



R20 Regulations

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
(Established by Govt. of A.P., ACT No.30 of 2008)
ANANTHAPURAMU – 515 002 (A.P) INDIA

Electronics & Communication Engineering

II B.TECH.

Semester-III							
S.No.	Course Code	Course Name	Category	Hours per week			Credits
				L	T	P	
1.	20A54302	Complex Variables and Transforms	BS	3	0	0	3
2.	20A04301T	Signals and Systems	PC	3	0	0	3
3.	20A02303T	Electrical Engineering	ES	3	0	0	3
4.	20A04302T	Analog Circuits	PC	3	0	0	3
5.	20A52301 20A52302 20A52303	Humanities Elective– I Managerial Economics & Financial Analysis Organizational Behaviour Business Environment	HS	3	0	0	3
6.	20A04301P	Simulation Lab	PC	0	0	3	1.5
7.	20A02303P	Electrical Engineering Lab	ES	0	0	3	1.5
8.	20A04302P	Analog Circuits Lab	PC	0	0	3	1.5
9.	20A05305	Skill oriented course – I Application Development with Python	SC	1	0	2	2
10.	20A52201	Mandatory noncredit course – II Universal Human Values	MC	3	0	0	0
11.	20A99301	NSS/NCC/NSO Activities	MC	0	0	2	0
Total							21.5

Semester-IV							
S.No.	Course Code	Course Name	Category	Hours per week			Credits
				L	T	P	
1.	20A54403	Probability Theory & Stochastic Processes	BS	3	0	0	3
2.	20A04303T	Digital Logic Design	PC	3	0	0	3
3.	20A04401	EM Waves and Transmission Lines	PC	3	0	0	3
4.	20A04402T	Communication Systems	PC	3	0	0	3
5.	20A04403T	Linear and Digital IC Applications	PC	3	0	0	3
6.	20A04303P	Digital Logic Design Lab	PC	0	0	3	1.5
7.	20A04402P	Communication Systems Lab	PC	0	0	3	1.5
8.	20A04403P	Linear and Digital IC Applications Lab	PC	0	0	3	1.5
9.	20A52401	Skill Oriented Course –II Soft Skills	SC	1	0	2	2
10.	20A99401	Mandatory noncredit course – III Design Thinking for Innovation	MC	2	1	0	0
Total							21.5
Community Service Internship (Mandatory) for 6 weeks duration during summer vacation							



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Note:

1. Eligible and interested students can register either for Honors or for a Minor in IV Semester as per the guidelines issued by the University
2. Students shall register for NCC/NSS/NSO activities and will be required to participate in an activity for two hours in a week during third semester.
3. Lateral entry students shall undergo a bridge course in Mathematics during third semester



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Course Code	PROBABILITY THEORY AND STOCHASTIC PROCESSES		L	T	P	C
20A54403			3	0	0	3
Pre-requisite	Signals Systems & Networks	Semester	IV			
Course Objectives:						
<ul style="list-style-type: none"> To gain the knowledge of the basic probability concepts and acquire skills in handling situations involving more than one random variable and functions of random variables. To understand the principles of random signals and random processes. To be acquainted with systems involving random signals. To gain knowledge of standard distributions that can describe real life phenomena 						
Course Outcomes (CO):						
<p>CO1: Understanding the concepts of Probability, Random Variables, Random Processes and their characteristics learn how to deal with multiple random variables, conditional probability, joint distribution and statistical independence. (L1)</p> <p>CO2: Formulate and solve the engineering problems involving random variables and random processes. (L2)</p> <p>CO3: Analyze various probability density functions of random variables. (L3)</p> <p>CO4: Derive the response of linear system for Gaussian noise and random signals as inputs. (L3)</p>						
UNIT - I	Probability & Random Variable					
<p>Probability through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events, Problem Solving.</p> <p>Random Variable: Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties, Problem Solving.</p>						
UNIT - II	Operations on Random variable					
<p>Operations on Single Random Variable: Introduction, Expectation of a random variable, moments-moments about the origin, Central moments, Variance and Skew, Chebyshev's inequality, moment generating function, characteristic function, transformations of random variable.</p> <p>Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected), Unequal Distribution, Equal Distributions.</p>						
UNIT - III	Operations on Multiple Random variables					
<p>Operations on Multiple Random Variables: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties of Gaussian random variables, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.</p>						
UNIT - IV	Random Processes					
<p>Random Processes-Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence, First-Order Stationary Processes, Second-Order and Wide-Sense Stationarity, N-Order and Strict-Sense Stationarity. Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-</p>						



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Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

Random Processes-Spectral Characteristics: The Power Density Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum and its Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

UNIT - V	Random Signal Response of Linear Systems	Lecture Hrs
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Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band Limited and Narrowband Processes, Properties.

Noise Definitions: White Noise, colored noise and their statistical characteristics, Ideal low pass filtered white noise, RC filtered white noise.

Textbooks:

1. Peyton Z. Peebles, “Probability, Random Variables & Random Signal Principles”, 4th Edition, TMH, 2002.
2. Athanasios Papoulis and S. Unnikrishna Pillai, “Probability, Random Variables and Stochastic Processes”, 4th Edition, PHI, 2002

Reference Books:

1. Simon Haykin, “Communication Systems”, 3rd Edition, Wiley, 2010.
2. Henry Stark and John W.Woods, “Probability and Random Processes with Application to Signal Processing,” 3rd Edition, Pearson Education, 2002.
3. George R. Cooper, Clave D. MC Gillem, “Probability Methods of Signal and System Analysis,” 3rd Edition, Oxford, 1999.



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Electronics & Communication Engineering

Course Code	DIGITAL LOGIC DESIGN (Common to ECE and EEE)		L	T	P	C
20A04303T			3	0	0	3
Pre-requisite	NIL	Semester	III			
Course Objectives:						
<ul style="list-style-type: none"> To familiarize with the concepts of different number systems and Boolean algebra. To introduce the design techniques of combinational, sequential logic circuits. To model combinational and sequential circuits using HDLs. 						
Course Outcomes (CO):						
CO1: Understand the properties of Boolean algebra, other logic operations, and minimization of Boolean functions using Karnaugh map. CO2: Make use of the concepts to solve the problems related to the logic circuits. CO3: Analyze the combinational and sequential logic circuits. CO4: Develop digital circuits using HDL, and Compare various Programmable logic devices CO5: Design various logic circuits using Boolean algebra, combinational and sequential logic circuits.						
UNIT - I	Number Systems, Boolean algebra and Logic Gates					
Number systems - binary numbers, octal, hexadecimal, other binary codes; complements, signed binary numbers, digital logic operations and gates, basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, complements of Boolean functions, two-level NAND and NOR Implementation of Boolean functions.						
UNIT - II	Minimization of Boolean functions and Combinational Logic Circuits					
The Karnaugh map method (up to five variables), product of sums simplifications, don't care conditions, Tabular method, Introduction, Combinational circuits, design procedure, adders, subtractors, 4-bit binary adder/ subtractor circuit, BCD adder, carry look-ahead adder, binary multiplier, magnitude comparator, decoders and encoders, multiplexers, demultiplexers,						
UNIT - III	Sequential Logic Circuits					
Basic architectural distinction between combinational and sequential circuits, Design procedure, latches, flip-flops, truth tables and excitation tables, timing and triggering consideration, conversion of flip-flops, design of counters, ripple counters, synchronous counters, ring counter, Johnson counter, registers, shift registers, universal shift register						
UNIT - IV	Finite State Machines and Programmable Logic Devices					
Types of FSM, capabilities and limitations of FSM, state assignment, realization of FSM using flip-flops, Mealy to Moore conversion and vice-versa, reduction of state tables using partition technique, Design of sequence detector.						
UNIT - V	Hardware Description Language					
Types of PLD's: PROM, PAL, PLA, basic structure of CPLD and FPGA, advantages of FPGAs, Design of sequential circuits using ROMs, PLAs, CPLDs and FPGAs, Introduction to Verilog - structural Specification of logic circuits, behavioural specification of logic circuits, hierarchical Verilog Code, Verilog for combinational circuits - conditional operator, if-else statement, case statement, for loop; using storage elements with CAD tools-using Verilog constructs for storage elements, flip-flop with clear capability, using Verilog constructs for registers and counters.						
Textbooks:						
1. M. Morris Mano, "Digital Design", 3rd Edition, PHI. (Unit I to IV) 2. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital Logic with Verilog Design", 3rd Edition, McGraw-Hill (Unit V)						
Reference Books:						
1. Charles H. Roth, Jr, "Fundamentals of Logic Design", 4th Edition, Jaico Publishers. 2. Zvi Kohavi and Niraj K. Jha, "Switching and Finite Automata Theory, 3rd Edition, Cambridge University Press, 2010. 3. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", 2 nd Edition, Prentice Hall PTR. 4. D.P. Leach, A.P. Malvino, "Digital Principles and Applications", TMH, 7th Edition.						



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Electronics & Communication Engineering

Course Code	ELECTROMAGNETIC WAVES AND TRANSMISSION LINES		L	T	P	C
20A04401			3	0	0	3
Pre-requisite	Mathematics II and Mathematics III	Semester	IV			
Course Objectives:						
<ul style="list-style-type: none"> • To introduce fundamentals of static and time varying electromagnetic fields. • To teach problem solving in Electromagnetic fields using vector calculus. • To demonstrate wave concept with the help of Maxwell's equations. • To introduce concepts of polarization and fundamental theory of electromagnetic waves in transmission lines and their practical applications. • To analyze reflection and refraction of electromagnetic waves propagated in normal and oblique incidences. 						
Course Outcomes (CO):						
CO1: Explain basic laws of electromagnetic fields and know the wave concept. (L2) CO2: Solve problems related to electromagnetic fields. (L3) CO3: Analyze electric and magnetic fields at the interface of different media. (L3) CO4: Derive Maxwell's equations for static and time varying fields. (L3) CO5: Analogy between electric and magnetic fields. (L5) CO6: Describes the transmission lines with equivalent circuit and explain their characteristic with various lengths. (L2)						
UNIT - I	Static Electric Fields					
Recap of Vector Analysis: Coordinate systems and transformation-Cartesian, Cylindrical and Spherical coordinates Recap of Vector Calculus: Differential length area and volume, line surface and volume integrals, Del operator, gradient, divergent and curl operations. Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Divergence Theorem, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.						
UNIT - II	Static Magnetic Fields & Time varying Fields					
Magnetic Fields: Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Magnetic dipole, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems. Faraday's Law and Transformer e.m.f, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's equations for time varying fields, Maxwell's Equations in Different Final Forms and Word Statements, Illustrative Problems						
UNIT - III	Boundary Conditions and Uniform Plane Wave					
Boundary Conditions of Electromagnetic fields: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Wave Equations for Conducting and Perfect Dielectric Media. Uniform Plane Waves – Definition, All Relations between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.						
UNIT - IV	Reflection and Refraction of Plane Waves					



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Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector, and Poynting Theorem – Applications, Power Loss in a Plane Conductor, Illustrative Problems.

UNIT - V | **Transmission Lines**

Transmission Lines: Introduction, Transmission line parameters, Transmission line equivalent circuit, Transmission line equations and their solutions in their phasor form, input impedance, standing wave ratio, Transmission of finite length- half wave, quarter wave transmission line, Smith chart, graphical analysis of transmission lines using Smith chart, stub matching- single and double stub matching, Illustrative Problems.

Textbooks:

1. Matthew N.O. Sadiku, “Elements of Electromagnetics”, 4th edition. Oxford Univ. Press, 2008.
2. William H. Hayt Jr. and John A. Buck, “Engineering Electromagnetics”, 7th edition., TMH, 2006.

Reference Books:

1. E.C. Jordan and K.G. Balmain, “Electromagnetic Waves and Radiating Systems”, 2nd Edition, PHI, 2000.
2. John D. Krauss, “Electromagnetics”, 4th Edition, McGraw- Hill publication, 1999.
3. Electromagnetics, Schaum’s outline series, 2nd Edition, Tata McGraw-Hill publications, 2006.



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Course Code	COMMUNICATION SYSTEMS		L	T	P	C
20A04402T			3	0	0	3
Pre-requisite	Signals & Systems	Semester	IV			
Course Objectives:						
<ul style="list-style-type: none"> • To introduce various modulation and demodulation techniques of analog and digital communication systems. • To analyze different parameters of analog and digital communication techniques. • To Know Noise Figure in AM & FM receiver systems. • To understand Function of various stages of AM, FM transmitters and Know Characteristics of AM & FM receivers. • To analyze the performance of various digital modulation techniques in the presence of AWGN. • To evaluate the performance of each modulation scheme to know the merits and demerits in terms of bandwidth and power efficiency 						
Course Outcomes (CO):						
CO1: Recognize/List the basic terminology used in analog and digital communication techniques for transmission of information/data.						
CO2: Explain/Discuss the basic operation of different analog and digital communication systems at baseband and passband level.						
CO3: Compute various parameters of baseband and passband transmission schemes by applying basic engineering knowledge.						
CO4: Analyze/Investigate the performance of different modulation & demodulation techniques to solve complex problems in the presence of noise.						
CO5: Evaluate/Assess the performance of all analog and digital modulation techniques to know the merits and demerits of each one of them in terms of bandwidth and power efficiency.						
UNIT - I	Continuous Wave Modulation					15 Hrs
Introduction: The communication Process, Communication Channels, Baseband and Passband Signals, Analog vs Digital Communications, Need for the modulation. Amplitude Modulation(AM): AM and its modifications – DSB, SSB, VSB. Frequency Translation, Frequency Division Multiplexing (FDM). Angle Modulation: Frequency Modulation(FM), Phase Modulation, PLL, Nonlinear Effects in FM, Superheterodyne Receivers.						
UNIT - II	Noise and Pulse Modulation					12 Hrs
Introduction to Noise: Types of Noise, Receiver Model, Noise in AM, DSB, SSB, and FM Receivers, Pre-Emphasis and De-emphasis in FM. Introduction to Pulse Modulation: The Sampling Process, PAM, TDM, Bandwidth-Noise Trade off, Quantization process, PCM, Noise considerations in PCM systems, Delta Modulation, DPCM, Coding speech at low bit rates.						
UNIT - III	Baseband Pulse Transmission					10 Hrs
Introduction, Matched Filter, Properties of Matched Filter, Error rate due to noise, Inter Symbol Interference (ISI), Nyquist Criterion for distortion less baseband binary transmission, Correlative level coding, Baseband M-ary PAM transmission, QAM, MAP and ML decoding, Equalization, Eye pattern.						
UNKT - IV	Digital Passband Transmission					8 Hrs
Introduction, Passband Transmission Model, Gram-Schmidt Orthogonalization Procedure, Geometric Interpretation of Signals, Response of bank of correlators in noise, Correlation receiver, Probability of Error, Detection of Signals with unknown phase.						



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UNIT - V	Digital Modulation Schemes & Information Theory	12 Hrs
Coherent Digital Modulation Schemes – ASK, BPSK, BFSK, QPSK, Non-coherent BFSK, DPSK. M-ary Modulation Techniques, Power Spectra, Bandwidth Efficiency, Timing and Frequency synchronization. Information theory: Entropy, Mutual Information and Channel capacity theorem.		
Textbooks:		
1. Simon Haykin, “Communication Systems”, JohnWiley& Sons, 4 th Edition, 2004. 2. B. P. Lathi, Zhi Ding “ Modern Digital and Analog Communication Systems”, Oxford press, 2011.		
References:		
1.Sam Shanmugam, “Digital and Analog Communication Systems”,JohnWiley& Sons, 1999. 2. Bernard Sklar, F. J. harris“Digial Communications: Fundamentals andApplications”, Pearson Publications, 2020. 3. Taub and Schilling, “ Principles of Communication Systems”, Tata McGraw Hill, 2007.		



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COMBINATIONAL CIRCUITS USING TTL 74XX ICS: Study of logic gates using 74XX ICs, Four-bit parallel adder (IC 7483), Comparator (IC 7485), Decoder (IC74138, IC 74154), BCD-to-7-segment decoder (IC 7447), Encoder (IC 74147), Multiplexer (IC 74151), Demultiplexer (IC74154).
SEQUENTIAL CIRCUITS USING TTL 74XX ICS: Flip Flops (IC 7474, IC 7473), Shift Registers, Universal Shift Register (IC 74194), 4- bit asynchronous binary counter (IC 7493).

Textbooks:

1. D. Roy Choudhury, Shail B. Jain, "Linear Integrated Circuit", 4th edition (2012), New Age International Pvt.Ltd., New Delhi, India
 2. Ramakant A. Gayakwad, "OP-AMP and Linear Integrated Circuits", 4th edition (2012), Prentice Hall / Pearson Education, New Delhi.
- Floyd, Jain, "Digital Fundamentals", 8th edition (2009), Pearson Education, New Delhi.

References:

1. Sergio Franco (1997), Design with operational amplifiers and analog integrated circuits, McGraw Hill, New Delhi.
2. Gray, Meyer (1995), Analysis and Design of Analog Integrated Circuits, Wiley International, New Delhi.



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Course Code	DIGITAL LOGIC DESIGN LAB (Common to ECE and EEE)	L	T	P	C
20A04303P		0	0	3	1.5
Pre-requisite	NIL	Semester		IV	
Course Objectives:					
<ul style="list-style-type: none"> • To understand various pin configurations of the Digital ICs used in the laboratory • To conduct the experiments and verify the truth tables of various logic circuits. • To analyze the logic circuits • To design sequential and combinational logic circuits and verify their properties. • To design of any sequential/combinational circuit using Hardware Description Language. 					
Course Outcomes (CO):					
CO1: Understand the pin configuration of various digital ICs used in the lab CO2: Conduct the experiment and verify the properties of various logic circuits. CO3: Analyze the sequential and combinational circuits. CO4: Design of any sequential/combinational circuit using Hardware/ HDL.					
List of Experiments:					
<ol style="list-style-type: none"> 1. Verification of truth tables of the following Logic gates Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive-OR (vi) Exclusive-NOR 2. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit. 3. Verification of functional table of 3 to 8-line Decoder /De-multiplexer 4. 4variable logic function verification using 8 to1 multiplexer. 5. Design full adder circuit and verify its functional table. 6. Verification of functional tables of (i) JK Edge triggered Flip–Flop (ii) JK Master Slav Flip–Flop (iii) D Flip-Flop 7. Design a four-bit ring counter using D Flip–Flops/JK Flip Flop and verify output 8. Design a four bit Johnson’s counter using D Flip-Flops/JK Flip Flops and verify output 9. Verify the operation of 4-bit Universal Shift Register for different Modes of operation. 10. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip-Flops and Test It with a low frequency clock and sketch the output waveforms. 11. Design MOD–8 synchronous counter using T Flip-Flop and verify the result and sketch the output waveforms. 12. (a) Draw the circuit diagram of a single bit comparator and test the output (b) Construct 7 Segment Display Circuit Using Decoder and7 Segment LED and test it. 					
ADD on Experiments:					
<ol style="list-style-type: none"> 1. Design BCD Adder Circuit and Test the Same using Relevant IC 2. Design Excess-3 to 9- Complement convertor using only four Full Adders and test the Circuit. 3. Design an Experimental model to demonstrate the operation of 74154 De-Multiplexer using LEDs for outputs. 4. Design of any combinational circuit using Hardware Description Language 5. Design of any sequential circuit using Hardware Description Language 					
References:					
M. Morris Mano, “Digital Design”, 3rd Edition, PHI					
Online learning resources/virtual labs: https://www.vlab.co.in/					

Course Code	COMMUNICATION SYSTEMS LAB	L	T	P	C
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20A04402P		0	0	3	1.5
Pre-requisite	NIL	Semester		IV	
Course Objectives:					
<ul style="list-style-type: none"> • To understand the basics of analog and digital modulation techniques. • To Integrate theory with experiments so that the students appreciate the knowledge gained from the theory course. • To design and implement different modulation and demodulation techniques and their applications. • To develop cognitive and behavioral skills for performance analysis of various modulation techniques. 					
Course Outcomes (CO):					
<p>CO1: Know about the usage of equipment/components/software tools used to conduct the experiments in analog and digital modulation techniques.</p> <p>CO2: Conduct the experiment based on the knowledge acquired in the theory about modulation and demodulation schemes to find the important metrics of the communication system experimentally.</p> <p>CO3: Analyze the performance of a given modulation scheme to find the important metrics of the system theoretically.</p> <p>CO4: Draw the relevant graphs between important metrics of the system from the observed measurements.</p> <p>CO5: Compare the experimental results with that of theoretical ones and infer the conclusions.</p>					
List of Experiments:					
Design the circuits and verify the following experiments taking minimum of six from each section shown below.					
<u>Section-A</u>					
<ol style="list-style-type: none"> 1. AM Modulation and Demodulation 2. DSB-SC Modulation and Demodulation 3. Frequency Division Multiplexing 4. FM Modulation and Demodulation 5. Radio receiver measurements 6. PAM Modulation and Demodulation 7. PWM Modulation and Demodulation 8. PPM Modulation and Demodulation 					
<u>Section-B</u>					
<ol style="list-style-type: none"> 1. Sampling Theorem. 2. Time Division Multiplexing 3. Delta Modulation and Demodulation 4. PCM Modulation and Demodulation 5. BASK Modulation and Demodulation 6. BFSK Modulation and Demodulation 7. QPSK Modulation and Demodulation 8. DPSK Modulation and Demodulation 					
<p>Note: Faculty members (who are handling the laboratory) are requested to instruct the <u>students not to use readymade kits for conducting the experiments</u>. They are advised to make the students work in the laboratory by constructing the circuits and analysing them during the lab sessions.</p>					
<p>Online learning resources/virtual labs: https://www.vlab.co.in/</p>					
Course Code		L	T	P	C



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20A04403P	LINEAR AND DIGITAL IC APPLICATIONS LAB	0	0	3	1.5
Pre-requisite	Analog Circuits Lab, Digital Logic Design Lab	Semester	IV		
Course Objectives:					
The objective of the course is to learn design, testing and characterizing of circuit behaviour with digital and analog ICs.					
Course Outcomes (CO):					
CO1: Understand the pin configuration of each linear/ digital IC and its functional diagram. CO2: Conduct the experiment and obtain the expected results. CO3: Analyze the given circuit/designed circuit and verify the practical observations with the analyzed results. CO4: Design the circuits for the given specifications using linear and digital ICs. CO5: Acquaintance with lab equipment about the operation and its use.					
List of Experiments:					
PART – I: Linear IC Experiments					
1. OP AMP Applications – Adder, Subtractor, Comparators. 2. Integrator and Differentiator Circuits using IC 741. 3. Active Filter Applications – LPF, HPF (first order) 4. IC 741 Waveform Generators – Sine, Square wave and Triangular waves. 5. IC 555 Timer – Monostable and Astable Multivibrator Circuits. 6. Schmitt Trigger Circuits – using IC 741 7. IC 565 – PLL Applications. 8. Voltage Regulator using IC 723, Three Terminal Voltage Regulators – 7805, 7809, 7912.					
PART – II: Digital IC Applications					
1. 3-8 decoder using 74138 2. 4-bit comparator using 7485. 3. 8*1 Multiplexer using 74151 and 2*4 Demultiplexer using 74155. 4. D, JK Flip Flops using 7474, 7483. 5. Decade counter using 7490. 6. UP/DOWN counter using 74163 7. Universal shift registers using 74194/195. 8. RAM (16*4) using 74189 (Read and Write operations).					
Note: At least 12 experiments shall be performed.					
References:					
1. D. Roy Choudhury, Shail B. Jain, “Linear Integrated Circuit”, 4th edition (2012), New Age International Pvt.Ltd., New Delhi, India 2. Ramakant A. Gayakwad, “OP-AMP and Linear Integrated Circuits”, 4th edition (2012), Prentice Hall / Pearson Education, New Delhi. 3. Floyd, Jain, “Digital Fundamentals”, 8th edition (2009), Pearson Education, New Delhi.					
Online Learning Resources/Virtual Labs:					
https://www.vlab.co.in/					



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Electronics & Communication Engineering

Course Code	Soft Skills		L	T	P	C
20A52401			1	0	2	2
Pre-requisite	NIL	Semester	IV			
Course Objectives:						
<ul style="list-style-type: none"> To encourage all round development of the students by focusing on soft skills To make the students aware of critical thinking and problem-solving skills To develop leadership skills and organizational skills through group activities To function effectively with heterogeneous teams 						
Course Outcomes (CO):						
By the end of the program students should be able to						
<ul style="list-style-type: none"> Memorize various elements of effective communicative skills Interpret people at the emotional level through emotional intelligence apply critical thinking skills in problem solving analyse the needs of an organization for team building Judge the situation and take necessary decisions as a leader Develop social and work-life skills as well as personal and emotional well-being 						
UNIT – I	Soft Skills & Communication Skills				10 Hrs	
Introduction, meaning, significance of soft skills – definition, significance, types of communication skills - Intrapersonal & Inter-personal skills - Verbal and Non-verbal Communication						
Activities:						
Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self- expression – articulating with felicity (The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)						
Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.						
Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.						
Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation						
UNIT – II	Critical Thinking				10 Hrs	
Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking						
Activities:						
Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues – placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis						
UNIT – III	Problem Solving & Decision Making				10 Hrs	
Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Methods of decision making – Effective decision making in teams – Methods & Styles						
Activities:						
Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision. Case Study & Group Discussion						



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UNIT – IV	Emotional Intelligence & Stress Management	10 Hrs
Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips		
Activities: Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations. Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates		
UNIT – V	Leadership Skills	10 Hrs
Team-Building – Decision-Making – Accountability – Planning – Public Speaking – Motivation – Risk-Taking - Team Building - Time Management		
Activities: Forming group with a consensus among the participants- choosing a leader- encouraging the group members to express views on leadership- democratic attitude- sense of sacrifice – sense of adjustment – vision – accommodating nature- eliciting views on successes and failures of leadership using the past knowledge and experience of the participants, Public Speaking, Activities on Time Management, Motivation, Decision Making, Group discussion etc.		
NOTE:- 1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill. 2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear or for good Leadership – Mahendar Singh Dhoni etc.		
Textbooks:		
1. Personality Development and Soft Skills (English, Paperback, Mitra Barun K.)Publisher: Oxford University Press; Pap/Cdr edition (July 22, 2012) 2. Personality Development and Soft Skills: Preparing for Tomorrow, <u>Dr Shikha Kapoor</u> Publisher : I K International Publishing House; 0 edition (February 28, 2018)		
Reference Books:		
1. Soft skills: personality development for life success by Prashant Sharma, BPB publications 2018. 2. Soft Skills By Alex K. Published by S.Chand 3. Soft Skills: An Integrated Approach to Maximise Personality Gajendra Singh Chauhan, Sangeetha Sharma Published by Wiley. 4. Communication Skills and Soft Skills (Hardcover, A. Sharma) Publisher: Yking books 5. SOFT SKILLS for a BIG IMPACT (English, Paperback, RenuShorey) Publisher: Notion Press 6. Life Skills Paperback English Dr. Rajiv Kumar Jain, Dr. Usha Jain Publisher: Vayu Education of India		
Online Learning Resources:		
1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q 2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KIJ 3. https://youtu.be/-Y-R9hDI7IU 4. https://youtu.be/gkLsn4ddmTs 5. https://youtu.be/2bf9K2rRWwo 6. https://youtu.be/FchfE3c2jzc		



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Course Code	Design Thinking for Innovation (Common to All branches of Engineering)		L	T	P	C
20A99401			2	1	0	0
Pre-requisite	NIL	Semester	IV			
Course Objectives:						
The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.						
Course Outcomes (CO):						
<ul style="list-style-type: none"> ● Define the concepts related to design thinking. ● Explain the fundamentals of Design Thinking and innovation ● Apply the design thinking techniques for solving problems in various sectors. ● Analyse to work in a multidisciplinary environment ● Evaluate the value of creativity ● Formulate specific problem statements of real time issues 						
UNIT - I	Introduction to Design Thinking					10 Hrs
Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.						
UNIT - II	Design Thinking Process					10 Hrs
Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brain storming, product development						
Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.						
UNIT - III	Innovation					8 Hrs
Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.						
Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.						
UNIT - IV	Product Design					8 Hrs
Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.						
Activity: Importance of modelling, how to set specifications, Explaining their own product design.						
UNIT - V	Design Thinking in Business Processes					10 Hrs
Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.						
Activity: How to market our own product, About maintenance, Reliability and plan for startup.						
Textbooks:						
1. Change by design, Tim Brown, Harper Bollins (2009)						
2. Design Thinking for Strategic Innovation, Idris Mootee, 2013, John Wiley & Sons.						
Reference Books:						



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|---|
| <ol style="list-style-type: none">1. Design Thinking in the Classroom by David Lee, Ulysses press2. Design the Future, by Shrrutin N Shetty, Norton Press3. Universal principles of design- William lidwell, kritinaholden, Jill butter.4. The era of open innovation – chesbrough.H |
|---|

Online Learning Resources:

<p>https://nptel.ac.in/courses/110/106/110106124/ https://nptel.ac.in/courses/109/104/109104109/ https://swayam.gov.in/nd1_noc19_mg60/preview</p>
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COMMUNITY SERVICE PROJECT

.....Experiential learning through community engagement

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in a 6 weeks for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
- The logbook has to be countersigned by the concerned mentor/faculty incharge.



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- Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
 - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
 - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
 - Agriculture
 - Health
 - Marketing and Cooperation
 - Animal Husbandry
 - Horticulture
 - Fisheries
 - Sericulture
 - Revenue and Survey
 - Natural Disaster Management
 - Irrigation
 - Law & Order
 - Excise and Prohibition
 - Mines and Geology
 - Energy
 - Internet
 - Free Electricity
 - Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS



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Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
- Improved ability to understand complexity and ambiguity

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

Relationship with the Institution

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

- Improved institutional commitment
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals
- New energy, enthusiasm and perspectives applied to community work
- Enhanced community-university relations.



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SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

For Engineering Students

1. **Water facilities and drinking water availability**
2. **Health and hygiene**
3. **Stress levels and coping mechanisms**
4. **Health intervention programmes**
5. **Horticulture**
6. **Herbal plants**
7. **Botanical survey**
8. **Zoological survey**
9. **Marine products**
10. **Aqua culture**
11. **Inland fisheries**
12. **Animals and species**
13. **Nutrition**
14. **Traditional health care methods**
15. **Food habits**
16. **Air pollution**
17. **Water pollution**
18. **Plantation**
19. **Soil protection**
20. **Renewable energy**
21. **Plant diseases**
22. **Yoga awareness and practice**
23. **Health care awareness programmes and their impact**
24. **Use of chemicals on fruits and vegetables**
25. **Organic farming**
26. **Crop rotation**
27. **Floury culture**
28. **Access to safe drinking water**
29. **Geographical survey**
30. **Geological survey**
31. **Sericulture**
32. **Study of species**



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33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilisation of free electricity to farmers and related issues
40. Gender ration in schooling level- observation.

Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programmes are;

Programmes for School Children

1. Reading Skill Programme (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Programme on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Programme on Socially relevant themes.

Programmes for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Womens' Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programmes on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programmes for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco



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4. Awareness on Competitive Examinations
5. Personality Development

Common Programmes

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programmes in consonance with the Govt. Departments like –
 - i. Agriculture
 - ii. Health
 - iii. Marketing and Cooperation
 - iv. Animal Husbandry
 - v. Horticulture
 - vi. Fisheries
 - vii. Sericulture
 - viii. Revenue and Survey
 - ix. Natural Disaster Management
 - x. Irrigation
 - xi. Law & Order
 - xii. Excise and Prohibition
 - xiii. Mines and Geology
 - xiv. Energy

Role of Students:

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also with the Governmental Departments. If the programme is rolled out, the District Administration could be roped in for the successful deployment of the programme.
- An in-house training and induction programme could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. Preliminary Survey (One Week)

- A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.



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- A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
- The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for the survey.

2. Community Awareness Campaigns (One Week)

- Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. Community Immersion Programme (Three Weeks)

Along with the Community Awareness Programmes, the student batch can also work with any one of the below listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programmes could be in consonance with the Govt. Departments.

4. Community Exit Report (One Week)

- During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks work to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.

Throughout the Community Service Project, a daily log-book need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.