	Analog Communication	EC	42	-	28	50	120	4	50	50	100	3
4	PC	22EC404	Microcontroller and Its applications	EC	42	-	28	50	120	4	50	50	100	3
5	PC	22EC405	Control Systems	EC	42	-	-	48	90	3	50	50	100	3
6	PC	22EC406	Electronics and Communication Skill Lab-2	EC	14	-	28	18	60	2	50	50	100	3
7	HS	22HV407	Universal Human Values	HS	14	-	-	16	30	1	50	-	50	-
8	HS	22EN408	Environmental Studies	HS	14	-	-	16	30	1	50	-	50	-
				Total	**238**	**-**	**84**	**280**	**630**	**21**	**400**	**300**	**700**	
L-Lecture, T-Tutorial, P-Practical/Drawing, CIE- Continuous Intenal Evaluation, SEE:-Semester End Examination,S- self learning, XX- Branch code														
Credit Distribution : BS:Basic Science-03, PC: Professional Core-16, HS:Humanity Science-02, Total-21 Credits.														

Department: Electronics and Communication Engineering			**Semester:**	4
Subject: Probability and Advanced Linear Algebra (Common to EC, EE, ET & BM)				
Subject Code:	22ES401		L – T – P - S:	42–0–0–48
			Credits:	3

Sl. No.	Course Objectives
1	**Introduce** the concept of vector space, linear transformations, probability and joint probability distributions and complex analysis.
2	**Apply** discrete and continuous probability distributions for single and two variables in analysing the probability models arising in engineering field.
3	**Study** the concept of joint probability distribution and Markov chain.
4	**Apply** the vector space and linear transformation problems in engineering fields.

Unit	Description	Hrs
I	**Vector spaces:** Solution of system of equations by LU decomposition method. Vector space, Subspaces, Linear Combinations, Linear Spans, row space and column space of a Matrix, Linear Dependence and Independence (all statements only).**Basis and Dimensions**: Basis and Dimensions of Vector space and problems.	**08**
II	**Linear transformation:** Introduction, Linear Mappings, Kernel and Image of a linear transformations, Matrix representation of linear transformations, Range space, Null space, Nullity, Rank-Nullity Theorem, Singular and Non-singular linear transformations (all statements only), Problems.	**07**
III	**Probability Distributions**: Review of basic probability theory. Random variables (Discrete and Continuous), Probability of mass/density functions and problems. Binomial distribution, Poisson's distribution and Normal distribution (without derivations) and problems.	**09**
IV	**Joint probability distribution:** Joint probability distribution for discrete random variables, Marginal distributions, Expectation, covariance, problems. **Stochastic Process:** Probability Vector, Stochastic Matrix, Regular Stochastic Matrix, definition of Markov chain, Transition Probabilities and Transition probability Matrix, Higher Transition Probabilities, stationary	**09**

	distribution of regular Markov chains, problems.	
V	**Complex Analysis**: Review of function of a complex variables, limits, continuity and differentiability. Analytic functions, Cauchy-Riemann equations in Cartesian and polar forms (without proof). Properties and construction of analytic functions by Milne-Thompson Method. Bilinear Transformations, problems.	**08**

Note:
Text Book 1: Module-III **:** 26.2,26.7,26.8,26.9,26.14 to 26.16; Module-V 20.1,20.3,20.5, 20.13.
Text Book 2: Module-I **:** 4.1,4.3,4.5; Module-II :1.8,1.9
Text Book 3: Module-III :2.1,2.2,2.3; Module-IV**:**2.5, 4.1, 8.I

Text Books:

S.I No.	Text Book title	Author	Volume and Year of Edition
1	Higher Engineering Mathematics	B.S. Grewal	44th Edition Khanna Publications, 2021.ISBN:9788193328491
2	Linear Algebra and its Applications	David C. lay	3rd Edition, 2002, Pearson Education India, ISBN-13: 978-81-7758-333-5.
3	Introduction to Probability Models	Sheldon M. Ross	Elsevier, 9th Edition, 2007

Reference Books:

Sl .No.	Text Book title	Author	Volume and Year of Edition
1	Advanced Engineering Mathematics	C. Ray Wylie, Louis C. Barrett, McGraw-Hill Book Co	6th Edition. 2017, ISBN:9780070722064
2	A Text Book of Engineering Mathematics	N.P.Bali and Manish Goyal	10th Edition Lakshmi Publishers, 2022, ISBN: 9788131808320.
3	Higher Engineering Mathematics	B.V.Ramana, Tata McGraw-Hill	11th Edition, Tata McGraw-Hill, 2017, ISBN:9780070634190
4	Higher Engineering Mathematics	H. K. Das and Er. Rajanish Varma	3rd Edition, S Chand Publication, 2014, ISBN: 9788121938907

Course Outcomes:

Course outcome	Descriptions
CO1	**Understand** the concept of vector space, Basis and Dimensions, linear transformations, Complex analysis and Probability distributions. (L1)
CO2	**Formulate** and solve mathematical problems on probability distribution, Vector spaces, LU-decomposition method and linear transformations.(L2)
CO3	**Make use of** linear transformations, stochastic process, Linear Transformations and complex analysis to solve the Engineering problems. (L2)
CO4	**Apply** and analyze the concept of probability distribution, Joint probability distribution and stochastic models in Engineering fields.(L3)
CO5	**Analyze** and apply concept of vector space, Basis and Dimensions, linear transformations, Complex analysis in Engineering fields.(L3)

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3											
CO2	3	3	2										
CO3	3	3	2								1		
CO4	3	3	2	1							1		
CO5	3	2		1							1		

Department: Electronics and Communication Engineering			Semester:	4
Subject: Fields and Waves				
Subject Code:	22EC402	**L – T – P - S:**	42-0-0-48 (In Hrs)	
			Credits:	3

Sl. No.	Course Objectives
1	**Understand** the concepts of Electrostatic and Magneto static fields.
2	**Study** the applications of Coulombs law, Gauss law for different charge distributions and Laplace equation.
3	**Acquire** the knowledge of characteristics of transmission lines.
4	**Learn** the wave equation and wave propagation in different mediums.

Module	Description	Hrs
I	**Electrostatics I: Coulomb's Law and Electric Field Intensity:** Introduction to vector algebra, Coulomb's law , Electric field Intensity, Different types of charge distributions, Electric field due to line charge, Field due to Sheet of charge, Field due to Surface charge distribution, Electric flux density, Relationship between Force, Electric field and Displacement flux density, Numerical problems. **(Text 1: 2.1, 2.2, 2.3, 2.4, 2.5, 3.1)**	09
II	**Electrostatics II: Gauss law, Divergence and Potential:** Introduction, Gauss law, Application of Gauss law to point charge, Line charge & Surface charge, Differential form of Gauss law, Work done in moving a point charge in an electric field, Relation between E and V, Numerical problems. **Poisson's and Laplace's Equations:** Poisson's & Laplace's Equations, Applications of Laplace equation (Cartesian, Cylindrical and Spherical Coordinate system), Numerical problems. **(Text1: 3.2, 3.3, 3.5, 3.7, 4.6, 7.1, 7.3)**	09
III	**Magneto statics: Steady magnetic Field:** Introduction, Ampere's circuital law, Differential form of amperes circuital law, Biot-savart Law, Magnetic field intensity due to Solenoid & on the axis of Solenoid, due to infinite straight conductor, due to centre of a circular coil & on the axis of circular coil, Numerical problems. **(Text1: 8.1, 8.2, 8.3,**	08

	8.5)	
IV	**Wave propagation:** Introduction to Maxwell's Equations in Point form and Integral form. **Uniform Plane Wave**: Wave equation of E & H in free space and its solution, Relation between E & H, Wave propagation in free space, in good dielectric and in good conductor, Numerical problems. **(Text1: 10.3, 10.4, 12.1, 12.2, 12.4)**	08
V	**Transmission Lines:** Introduction, A line of cascaded T sections, Transmission line- general solutions, relation between primary and secondary constants in transmission line, Attenuation constant and phase constant, Distortion-less line, Reflection coefficient, Numerical problems. **(Text 2: 6.1, 6.2, 6.6, 6.7, 6.11)**	08

Text Books:

Sl .No.	Text Book title	Author	Volume and Year of Edition
1	Engineering Electromagnetics	W.H. Hayt and Jr John. A. Buck	Tata McGraw-Hill, 2012, 7th Edition ISBN:978-0-07-061223-5
2	Networks, Lines and Fields	John D Ryder	Prentice-Hall India, 2004, 2nd Edition ISBN: 81-23-0299-6

Reference Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	Element of Electromagnetics	Matthew N.O., Sadiku,	Oxford university, 2018, 7th Edition ISBN: 978-0-19-069861-4
2	Fields and Waves in Communication Electronics	Simon Ramo and John R Whinnery	John Wiley & Sons, Inc, 3rd Edition ISBN: 978-0471-58551-0
3	Electromagnetic Waves and Radiating systems	E.C. Jordan and K.G. Balman,	Prentice-Hall India, 2008, 2nd Edition ISBN: 978-81-2003-0054-5

Course Outcomes:

CO's	Descriptions
CO1	**Illustrate** the various fundamental laws and concepts related to Electrostatic Fields and Magneto static Fields (L2)
CO2	**Find** the electric and Magnetic field intensity due to different charge distributions by using various laws and Analytical methods (L1)
CO3	**Explain** the transmission lines and Interpret the importance of Poisson's and Laplace equation (L2)
CO4	**Apply** Maxwell's equation to illustrate wave equations and propagation EM waves in different mediums.(L3)
CO5	**Outline** the use of Laplace's equation in determining capacitance in different coordinate systems (L2)

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2												
CO2	1	2		1									
CO3	2	1											
CO4		1	2										
CO5		2											

Department: Electronics and Communication Engineering	**Semester:**	4

Subject: Analog Communication				
Subject Code:	22EC403	**L – T – P - S:**	42-0-28-50 (In Hrs)	
			Credits	4

Sl. No	Course Objectives
1	**Explain** the basic principles of amplitude modulation and angle modulation.
2	**Apply** the significance of SNR in analog communication systems.
3	**Summarize** the knowledge of concepts of random process and probability theory in communication systems.
4	**Outline** the concepts of different applications of analog communication.

Module	Description	Hrs
I	**Amplitude modulation:** Introduction, Amplitude Modulation, Time-Domain description, Frequency Domain description, Single tone modulation, Power relations in single tone AM, Modulation by several sine waves, Generation of AM wave: Square law modulator, Switching modulator, Detection of AM waves: Square law detector, Envelop detector. **Double Side Band Suppressed Carrier (DSBSC):** Double side band suppressed carrier modulation (DSBSC): Time-Domain description, Frequency-Domain representation, Generation of DSBSC waves: Balanced modulator, Ring modulator, Coherent detection of DSBSC modulated waves, Costas loop, Quadrature carrier multiplexing. Text: 7.1 to 7.3.	**9**
II	**Single Side-Band Modulation (SSB):**Hilbert transform, Properties of Hilbert transform, Canonical representation of band pass signals, Frequency domain description of SSB, Time domain description, Generation of SSB : Frequency discrimination method, Phase discrimination method, Demodulation of SSB. **Vestigial Side Band Modulation(VSB):** Frequency domain description, Time domain description, Generation of VSB waves using filtering method, Detection of VSB waves using coherent detection, Comparison of	**9**

	Amplitude modulation techniques, Frequency translation, Frequency division multiplexing, Application: AM radio. Text: 7.4 to 7.9	
III	**Angle Modulation:** Basic definitions, FM, Narrowband FM, Wideband FM, Transmission bandwidth of FM, Generation of FM waves : Direct method , Indirect method, Demodulation of FM waves, Phase locked loop, FM Stereo multiplexing, FM radio. Text: 7.10 to 7.14 except 7.13	**8**
IV	**Random variables and process:** Random variables, Several random variables, Function of a random variable, Gaussian distribution, Transformation of random variables, Properties of autocorrelation function, Random process, Stationarity, Mean, Correlation and covariance function Properties of Gaussian process. Text: 8.2 to 8.7 and 8.12	**8**
V	**Noise:** Introduction to Noise: shot noise, thermal noise, white noise, Noise equivalent bandwidth, Narrow bandwidth, Noise figure, Equivalent noise temperature, Friss transmission formula. **Noise in Analog modulation systems:** Introduction, Signal-to-Noise ratios, Receiver model, Noise in DSB-SC receivers, Noise in SSB receivers ,Noise in AM receivers using envelope detection, Noise in FM receivers, Pre-emphasis and de-emphasis in FM system (Qualitative analysis), PAM, PWM, PPM(Qualitative analysis). Text: 4.7, 4.8,9.1to 9.5 and 9.8,5.1	**8**

LAB CONTENT:

Sl. No	Experiment Description
	Experiments using Hardware
1.	Design and generate an Amplitude modulation signal using AFT,IFT and transistor and demodulate the original signal using envelope detector.
2.	Generate a DSBSC signal using Ring Modulator.
3.	Design and generate a Frequency modulation using IC 8038 and also find the modulation index and transmission bandwidth of generated FM signal.
4.	Design and generate a Pulse Amplitude Modulation(PAM) signal and also demodulate the generated Pulse amplitude modulation signal.
5.	Design and verify the working of Pre-Emphasis & De-emphasis circuits and find the normalized gain.

	Experiments using Matlab/Simulink software
6.	Design and generate a Single Sideband Modulation (SSB) signal.
7.	Design and verify the Phase Lock Loop (PLL) and its capture range, lock range and Free running VCO Frequency.
8.	Design and generate a Pulse Width Modulation(PWM) signal and also demodulate the generated Pulse width modulation signal.
9.	Design and generate a Pulse Position Modulation(PPM) signal and also demodulate the generated PPM signal.
10.	Design and generate a Frequency Division Multiplexed(FDM) signal and reconstruct the message signals.

Text Book:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	An Introduction to Analog and Digital Communication	Simon Haykin	2nd edition,2010,JohnWiley

Reference Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	Analog communications Introduction to Communication Systems	Jerry D Gibson	1st Edition,2023,Springer
2	Principles of communication systems	Taub and Schilling	3rd Edition,2011,TMH
3	Modern Digital and Analog communication systems	B.P.Lathi and Zhiding	4th Edition,2010,Oxfordpress

Course Outcomes:

Course outcome	Description
CO1	**Outline** and realize the modulation and demodulation techniques of analog and pulse modulation. (L2).
CO2	**Interpret** noise analysis techniques to assess the impact of noise on analog modulation systems. (L2).
CO3	**Analyze** the signal-to-noise ratio (SNR) for different analog modulation techniques to enhance system performance**.** (L2).
CO4	**Make use of** random variables and random process for noise modeling of analog signals.(L3).

CO5	**Apply** Fourier analysis and characterize the analog signals.(L3).

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	**3**				**2**								
CO2		**2**	**3**										
CO3		**3**	**2**										
CO4		**3**	**2**										
CO5		**3**	**2**		**2**								

Department: Electronics and Communication Engineering	**Semester:**	4

Subject: Microcontroller and Its applications				
Subject Code:	22EC404	**L – T – P - S:**	42-0-28-50 (In Hrs)	
			Credits	4

Sl. No.	Course Objectives
1	**Understand** the fundamentals and differences between microprocessors, micro ıtrollers, and embedded systems
2	**Study** the architecture, memory organization, and instruction set of the 8051 micro controller and **Develop** assembly language programs for 8051 microcontroller.
3	**Learn** concepts of I/O, timers, counters, serial communication, and interrupts in 8051.
4	**Analyze** interfacing techniques with external devices and introduce ARM7 architecture and its applications.

Module	Description	Hrs
I	**Microprocessor, Microcontroller and Embedded Micro Controllers**: Introduction, Difference between Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, the 8051 Microcontroller: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, Stacks, Addressing Modes. Text 1: Chapter 2.1 to chapter 2.7 and chapter 5.1 to 5.3	**9**
II	**8051 Instruction Set:** Introduction, Instruction set of 8051: Data transfer instructions, Arithmetic Instructions, Logical Instructions, Branch control instructions, Bit oriented instructions. Application Programs: Incrementing, Decrementing, Addition, Subtraction, Multiplication and Division, Decimal Arithmetic, sorting programs. (Text 1: Chapter 3.1 to 3.3, chapter 4.1 to4.2 and chapter 6.1 to 6.5)	**9**
III	**8051 I/O Ports, Timer/counter programming**: Introduction, 8051 Peripherals: I/O Ports: Input/output port structures of 8051, Programming of ports. Timer/Counter: Programming 8051 Timers, Counter Programming (Programming using Assembly language) (Text1: Chapter 9.1 to 9.3 and Chapter 10.1 to 10.4)	**8**
IV	**8051 Serial communication and Interrupts Programming**: Introduction,	**8**

	Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, Serial Communication Programming in assembly. Basics of interrupts, 8051 interrupt structure, Priority of interrupts and Programming External Hardware Interrupts. (Text 1. Chapter 11.1 to 11.5)	
V	**8051 Interfacing to External memory, I/O Devices and Introduction toARM7**: Introduction to external memory, External Memory interfacing (Programming memory only),DAC, Stepper motor interfacing, and programming in Assembly language,ARM7TDMI processor block diagram, ARM7TDMI Features, programmer's model Text 1: Chapter 17.2 to 17.3 and Text: 2: chapter 2.1 to 2.4	**8**

LAB CONTENT:

Sl. No.	Experiment Description
1	**Data transfer instructions** (a)Write an Assembly language program to Transfer A Block 0f Data from Source to Destination (b) Write an Assembly language program to Interchange Block 0f Data from Source to Destination
2	**Arithmetic Instructions** (a) Write an Assembly language program for Addition of Two Multi Byte Numbers (b) Write an Assembly language program for Subtraction of Two Multi Byte Numbers
3	(a)Write an assembly language program to find cube of a number (b)Write an Assembly language program to find Average Of 'N' Numbers
4	Write an Assembly language program for Implementation of Decimal Up/Down Counter
5	(a)Write an Assembly language program for Realization of Boolean Expression (b) Write an Assembly language program for identifying valid Two Out Of Five Code
6	**Bit Manipulation Instructions** (a) Write an Assembly language program for Finding Positive and Negative Numbers in A Given Array (b) Write an Assembly language program for Finding Ones And Zeros In A Given Byte
7	**DAC Interfacing** (a) Write a C Program for Generation of Ramp Wave Using DAC Interface. (b) Write an assembly Program for Generation of Square Wave Using DAC Interface (c) Write an assembly Program for Generation of Triangular Wave Using DAC Interface (d) Write a C Program for Generation of Sine Wave Using DAC Interface
8	**Stepper Motor Control** (a) Write a C Program for Stepper Motor Interface DC Motor Control (b) Write a C Program for DC Motor Interface

Text Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	“The 8051 Microcontroller and Embedded Systems – using assembly and C”.	Muhammad Ali Mazidi and Janice Gillespie Mazidi and RollinD.	2014 , McKinl ay PHI, Pearson Publicationj
2	ARM System Developer’s Guide	Andrew N. Sloss, Dominic Symes and Chris Wright	2004, Morgan Kaufmann publication

Reference Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	The 8051 Microcontroller Architecture, Programming and Application	Kenneth J Ayala	3rd Edition ,2016, Pen ram International publication
2	Microcontrollers Architecture, programming, Interfacing and System Design	Raj Kamal	2011, Dorling Kindersley (India) publication
3	MSP 430 Microcontroller Basics	Davies J H	2008 , Elsiever Publication

Course Outcomes:

Course outcome	Descriptions
CO1	**Differentiate** between microprocessors and microcontrollers, CPU architectures like RISC, CISC, Harvard, and Von-Neumann. (L2)
CO2	**Describe** the architecture, memory organization, and addressing modes of 8051 and ARM7TDMI microcontroller (L2)
CO3	**Write** assembly language programs using the instruction set of 8051. (L3)
CO4	**Implement** programs for I/O operations, timers, counters, serial communication, and interrupts in 8051. (L3)
CO5	**Interface** external memory, DAC, and stepper motors with 8051. (L3)

Course Articulation Matrix:

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2											
CO2	3	2											

CO3	3	3	2		2								
CO4	3	3	2	1	2								
CO5	3	3	2	2	2								

Department: Electronics and Communication Engineering			Semester:	4
Subject: Control Systems				
Subject Code:	22EC405	**L – T – P - S:**	42-0-0-48 (In Hrs)	
			Credits:	3

Sl. No.	Course Objectives
1	**Identify** the mathematical modelling of electrical and mechanical systems.
2	**Summarize** the system transfer function using block diagram and signal flow graph representations.
3	**Learn** the concept of transient response and steady state response of the system.
4	**Describe** the knowledge of frequency domain analysis of a system using graphical method

Module	Description	Hrs
I	Mathematical models of physical systems: Introduction, Laplace transform, significance of poles and zeros in open loop and closed loop control systems, differential equations of physical systems (translational and rotational system), analogous circuit (force voltage and force current method). (Text 1: 1.1 to 1.6, 2.1 to 2.3, 3.1 to 3.7)	**9**
II	Block diagram algebra and signal flow graph: Introduction, block diagrams and signal flow graph: block diagram reduction techniques, signal flow graphs, mason's gain formula, relative advantages, conversion from electrical circuit to SFG and block diagram to SFG. (Text 1: 2.4 to 2.7)	**9**
III	Time response analysis: Introduction, time response of feedback control systems: Standard test signals, step response of first order and second order systems, time domain specifications: type and order of the system, steady state error and static error constants. (Text 1: 5.1 to 5.5)	**8**
IV	Root Locus and stability analysis: Introduction, stability analysis-concepts of stability, types of stability, RH criterion, relative stability analysis, root locus concepts, construction of root loci-construction rules, determination of roots from root locus, root contours. (Text 1: 6.1 to 6.5, 7.1 to 7.4)	**8**
V	Frequency response analysis: Introduction, correlation between time and frequency response, bode plots- bode diagrams for frequency domain	**8**

	analysis, nyquist plot- introduction, nyquist stability criterion, assessment of relative stability using nyquist criterion. (Text 1: 8.1, 8.2, 8.4, 9.1 to 9.4)	

Text Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	Control Systems Engineering	I J Nagrat h and M Gopal	5th edition, New age international publishers, 2015

Reference Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	Automatic Control Systems	Benjamin C. Kuo	10thEdition,john wiley& Sons, 2018
2	Modern Control Engineering	Ogata K	6thEdition, Pearson Education Asia/PHI, 2020

Course Outcomes:

Course outcome	Descriptions
CO1	**Define** and **illustrate** the concepts of closed-loop and open-loop control systems with suitable examples. (L1)
CO2	**Derive** and **obtain** the transfer function for the given control systems using standard techniques. (L2)
CO3	**Apply** the principles of time domain and frequency domain analysis to evaluate the performance of the given control systems. (L3)
CO4	**Analyze** the stability of a given system using its transfer function and standard stability criteria. (L4)
CO5	**Interpret** the system behaviour from its transfer function and **compare** the results from different analytical methods. (L4)

Course Articulation Matrix:

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2	2												
CO3		3			1								
CO4		2	3		1								
CO5		2		2									

Department: Electronics and Communication Engineering	Semester:	4

Subject: Electronics and Communication Skill Lab-2 (Hardware synthesis and simulation Lab)				
Subject Code:	22EC406		**L - T - P - S:**	**14-0-28-18**
			Credits:	**2**

Sl. No.	Course Objectives
1	**Understand** the fundamental principles of digital system design using Verilog.
2	**Apply** simulation tools like Multisim to design and test electronic circuits.
3	**Utilize** MATLAB to analyze signals and control systems.
4	**Analyze** lab results and compare them with expected theoretical outcomes.

LAB CONTENT:

<table>
<tr><th>Sl. No.</th><th>Experiment Description</th></tr>
<tr><td>1</td><td>Develop a Verilog code for 4 bit ALU using the following descriptions:
ALU should use combinational logic to calculate an output based on the four bit op-code input code. ALU should pass the result to the out bus when enable line in high, and tri-state the out bus when the enable line is low. ALU should decode the 4 bit op-code as shown in the below table, simulate using Modelsim simulator and implement on FPGA kit.

<table>
<tr><th>Opcode</th><th>Operation</th></tr>
<tr><td>0001</td><td>A+B</td></tr>
<tr><td>0010</td><td>A-B</td></tr>
<tr><td>0011</td><td>A*B</td></tr>
<tr><td>0100</td><td>A|B</td></tr>
<tr><td>0101</td><td>A and B</td></tr>
<tr><td>0110</td><td>A xor B</td></tr>
<tr><td>0111</td><td>A xnor B</td></tr>
<tr><td>1000</td><td>NOT A</td></tr>
<tr><td>Default</td><td>A nand B</td></tr>
</table>
</td></tr>
<tr><td>2</td><td>Write a Verilog code for BCD- seven segment display and implement it on FPGA kit</td></tr>
<tr><td>3</td><td>Write a Verilog code to control speed, direction of Stepper motor and implement it on FPGA kit.</td></tr>
</table>

4	Realization of Code converter using Modelsim and implement on FPGA
5	Write a Verilog code for N bit- Ripple carry adder and CLA and implement on FPGA kit.
6	Write a Verilog code to generate Ramp waveforms using DAC and implement on FPGA.
7	a. Verification of Sampling Theorem using Matlab. b. Write a MATLAB code to compute and plot the Discrete-Time Fourier Transform (DTFT) of a rectangular signal for different values of N. Also, verify that the output of the DTFT of a rectangular signal resembles a sinc function
8	Digital to Analog Converter using Multisim. (a) R-2R Ladder DAC (b) Binary Weighted DAC
9	Design and Verify a 2-bit Flash ADC in Multisim using comparators and logic gates. Also Verify the truth table by simulating the circuit for different input voltages.
10	MATLAB tasks for a given control system: perform block diagram reduction, obtain transfer function, plot poles and zeroes, check stability, and generate Bode plot for frequency response analysis.

Text Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	Digital Design with Verilog HDL	M. Morris Mano, Michael D. Ciletti	Pearson Education,1st Edition 2017
2	MATLAB for ENGINEERS	Holly Moore	Pearson 5th Edition 2017

Reference Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	Verilog HDL: A Guide to Digital Design and Synthesis	Samir Palnitkar	Pearson Education,2nd Edition,2003
2	Circuit Design and Simulation with Multisim	Muhammad H. Rashid	Pearson/Elsevier,2nd Edition, 2012

Course outcome	Descriptions
CO1	**Design** and **synthesize** the digital circuits using Verilog on FPGA platforms(L3)
CO2	**Interface** stepper motors and DAC with FPGA.(L4)
CO3	**Illustrate** the discrete time signa ls operation and stability analysis of control system using MATlab. (L2)
CO4	**Simulate** and verify data converters using Multisim (L3)

CO5	**Prepare** lab reports with all required steps, circuit diagrams, and observations. (L3)

Course Outcomes:

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1		2		2								
CO2	2		2		2								
CO3	2	2	2		2								
CO4	1	3			2								
CO5									3				

Department: Electronics and Communication Engineering			Semester:	4
Subject: Universal Human Values-II (UHV-II)				
Subject Code:	22HV407	L – T – P - S:	14-0-0-16 (In Hrs)	
			Credits:	1

Sl. No.	Course Objectives
1	**Understand** the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2	**Facilitate** the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3	**Highlight** plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.
4	**Provides** a much needed orientation input in value education to the young enquiring minds.

Module	Description	Hrs
I	**Introduction to Value Education:** -Understanding Value education. -Self-exploration as the process for Value Education. -The Basic Human Aspirations and their fulfillment. -Right Understanding, Relationship and Physical Facility. -Happiness and Prosperity-Current Scenario. -Method to Fulfill the Basic Human Aspirations.	**3**

II	**Harmony in the Human Being:** -Understanding the Human being as the Co-existence of the Self and Body. -Distinguishing between the Needs of the Self and the Body. -The Body as an Instrument of the Self. -The response of the self and the body. -Understanding Harmony in the Self. -Harmony of the Self with the Body -Programme to ensure self-regulation and Health.	**3**
III	**Harmony in the Family and Society:** -Understanding Harmony in the Family – The Basic Unit of Human Interaction -'Trust' – the Foundational Value in Relationship. - 'Respect' – as the Right Evaluation. -Other Values in Human –to- Human Relationship -Understanding Harmony in the society. -Vision for the Universal Human Order.	**3**
IV	**Harmony in the Nature(Existence):** -Understanding Harmony in the Nature. -Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature. -Realizing Existence as Co-existence at All Levels. -The Holistic Perception of Harmony in Existence.	**2**
V	**Implications of the Holistic Understanding – a Look at Professional Ethics:** -Basis for universal Human Values. -Definitiveness of (Ethical) Human Conduct. -Professional Ethics in the light of Right Understanding. -A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order. -Holistic Technologies, Production Systems and Management Models- Typical Case Studies. -Strategies for transition towards Value-based life and profession.	**3**

Text Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	A Foundation Course in Human Values and Professional Ethics.	R R Gaur, R Sangal G P Bagaria,	Excel Books, New Delhi,2010
2	The Teacher's Manual Teachers' Manual for A Foundation Course in Human Values and, Professional Ethics,	R R Gaur, R Asthana, G P Bagaria	2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

Sl. No.	Text Book title	Author	Volume and Year of Edition
1	. Jeevan Vidya: EkParichaya,.	A Nagaraj,	Jeevan Vidya Prakashan, Amarkantak, 1999.
2	Human Values,	A.N. Tripathi,	New Age Intl. Publishers, New Delhi, 2004
3	The Story of Stuff (Book). . i)Small is Beautiful ii)Slow is Beautiful	 - E. F Schumacher. - Cecile Andrews	

Course Outcomes:

Course outcome	Descriptions
CO1	**Aware** of themselves, and their surroundings (family, society, nature). (L1)
CO2	**Able** to be critical and sensitive to their commitment towards what they have understood (human values, human relationship and human society). (L2)
CO3	**Able** to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction. (L2)
CO4	**Follow up** the human values by Faculty-student or mentor-mentee throughout their time with the institution in their programme & in every aspect of living.(L2)
CO5	**Leads to** form strategies for transition towards Value-based life and profession. (L1)

Course Articulation Matrix:

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1						3	3	3	2	3			
CO2				2		3	3	3	2	3			
CO3				2		3	3	3	2	3			
CO4				2		3	3	3	2	3			
CO5				2		3	3	3	2	3			

Department: Electronics and Communication Engineering			Semester:	4
Subject: Environmental Studies				
Subject Code:	**22EN408**	**L – T – P - S:**	**14-0-0-16 (In Hrs)**	
			Credits:	**1**

Sl. No	Course Objectives
1	**Identify** the major challenges in environmental issues and evaluate possible solutions.
2	**Develop** analytical skills, critical thinking and demonstrate socio-economic skills for sustainable development.
3	**Gain** knowledge on different types of pollution in the environment.
4	**Analyze** an overall impact of specific issues and develop environmental management plan. Environment.

COURSE TOPICS:

Module	Description	Hrs
I	Introduction: Environment - Components of Environment Ecosystem: Types of Ecosystem, Balanced ecosystem. Human Activities – Food, Shelter, And Economic & Social Security, Effects of human activities on environment- Agriculture, Housing, Industry, Mining & Transportation. Environmental Impact Assessment (EIA), Sustainable Development.	**3**
II	Natural Resources-Introduction, types of resources, Water resources – Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water. Mineral resources**,** Forest Wealth. Material Cycles – Carbon Cycle, Nitrogen Cycle & Sulphur Cycle.	**3**
III	Energy – Different types of energy, Conventional sources & Non-conventional sources of energy Solar energy, Hydro electric energy, Wind Energy, Nuclear energy, Biomass & Biogas Fossil Fuels, Hydrogen as an alternative energy.	**3**
IV	Environmental Pollution – Air Pollution & Automobile Pollution Water Pollution, Noise pollution, Land Pollution, Public Health Aspects. Global Environmental Issues: Population Growth, Urbanization, Land Management, Water & Waste Water Management.	**3**
V	Definition, Effects – Global Warming, Acid rain & Ozone layer depletion,	**2**

	controlling measures. Solid Waste Management, E - Waste Management & Biomedical Waste Management -Sources, Characteristics & Disposal methods. Environmental Acts & Regulations, Role of government, Legal aspects, Role of Non-governmental Organizations (NGOs) , Environmental Education.	

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Environmental Studies	Benny Joseph	Tata McGraw– Hill Publishing Company Limited(2005), Delhi.
2	Environmental Studies	R Rajagopalan	From Crisis to Cure", Oxford University Press, 2005,

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Environmental Science and Engineering	Aloka Debi,	Universities Press (India) Pvt. Ltd. 2012
2	Environmental Studies	R.J.Ranjit Daniels and Jagadish Krishnaswamy,	Wiley India Private Ltd., New Delhi(2009),
3	Text Book of Environmental and Ecology",	Dr.Pratiba Sing, Dr.AnoopSingh and Dr.Piyush Malaviya,	Acme Learning Pvt. Ltd. New Delhi

Course Outcomes:

Course outcome	Descriptions
CO1	**Understand** the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale. (L1)
CO2	**Develop** critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment. (L2)
CO3	**Demonstrate** ecology knowledge of a complex relationship between biotic and abiotic components. (L1)
CO4	**Apply** their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues. (L3)
CO5	**Understand** the major environmental issues and legal regulations. (L1)

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1					2		3	3	3	1		
CO2	1					2		3	3	3	1		
CO3	1					2		3	3	3	1		
CO4	1					2		3	3	3	1		
CO5	1					2		3	3	3	1		