GOVERNMENT OF INDIA
MINISTRY OF
PARLIAMENTARY AFFAIRS

Azadi Ka Amrit Mahotsav

my GOV
मेरी सरकार

PREAMBLE TO THE CONSTITUTION

PREAMBLE

WE, THE PEOPLE OF INDIA,

having solemnly resolved to constitute India

into a **SOVEREIGN SOCIALIST SECULAR DEMOCRATIC**

REPUBLIC and to secure to all its citizens:

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity;

and to promote among them all

FRATERNITY assuring the dignity of the individual and

the unity and integrity of the Nation;

IN OUR CONSTITUENT ASSEMBLY this 26th day of

November, 1949, do HEREBY ADOPT, ENACT AND GIVE

TO OURSELVES THIS CONSTITUTION.

I have read the Preamble

23-01-2022

Signature

SRI SIDDHARTHA ACADEMY OF HIGHER EDUCATION

("Deemed to be University u/s 3 of the UGC Act, 1956")
Accredited 'A+' Grade by NAAC
Agalakote, B.H.Road, Tumkur – 572 107.KARNATAKA, INDIA.

No. SSAHE/ACA-S&C/23/UG(BE)/2024   Date: 15/07/2024

NOTIFICATION

Sub: - Ordinance pertaining to Curriculum of Undergraduate Programme Bachelor of Engineering (2nd Year Electronics and Communication Engineering)

Ref: Proceedings of the Academic Council meeting held on 10/07/2024 vide agenda No. SSAHE/AC/XXVIII-12/2024

In exercise of the powers vested under section 6 of 6.05 of MoA / Rules of SSAHE, the Revised Ordinance pertaining to Curriculum of Undergraduate Programme Bachelor of Engineering (2nd Year Electronics and Communication Engineering) is notified herewith as per Annexure.

By Order,

REGISTRAR

REGISTRAR
Sri Siddhartha Academy of Higher Education
TUMKUR - 572 107, Karnataka.

To,
Dean / Principal, Sri Siddhartha Institute of Technology,

Copy to
1) Office of the Chancellor, SSAHE, for kind information,
2) PA to Vice-Chancellor / PA to Registrar / Controller of Examinations / Finance Officer, SSAHE
3) All Officers of the Academy Examination Branch / Academic Section
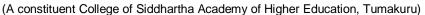4) Guard File / Office copy.

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 2024-25 `

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

Program Outcomes:
Engineering Graduates will be able to

PO 1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

1

PO 4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO 6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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.

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-2022 (160 Credits Scheme, NEP)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

III Semester B E   **Academic Year: 2024-25**

Sl No	Course Code		Course Title	Teaching Dept.	L	T	P	Credits	CIE Marks	SEE Marks	Total Marks	Exam Hrs
1	BS	22ES301	Integral Transforms and Numerical Techniques	MA	3	-	-	3	50	50	100	3
2	PC	22EC302	Network Theory	EC	3	-	-	3	50	50	100	3
3	PC	22EC303	Digital Circuit Design using Verilog	EC	3	-	2	4	50	50	100	3
4	PC	22EC304	Analog Electronic Circuits	EC	3	-	2	4	50	50	100	3
5	PC	22EC305	Signals and Systems	EC	3	-	-	3	50	50	100	3
6	PC	22EC306	Electronics and Communication Skill Lab-1	EC	1	-	2	2	50	50	100	3
7	HS	22SK307	Skill Development– I (T&P)	HS	1	-	-	1	50	-	50	-
8	HS	22CI308	Constitution of India	HS	1	-	-	1	50	-	50	-
L: Lecture, T-Tutorial, P-Practical, CIE: Continuous Internal Evaluation, SEE: Semester End Examination				**Total**	**18**	**-**	**6**	**21**	**400**	**300**	**700**	**-**

Department: Electronics and Communication Engineering	Semester:	3
Subject: Integral Transforms and Numerical Techniques (Common to EC, EE, ET, & BM)		
Subject Code:	22ES301	L – T – P - C:	3–0–0–3

SI. No	Course Objectives
1	Introduce the concept of Numerical methods.
2	Introduce the concept of Fourier series and Fourier transforms to study the behavior 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.

Unit	Description	Hrs
I	**Numerical solution of Ordinary differential equations of first order and first degree**: Introduction, 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) .**Numerical Integration:** Simpson's $1/3^{rd}$,$3/8^{th}$ rule, Weddle's rule, (without proof) – problems.	07
II	**Laplace Transforms:** Introduction, 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. Solutions of second order linear differential equations using Laplace transforms method.	09
III	**Statistical Methods:** Introduction, Definition of Correlation-Karl Pearson's coefficient of correlation–problems. Regression lines (All results without proof). **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 and solutions.	07
IV	**Fourier Series:** Introduction, Periodic function, Dirichlet's conditions. Fourier series of even and odd functions. Fourier series of periodic functions with period 2π and 2l. Applications to Engineering problems: Fourier series for Periodic square wave, Full wave rectified form, Saw-tooth wave with graphical representation. Half range Fourier series. Practical harmonic analysis – problems and solutions.	09
V	**Fourier Transforms:** Introduction, 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. Application to difference equations using Z-transforms - problems and solutions.	08

Course Outcomes:

Course outcome	Descriptions
CO1	Recall the basic concepts of Numerical and Statistical methods, Laplace transforms, Inverse Laplace transforms, Fourier series, Fourier transforms and Z- transforms. (L1)
CO2	Apply the concepts of Laplace transform, Inverse Laplace transform, Fourier series to solve problems in Engineering fields. (L2)
CO3	Demonstrate Fourier series and Fourier transforms to study behavior of periodic functions problems arising in Engineering fields. (L2)
CO4	Analyze and apply Z- transforms, Numerical and Statistical methods in Engineering fields.(L3)

Course Articulation Matrix

CO \ PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		2												
CO2	3													
CO3		2												
CO4	3													

Text Books:

Sl No	Book title	Author	Volume and Year of Edition
1	Higher Engineering Mathematics	B.S. Grewal	43rdEdition Khanna Publications, 2015. ISBN:9788174091956
2	Higher Engineering Mathematics	B.V. Ramana	1stEdition, Tata McGraw-Hill, 2006. ISBN:9780070634190

Reference Books:

Sl No	Book title	Author	Volume and Year of Edition
1	Advanced Engineering Mathematics	E. Kreyszig	10th Edition JonWiley& Sons, 2015. ISBN:9780470913611
2	Higher Engineering Mathematics	H.K. Das Er. RajnishVerma	1stEdition, Chand publishing, 2011. ISBN:9788121938907

Department: Electronics and Communication Engineering		Semester:	3
Subject: Network Theory			
Subject Code:	22EC302		L – T – P - C:	3-0-0-3

Sl. No	Course Objectives
1	Introduce 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	Study Two port network models in terms of Z, Y, h and T-parameters.

Unit	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)	9
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	7

Course Outcomes:

Course outcome	Descriptions
CO1	Solve electrical circuit Parameters using mesh and node voltage analysis . (L3)
CO2	Interpret different network theorems and topological methods 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)

Course Articulation Matrix

CO \ PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2					1						
CO2	3	2			2				1			1		
CO3	2							1		1		1		
CO4	2	2												

Text Books:

SI No	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:

SI No	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

Department: Electronics and Communication Engineering		Semester:	3
Subject: Digital Circuit Design using Verilog (Integrated Course)			
Subject Code:	22EC303	L – T – P - C:	3 – 0 – 2 – 4

SI. 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 implement logical operations using combinational Circuits and sequential circuits. and build Verilog models.
3	Learn concepts of developing Verilog models of combinational and sequential circuits in terms of state machines.
4	Acquire knowledge of the classification and characteristics of memory and Programmable logical design and various logical families of digital IC Technology.

Unit	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	**9**
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 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	**8**
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	**7**

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

Course Outcomes:

Course outcome	Descriptions
CO1	Simplify Boolean equations using K-map techniques and design combinational circuits. (L1)
CO2	Analyze and design sequential circuits by applying simplification techniques. (L2)
CO3	Formulate a methodology to design digital computational blocks and compare various logic families. (L3)
CO4	Apply HDL tools 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	PO12	PSO1	PSO2
CO1		2												
CO2	2	3	2						2					
CO3	2	2	2	1										
CO4					3				2					

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/

Department: Electronics and Communication Engineering	Semester:	3
Subject : Analog Electronic Circuits (Integrated Course)		
Subject Code:	22EC304		L – T – P - C:	3 – 0 – 2 – 4

SI. No	Course Objectives
1	Understand the basics of semiconductor physics and electronic devices.
2	Study 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.

Unit	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 i_D-V_{DS} Relationship, Symbol, i_D –V_{DS} 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)	8
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. (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)	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 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: 9.1to9.4,9.12.2,8.2 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)	7
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)	7

Sl. No	Experiment Description

1	A. 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)
	B. 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)

2	A. To plot the I/O characteristics of MOSFET B. Implement of single stage RC coupled amplifier using MOSFET/Transistor.
3	A. Design of analog RC phase shift oscillator circuit to oscillate at given operating frequency using Multisim (simulation) B. Design of analog Hartley and Colpitts oscillator circuit to oscillate at given operating frequency using Multisim (simulation)
4	A. Design and test of Schmitt trigger circuit for given values of triggering points (UTP and LTP). B. Design a I-order active low pass/ high pass filter for a given cut-off frequency and verify the roll off.
5	A. To design and test Astable multivibrator circuit using 555 timers for f=1kHz, duty cycle 70% and V_{out}= 5V. B. To design and test Monostable multivibrator circuit using 555 timers.

Course Outcomes:

Course outcome	Descriptions
CO1	Design the rectifiers , amplifiers, oscillators using appropriate principles (L1)
CO2	Outline the small signal analysis of analog circuits (L2)
CO3	Interpret the performance parameters of analog circuits based on standard specifications (L3)
CO4	Demonstrate the applications of analog amplifier, oscillator and timer (L3)

Course Articulation Matrix

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		2	3		1									
CO2		2	2											
CO3	2	2		2	2									
CO4	2								2					

Text Books:

Sl No	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	3rd Edition, Pearson Education, 2015

Reference Books:

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

Department: Electronics and Communication Engineering		Semester:	3
Subject: Signals and Systems			
Subject Code:	22EC305	L – T – P - C:	3 -0- 0 -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 behavior of an LTI System.
4	Learn the different transformations techniques on Signals.

Unit	Description	Hrs
I	**Introduction to Signals and Systems:** Introduction to Signals and Systems: Definition of Signals, Classification of signals, Basic operations on Signals, lementary Signals. Definition of Systems, System Viewed as Interconnection of Operations, Properties of Systems: Statement with Examples (No 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. (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)	7
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. (Text: 4.1 to 4.6)	7
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

Course Outcomes:

Course outcome	Descriptions
CO1	Apply knowledge of mathematics and Engineering fundamentals to Identify and characterize different classes of signals (L2)
CO2	Formulate the methodology to compute the response of an LTI system (L3)
CO3	Analyze Non Periodic signals in Frequency domain.(L3)
CO4	Evaluate the Discrete time systems using Z-Transform.(L3)

Course Articulation Matrix

CO \ PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2												
CO2		2	2											
CO3		2		2										
CO4	2	2	1	1								1		

Text Books:

SI No	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:

SI No	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)

Department: Electronics and Communication Engineering	Semester:	3
Subject: Electronics and Communication Skill lab-1		
Subject Code:	22EC306		L – T – P - C:	1-0-2-2

Sl. No	Course Objectives
1	Learn the basic programming constructs in Python.
2	Understand the basics of MATLAB and Simulate the generation of signals and operations on them
3	Study the working principle of household appliances

Sl. No	Experiment Description
1	Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2	a. Exploring to open-CV python tool b. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building – operations of list & tuples)
3	Verification of network theorems like Thevenin's and maximum power transfer theorem using simulators.
4	To generate matrix and perform basic operation on matrices Using MATLAB Software.
5	Generation on various signals and sequences (periodic and aperiodic), such as unit impulse, unit step, square, saw tooth, triangular, sinusoidal, ramp and sinc
6	To performs functions on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power.
7	A Study the working principle and prepare a report on Uninterrupted Power supply (UPS) – online and off line UPS, SMPS.
8	Study the various types of motors and transformers used in household appliances and prepare a report on the same
9	Exploring to PY game tool.
10	To Study the types, working principle and prepare a report on resistors, capacitors, inductors, diodes, LEDs, transistors, crystals and oscillators, electromechanical components like relays, switches, ICs, and connectors.

Course Outcomes:

Course outcome	Descriptions
CO1	Generate the various signals and sequences to perform various operations on signals. (L1)
CO2	Implement and execute simple programs using MATLAB/open source tools (L2)
CO3	Interpret and Record the experimental data, analyze the results and prepare a formal laboratory report (L3)

Course Articulation Matrix

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2											1	
CO2			2		2									
CO3										2				

Department: Electronics and Communication Engineering	Semester:	3
Subject: **Skill Development –I (T&P)** **(Communication Skills and Professional Ethics)**		
Subject Code: 22SK307	L – T – P - C:	1-0-0-1

SI. No	Course Objectives
1	Improve Communication Skills: Enhance students' ability to express ideas clearly and adapt communication skills to different contexts and audiences.
2	Foster Effective Teamwork: Develop students' teamwork skills, including cooperation, active participation, conflict resolution, and leveraging diverse strengths for collaborative success.
3	Enhance Leadership Abilities: Cultivate leadership qualities by helping students develop self-awareness, problem-solving skills, and decision-making abilities
4	Promote Professional Etiquette: Instil a sense of professionalism in students, emphasizing appropriate workplace behaviour, business etiquette, and ethical conduct.

UNIT	Description	Hours
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.	6
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
III	**Team Work**: Team Work and its important elements Clarifying the advantages and challenges of team work Understanding bargains in team building Defining behavior 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.	5
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,	6

	tension, and relaxation techniques. Individual Counseling & Guidance, Career Orientation. Balancing Personal & Professional Life	
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	6

Course Outcomes:

Course outcome	Descriptions
CO1	Improved Communication Skills: Students will demonstrate enhanced verbal and written communication abilities, effectively expressing ideas, actively listening, and adapting their communication style to different Situations. (L2)
CO2	Effective Teamwork and Collaboration: Students will exhibit improved teamwork skills, actively contributing to group projects, resolving conflicts constructively, and leveraging the strengths of team members to achieve shared goals. (L2)
CO3	Professional Etiquette and Conduct: Students will display professional behavior, adhering to workplace etiquette, demonstrating appropriate appearance, punctuality, and practicing ethical conduct in professional settings. (L2)
CO4	Strengthened Aptitude Skills: Students will demonstrate improved aptitude skills, including logical reasoning, analytical thinking, and problem-solving abilities, enabling them to excel in competitive exams, interviews, and real-life problem-solving scenarios (L3)

Course Articulation Matrix

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1										3				
CO2											3			
CO3						1		2				2		
CO4				2										

Reference Books:

Sl No	Book title	Author	Volume and Year of Edition
1	Technical Communication Principles and Practices,	Meenakshi Raman and Sangeeta Sharma,	Oxford Publishers, 2004
2	*Tools for Talking When Stakes are High,*	*Kerry Patterson, Joseph Grenny, Ron McMillan, Crucial Conversation*	*McGraw-Hill Publication, ISBN: 9780071772204*

Department: Electronics and Communication Engineering		Semester:	3
Subject: Constitution of India			
Subject Code:	22CI308	L – T – P - C:	1-0-0-1

SI. No	Course Objectives
1	Understand the salient features and preamble of the constitution of India. Including fundamental rights of the citizen of India and types of Fundamental rights
2	Study 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	Introduce the basic information of FDs, Electoral Process, emergencies and amending procedures.

UNIT	Description	Hours
I	Introduction, Meaning and definitions. Salient features, Sources, Constituent Assembly, Drafting Committee. Preamble to the constitution of India.	6
II	Fundamental rights under part III – details of exercise of rights, Scopes & Limitations and, important cases	6
III	Relevance of directive principles of state policy under part-IV Fundamental duties and their significance-part-IV A	6
IV	Union Executive- President, Prime minister, Parliament and Supreme Court of India. State Executive – Governors, Chief Ministers, State legislature and High Courts.	4
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.	6

Course Outcomes:

Course outcome	Descriptions
CO1	Gain the general knowledge and legal literacy and thereby to take up competitive examinations. (L1)
CO2	Interpret the freedom, rights and restrictions including directives, through fundamental duties. (L2)
CO3	Realise the importance of the three main organs of the constitution, Viz-the legislature, the executive and the judiciary. (L2)
CO4	Summarize the power and functions of political institutions established throughout the country. (L1)

Course Articulation Matrix

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1			2		1						1		
CO2								2	2					
CO3	1											1		
CO4				1		1								

Text Books:

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

Reference Books:

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

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-2022 (160 Credits Scheme, NEP)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

IV Semester B E   **Academic Year: 2024-25**

SI No		Course Code	Course Title	Teaching Dept.	L	T	P	Credits	CIE Marks	SEE Marks	Total Marks	Exam Hrs
1	BS	22ES401	Probability and Advanced Linear Algebra	MA	3	-	-	3	50	50	100	3
2	PC	22EC402	Fields and Waves	EC	3	-	-	3	50	50	100	3
3	PC	22EC403	Analog Communication	EC	3	-	2	4	50	50	100	3
4	PC	22EC404	Microcontroller and Its applications	EC	3	-	2	4	50	50	100	3
5	PC	22EC405	Control Systems	EC	3	-	-	3	50	50	100	3
6	PC	22EC406	Electronics and Communication s Skill Lab-2	EC	1	-	2	2	50	50	100	3
7	HS	22HV407	Universal Human Values	HS	1	-	-	1	50	-	50	-
8	HS	22EN408	Environmental Studies	HS	1	-	-	1	50	-	50	-
L: Lecture, T-Tutorial, P-Practical/Drawing, CIE: Continuous Internal Evaluation, SEE: Semester End Examination				**Total**	**18**	**-**	**6**	**21**	**400**	**300**	**700**	**18**

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 - C:	3–0–0–3

SI. 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 analyzing 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.	8
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.	7
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.	9
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 distribution of regular Markov chains, problems.	8
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	8

analytic functions by Milne-Thompson Method. Bilinear Transformations, problems.	

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.(L3)
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)

Course Articulation Matrix

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3												
CO2	3	3	2											
CO3	3	3	2											
CO4	3	3	2	1								1		

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Higher Engineering Mathematics	B.S. Grewal	43rd Edition Khanna Publications, 2015.ISBN:9788174091956
2	Linear Algebra and its Applications	David C. Lay	3rd Edition, 2002, Pearson Education India, ISBN-13: 978-81-7758-333-5.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Linear Algebra and its Applications	Gilbert Strang	4th Edition, 2006, Cengage Learning India Edition, ISBN: 81-315-0172-8.
2	Higher Engineering Mathematics	B.V. Ramana	1st Edition, Tata McGraw-Hill, 2006.ISBN:9780070634190

Department: Electronics and Communication Engineering		Semester:	4
Subject: FIELDS AND WAVES			
Subject Code:	22EC402	L – T – P - C:	3 – 0 – 0 – 3

SI. 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.

Unit	Description	Hrs
I	**Electrostatics I:**Introduction,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, due to Sheet of charge, 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	8
II	**Electrostatics II:** Introduction, 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.	8
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, 8.5.	8
IV	**Wave propagation:** Introduction to Maxwell's Equations in Point form and Integral form (No derivations). 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.	8
V	**Transmission Lines:** Introduction, A line of cascaded T sections,	8

Transmission line- general solutions, relation between primary and secondary constants in transmission line, Attenuation constant and phase constant, Waveform distortion, distortion-less line, Reflection coefficient, Numerical problems. Text 2: 6.1, 6.2, 6.6, 6.7, 6.11.	

Course Outcomes:

Course outcome	Descriptions
CO1	Interpret the various fundamental laws and concepts related to Electrostatic Fields and Magneto static Fields(L1)
CO2	Compute the electric and Magnetic field due to different charge distributions by using various laws and Analytical methods (L3)
CO3	Analyze the transmission lines and Interpret the Poisson's and applications of Laplace equation (L3)
CO4	Apply Maxwell's equation to illustrate wave equations and propagation EM waves in different mediums.(L2)

Course Articulation Matrix

CO \ PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1												
CO2	1	1	1											
CO3	1	2												
CO4		1	1											

Text Books:

SI No	Book title	Author	Volume and Year of Edition
1	Engineering Electromagnetic	W.H. Hayt and Jr John. A. Buck	Tata McGraw-Hill 2012, 7th Edition
2	Networks, Lines and Fields	John D Ryder	Prentice-Hall India 2004, 2nd Edition

Reference Books:

SI No	Book title	Author	Volume and Year of Edition
1	Element of Electromagnetics	Matthew N.O., Sadiku	Oxford university press 2018, 7th Edition
2	Electromagnetic Waves and Radiating systems	E.C. Jordan and K.G. Balman	Prentice-Hall India 2008, 2nd Edition
3	Fields and Waves in Communication Electronics	Simon Ramo and John R Whinnery	John Wiley & Sons 1994, 3rd Edition

Department: Electronics and Communication Engineering		Semester:	4
Subject: ANALOG COMMUNICATION (Integrated course)			
Subject Code:	22EC403		L – T – P - C:	3 – 0 – 2 – 4

SI. No	Course Objectives
1	Study the basic principles of amplitude modulation and angle modulation.
2	Understand the significance of SNR in analog communication systems.
3	Acquire the knowledge of concepts of random process and probability theory in communication systems.
4	Learn the concepts of different applications of analog communication.

Unit	Description	Hrs
I	**Amplitude modulation and Double Side Band Suppressed Carrier (DSBSC):** 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.	10
II	**Single Side-Band Modulation (SSB) and Vestigial Side Band Modulation(VSB):** Introduction**,** 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 Amplitude modulation techniques, Frequency translation, Frequency division multiplexing, Application: AM radio. Text: 7.4 to 7.9.	8
III	**Angle Modulation:** Introduction, Basic definitions, FM, Narrowband FM,	

	Wideband FM, Transmission bandwidth of FM, Generation of FM waves : Indirect method, Demodulation of FM waves, Phase locked loop, FM Stereo multiplexing, FM radio. Text:7.10 to 7.14 except 7.13.	7
IV	**UNIT-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: s/c: 8.2 to 8.7 and 8.12	8
V	**UNIT-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: s/c: 4.7, 4.8,9.1to 9.5 and 9.8, 5.1	7

Sl. No	Experiment Description
1	a. Design and generate an Amplitude modulation signal using AFT,IFT and transistor and demodulate the original signal using envelope detector. b. Generate a DSBSC signal using Ring Modulator.
2	a. Design and generate a Single Sideband Modulation(SSB) signal.
3	a. Design and generate a Frequency modulation using IC 8038 and also find the modulation index and transmission bandwidth of generated FM signal. b. Design and verify the phase lock loop and its capture range, lock range and Free running VCO Frequency.
4	a. Design and generate a Pulse Amplitude Modulation(PAM) signal and also demodulate the generated Pulse amplitude modulation signal. b. Design and generate a Pulse Width Modulation(PWM) signal and also demodulate the generated Pulse width modulation signal. c. Design and generate a Pulse Position Modulation(PPM) signal and also demodulate the generated Pulse position modulation signal.
5	a. Design and verify the working of Pre-Emphasis & De-Emphasis circuits and find the normalized gain. b. Verify and analyze the working of effect of noise in AM, DSB-SC and FM

	receiver.

Note: Above experiments can be conducted using Hardware components or Matlab / simulink, Labview simulation softwares**.**

Course Outcomes:

Course outcome	Descriptions
CO1	Outline and realize the modulation and demodulation techniques of analog and pulse modulation (L2).
CO2	Interpret the various noises, receiver models and SNR of analog communication systems and illustrate the Pre-Emphasis & De-Emphasis circuits effect of noise in AM, DSB-SC and FM receiver (L2).
CO3	Apply Fourier analysis and characterize the analog signals.(L3).
CO4	Make use of random variables and random process for noise modelling of analog signals.(L3).

Course Articulation Matrix

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				2									
CO2		2	3		2									
CO3		3	2											
CO4		3	2		2									

Text Books:

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

Reference Books:

Sl No	Book title	Author	Volume and Year of Edition
1	Analog communications Introduction to Communication Systems	Jerry d Gibson	1stEdition,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, Oxford press

Department: Electronics and Communication Engineering		Semester:	4
Subject : Microcontroller and Its applications (Integrated course)			
Subject Code:	22EC404	L – T – P - C:	3 – 0 – 2 – 4

Sl. No	Course Objectives
1	Understand the difference between Microprocessor, Microcontroller and Embedded Microcontroller
2	Familiarize the basic Architectural Features of 8051 and ARM7 Microcontroller. Interface 8051 to External memory and I/O devices
3	Learn the ALP techniques using 8051 microcontroller instruction set
4	Study the operation and use of inbuilt timers/counters and Serial port of 8051

Unit	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(addressing modes)	8
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)	8
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, 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)	8
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	8

| | 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 | |

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 (c) Write an assembly language program to find cube of a number (d) Write an Assembly language program to find Average Of 'N' Numbers
3	**Counters** (a) Write an Assembly language program for Implementation of Decimal Up/Down Counter **Bit Handling Instructions** (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 **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
4	**DAC Interfacing** (a) Write a C Program for Generation of Ramp Wave Using DAC Interface. (b) Write a C Program for Generation of Square Wave Using DAC Interface (c) Write a C Program for Generation of Triangular Wave Using DAC Interface (d) Write a C Program for Generation of Sine Wave Using DAC Interface
5	**Stepper Motor Control** (a) Write a C Program for Stepper Motor Interface DC Motor Control (b) Write a C Program for DC Motor Interface

Course Outcomes:

Course outcome	Descriptions
CO1	Interpret the architectural features of 8051 and design memory interfacing. (L2)
CO2	Outline Interrupt systems, operation of Timers/Counters and Serial Port of 8051 (L2)
CO3	Apply knowledge of addressing modes and instructions for writing assembly language programming. (L3)
CO4	Develop assembly language program to interface I/O devices and interpret architectural features of ARM7 microcontroller (L3)

Course Articulation Matrix

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1				1	2								
CO2	2		1											
CO3					1									
CO4	2		2		1									

Text Books:

Sl No	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	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
4	Microcontrollers	Sampath K Venkatesh	2008, S K Kataria and sons Publication

Department: Electronics and Communication Engineering		Semester:	4
Subject: Control Systems			
Subject Code:	22EC405	L – T – P - C:	3-0-0-3

SI. No	Course Objectives
1	Study the Mathematical modeling of Electrical and Mechanical systems.
2	Understand 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	Acquire the knowledge of frequency domain analysis of a system using graphical method

Unit	Description	Hrs
I	**Mathematical models of physical systems**: Introduction, The Control System, Servomechanisms, History and Development of Automatic Control, Digital Computer Control, Application of Control Theory in Non-Engineering Fields, The control Problem. **Mathematical Models of Physical Systems:** Differential Equations of Physical Systems, Dynamic of Robotic Mechanisms, Feedback and Non Feedback Systems, Use of Feedback, Reduction of parameter variations, Control over System Dynamics, Control of the effects of disturbances signals, Linearizing effect of Feedback, Regenerative Feedback. (Text 1: 1.1 to 1.6, 2.1 to 2.3, 3.1 to 3.7)	**10**
II	**Block diagram algebra and signal flow graph**: Introduction, Block diagrams and Signal flow Graph: Block diagram reduction, 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)	**7**
III	**Time response analysis and stability 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. Stability analysis: concepts of stability, types of stability, RH criterion, relative stability analysis. (Text 1: 5.1 to 5.5, 6.1 to 6.5)	**8**
IV	**The root locus techniques**: Root Locus Concepts, Construction Foot Loci, Root Contours: construction rules, determination of roots from root locus , root contours. (Text 1:7.1 to 7.4)	**8**
V	**Frequency response analysis**: Introduction, Correlation between Time and Frequency response, Bode Plots, Bode diagrams for frequency domain	**7**

analysis. **Stability in frequency domain**: Introduction, Nyquist Stability Criterion, Assessment of relative stability using Nyquist Criterion.
(Text 1: 8.1, 8.2, 8.4, 9.1 to 9.4)

Course Outcomes:

Course outcome	Descriptions
CO1	Illustrate the closed and open loop systems(L1)
CO2	Develop mathematical model of a given Mechanical system/electrical system (L2)
CO3	Apply the concepts of frequency domain and time domain analysis of a given system (L3)
CO4	Analyze the stability of a given system using Transfer function (L4)

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	2	2				1								
CO3			3											
CO4		2		2										

Text Books:

Sl No	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	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

Department: Electronics and Communication Engineering	Semester:	4
Subject: Electronics and Communication Skill Lab - 2		
Subject Code:	22EC406	L – T – P - C:	1- 0-2-2

Sl. No	Course Objectives
1	Gain proficiency in Verilog HDL for FPGA development, implementing circuits like ALU, BCD to seven segment display, and stepper motor control. Understand FPGA synthesis, Modelsim simulation, and hardware implementation.
2	Mastery of Multisim for analog and digital circuit design, including simulations for DACs, ADCs, and verification experiments like Flash ADC and LED blinking with microcontrollers.
3	Explore MATLAB for practical engineering tasks, such as analyzing control systems, computing DTFT for signal processing, and verifying concepts like the Sampling Theorem, enhancing capabilities in digital signal processing and control systems engineering. .

LAB CONTENT

Sl. No	Experiment Description
1	**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><td>**Opcode**</td><td>**Operation**</td></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></table>
2	Write a Verilog code for BCD- seven segment display and implement it on FPGA kit
3	Write a Verilog code to control speed, direction of Stepper motor and implement it on FPGA kit.
4	Realization of Code converter using Modelsim and implement on FPGA
5	Write a Verilog code for N bit- Ripple carry adder 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	a. 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. b. Blinking an LED with 8051 Microcontroller using Multisim and C Code.
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.

Course Outcomes:

Course outcome	Descriptions
CO1	Gain proficiency in designing and implementing digital systems using Verilog on FPGA platforms (L3)
CO2	Demonstrate competence in circuit simulation and verification using Multisim.(L3)
CO3	Develop skills in MATLAB for analyzing signals, systems, and control mechanisms.(L2)

Course Articulation Matrix

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2	2	1			1		1		1	2	
CO2	3	1	2		1			1		1		1	2	
CO3	2	1	2		1			1		1		1	1	

Department: Electronics and Communication Engineering		Semester:	4
Subject: Universal Human Values			
Subject Code:	22HV407	L – T – P - C:	1-0-0-1

Sl. No	Course Objectives
1	Understand the essentials of human 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity.
2	Study the development of a Holistic perspective among students towards life and profession: happiness and prosperity.
3	Learn the plausible implications of ethical human conduct, trustful mutually fulfilling human behaviour with nature.
4	Provide a much needed orientation input in value education to the young enquiring minds.

Unit	Description	Hrs
I	**Introduction to Value Education:** 1.Understanding Value education-Need, Guidelines, content, Role of education - Sanskar 2. Process for Value Education-Self-exploration, the Dialogue Within. 3. Continuous Happiness and Prosperity – the Basic Human Aspirations 4. Right Understanding, Relationship and Physical Facility 5.Exploring the Meaning of Happiness and Prosperity. 6. Method to Fulfill the Basic Human Aspirations	6
II	**Harmony in the Human Being:** 7. Understanding the Human being (As the Co-existence of the Self and Body) 8. Distinguishing between the Needs of the Self and the Body 9. The Body as an Instrument of the Self-The response of the self and the body 10: Understanding Harmony in the Self-State of imagination 11: understanding Harmony of the Self with the Body 12: Programme to ensure self-regulation and Health-Nurturing the body	6
III	**Understanding Harmony in the Family and Society** 13: Harmony in the Family – the Basic Unit of Human Interaction 14: Values in Human-to-Human Relationship 15: 'Trust' – the Foundational Value in Relationship 16: 'Respect' – as the Right Evaluation 17: Other Naturally Acceptable Feelings in Relationship-Affection, Care,	6

	Guidance, Reverence, Glory, Gratitude and Love 18: Vision for the Universal Human Order-from family to world family	
IV	**Understanding Harmony in the Nature/Existence:** 19: Understanding Harmony in the Nature 20: Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature 21:Realizing Existence as Co-existence at All Levels 22: The Holistic Perception of Harmony in Existence	4
V	**Implications of the Holistic Understanding – a Look at Professional Ethics** 23: Natural Acceptance of Human Values 24: Definitiveness of (Ethical) Human Conduct 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order 26: Competence in Professional Ethics 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies 28: Strategies for Transition towards Value-based Life and Profession	6

Course Outcomes:

Course outcome	Descriptions
CO1	Aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. (L1)
CO2	Gain critical ability, and also become sensitive to their commitment towards human values, human relationship and human society. (L2)
CO3	Apply their own self in different day-to-day settings in real life.(L3)
CO4	Analyze the higher level courses on human values in every aspect of living system. (L4)

Course Articulation Matrix

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2					2		1						
CO2						1	1							
CO3								2				2		
C04						1			1			1		

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, RSangal 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 Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	. Jeevan Vidya: Ek Parichaya,.	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	
4	The Story of My Experiments with Truth	- by Mohandas Karamchand Gandhi	

Department: Electronics and Communication Engineering		Semester:	4
Subject: Environmental Studies			
Subject Code:	22EN408	L – T – P - C:	1-0-0-1

Sl. No	Course Objectives
1	Understand the challenges in environmental issues and evaluate possible solutions.
2	Learn analytical skills, critical thinking and demonstrate socio-economic skills for sustainable development.
3	Gain knowledge of different types of pollution in the environment.
4	Introduce overall l impact of specific issues and develop environmental management plan.

UNIT	Description	Hours
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.	6
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.	6
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.	4
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.	6
V	Definition, Effects – Global Warming, Acid rain &Ozone layer depletion, 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	6

Course Outcomes:

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

Course Articulation Matrix

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2						2							
CO2		2		2										
CO3						2						1		
C04						1					2			

Text Books:

SI 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 Raja gopalan	From Crisis to Cure", Oxford University Press, 2005,

Reference Books:

SI 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. PiyushMalaviya,	Acme Learning Pvt. Ltd. New Delhi
4	Environmental Science – working with the Earth	G.Tyler Miller Jr.,	Eleventh Edition, Thomson Brooks /Cole, 2006