



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



Course Code 20A54302	Complex variables and Transforms (Common to ECE & EEE)		L	T	P	C
Pre-requisite			3	0	0	3
	Functions, Differentiations and Integration	Semester	III			
Course Objectives:						
This course aims at providing the student to acquire the knowledge on the calculus of functions of complex variables. The student develops the idea of using continuous/discrete transforms.						
Course Outcomes (CO): Student will be able to						
- Understand the analyticity of complex functions and conformal mappings. - Apply cauchy's integral formula and cauchy's integral theorem to evaluate improper integrals along contours. - Understand the usage of laplace transforms, fourier transforms and z transforms. - Evaluate the fourier series expansion of periodic functions. - Understand the use of fourier transforms and apply z transforms to solve difference equations.						
UNIT - I	Complex Variable – Differentiation:		8 Hrs			
Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations, analytic functions (exponential, trigonometric, logarithm), harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method-Conformal mappings-standard and special transformations ($\sin z$, e^z , $\cos z$, z^2) Mobius transformations (bilinear) and their properties.						
UNIT - II	Complex Variable – Integration:		9 Hrs			
Line integral-Contour integration, Cauchy's integral theorem, Cauchy Integral formula, Liouville's theorem (without proof) and Maximum-Modulus theorem (without proof);power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals (around unit circle, semi circle with $f(z)$ not having poles on real axis).						
UNIT - III	Laplace Transforms		9 Hrs			
Definition-Laplace transform of standard functions-existence of Laplace Transform – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function. Differentiation and integration of transform – solving Initial value problems to ordinary differential equations with constant coefficients using Laplace transforms.						
UNIT - IV	Fourier series		8 Hrs			
Determination of Fourier coefficients (Euler's) – Dirichlet conditions for the existence of Fourier series – functions having discontinuity-Fourier series of Even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions- typical wave forms - Parseval's formula- Complex form of Fourier series.						
UNIT - V	Fourier transforms & Z Transforms:		9 Hrs			
Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form of Fourier integral. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – convolution theorem . Z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.						



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Textbooks:
1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers. 2. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India
Reference Books:
1. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers. 2. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.
Online Learning Resources:
1. nptel.ac.in/courses/111107056 2. onlinelibrary.wiley.com 3. https://onlinecourses.nptel.ac.in/noc18ma12 .



Electronics & Communication Engineering

Course Code	SIGNALS AND SYSTEMS		L	T	P	C
20A04301T			3	0	0	3
Pre-requisite	Mathematics - I	Semester	III			
Course Objectives:						
- To introduce students to the basic idea of signal and system analysis and its characterization in time and frequency domains. - To present Fourier tools through the analogy between vectors and signals. - To teach concept of sampling and reconstruction of signals. - To analyze characteristics of linear systems in time and frequency domains. - To understand Laplace and z-transforms as mathematical tool to analyze continuous and discrete-time signals and systems.						
Course Outcomes (CO):						
CO1: Understand the mathematical description and representation of continuous-time and discrete-time signals and systems. Also understand the concepts of various transform techniques.						
CO2: Apply sampling theorem to convert continuous-time signals to discrete-time signals and reconstruct back, different transform techniques to solve signals and system related problems.						
CO3: Analyze the frequency spectra of various continuous-time and discrete-time signals using different transform methods.						
CO4: Classify the systems based on their properties and determine the response of them.						
UNIT - I	Signals and Systems					
Signals & Systems: Basic definitions and classification of Signals and Systems (Continuous time and discrete time), operations on signals, Concepts of Convolution and Correlation of signals, Analogy between vectors and signals-Orthogonality, mean square error.						
UNIT - II	Fourier Series and Fourier Transform					
Fourier series: Trigonometric & Exponential, Properties of Fourier series, concept of discrete spectrum, Illustrative Problems.						
Continuous Time Fourier Transform: Definition, Computation and properties of Fourier transform for different types of signals and systems, Inverse Fourier transform. Statement and proof of sampling theorem of low pass signals, Illustrative Problems.						
UNIT - III	Laplace Transform					
Laplace Transform: Definition, ROC, Properties, Inverse Laplace transforms, the S-plane and BIBO stability, Transfer functions, System Response to standard signals, Solution of differential equations with initial conditions.						
UNIT - IV	Signal Transmission through LTI systems					
Signal Transmission through Linear Systems: Linear system, impulse response, Response of a linear system for different input signals, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time, Energy and Power spectral densities, Illustrative Problems.						
UNIT - V	DTFT & Z-Transform					
Discrete Time Fourier Transform: Definition, Computation and properties of Discrete Time Fourier transform for different types of signals and systems.						
Z-Transform: Definition, ROC, Properties, Poles and Zeros in Z-plane, The inverse Z-Transform, System analysis, Transfer function, BIBO stability, System Response to standard signals, Solution of difference equations with initial conditions. Illustrative Problems.						



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Textbooks:
1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, “Signals and Systems”, 2 nd Edition, PHI, 2009.
2. Simon Haykin and Van Veen, “Signals & Systems”, 2 nd Edition, Wiley, 2005.
Reference Books:
1. BP Lathi, “Principles of Linear Systems and Signals”, 2 nd Edition, Oxford University Press, 015.
2. Matthew Sadiku and Warsame H. Ali, “Signals and Systems A primer with MATLAB”, CRC Press, 2016.
3. Hwei Hsu, “Schaum's Outline of Signals and Systems”, 4 th Edition, TMH, 2019.



Electronics & Communication Engineering

Course Code	ELECTRICAL ENGINEERING		L	T	P	C
20A02303T			3	0	0	3
Pre-requisite	Fundamentals of Electrical Circuits	Semester	III			
Course Objectives:						
- Distinguish between classical method and Laplace transform approach in analyzing transient phenomenon in DC excitations - Understand and design the different types of filters. - To know about various characteristics of DC Generators and motors. - To know about principle of operation of a DC machine working as a generator and motor. - To understand computation and predetermination of regulation of a 1-ϕ transformer. - To know about principle of operation of three phase induction motor.						
Course Outcomes (COs):						
CO1: Able to acquire knowledge about how to determine the transient response of R-L, R-C, R-L-C series circuits for D.C and A.C excitations.						
CO2: Able to solve the problems on R L C circuits for different excitations using different approaches.						
CO3: Analyze the complex circuits of R L C circuits.						
CO4: Able to solve the problems the e.m.f. generated on DC Generator						
CO5: Able to acquire knowledge about how to determine the efficiency and regulation of single phase transformer and synchronous machine.						
UNIT - I	Transient Analysis					
Introduction, Source free R-L, R-C circuits, R-L, R-C circuits with DC, step, pulse forcing functions, Source free R-L-C circuits – under damped, over damped and critical damped cases, Response of R-L-C circuits with DC and Sinusoidal forcing functions, Relationship between bandwidth and Quality factor in R-L-C circuits – Response of R-L-C circuits using Integral-differential equation and Laplace Transform approaches for dc and sinusoidal excitations – Problem Solving.						
UNIT - II	Frequency Response					
Introduction, Series and Parallel Resonant circuits, Resonant frequency, Relationship between bandwidth and Quality factor, Variation of resonant frequency with circuit elements, Passive Filters – Low pass, High pass, band pass, band elimination filter, Network Synthesis – Foster and Cover forms of LC circuits – Problem Solving.						
UNIT - III	Two-port Networks					
Introduction, Types of two port networks, Various parameters of two port networks, Impedance, Admittance, Transmission, Hybrid parameters and their relations – Finding the two port parameters for various circuits, Concept of transformed network, Two port parameters using transformed variables – Problem solving.						
UNIT - IV	DC Machines					
<i>DC Generators:</i> Principle of operation of DC machines – EMF equation – types of generators – Magnetization and Load characteristics of DC generators <i>DC Motors:</i> Principle of operation of DC Motor, Types of Motors, Back EMF Equation, Characteristics of DC motor, Torque Equation, Three Point starter, Efficiency Calculation, Swinburne's Test and speed control.						
UNIT - V	AC Machines					
<i>Transformers:</i> Construction and principle of operation of single-phase transformer – EMF equation O.C. & S.C. tests – efficiency and regulation. <i>Induction Motors:</i> Principle and operation of three phase induction motors – Constructional details – Torque equation- slip torque characteristics. <i>Alternators:</i> Principle and operation of alternators – O.C. & S.C. tests – regulation by synchronous impedance method.						



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Textbooks:

1. William Hayt, Jack E. Kemmerly and Jamie Phillips, “Engineering Circuit Analysis”, Mc Graw Hill, 9th edition, 2019.
2. Charles Alexander & Mathew Sadiku, “Fundamentals of Electric Circuits”, 6th edition, McGraw Hill Publications, 2016.
3. I. J. Nagrath & D.P. Kothari, “Electric Machines”, 7th Edition, Tata Mc Graw Hill, 2005.

Reference Books:

1. M.E. Van Valkenberg, “Network Analysis”, 3rd Edition, Prentice Hall (India), 1980.
2. B. R. Gupta, “Fundamentals of Electric Machines”, Vandana Singhal, 3rd Edition, New age International Publishers, 2005.
3. T.K. Nagsarkar and M.S. Sukhija, “ Basic Electrical Engineering”, 3rd Edition, Oxford University Press 2017.
4. S. Kamakashiah, “Electromechanics – III”, overseas publishers Pvt. Ltd.
5. V.K. Mehta and Rohit Mehta, “Principles of Electrical Engineering”, S.Chand Publications, 2005.



Course Code	ANALOG CIRCUITS		L	T	P	C
20A04302T			3	0	0	3
Pre-requisite	Electronic Devices and Circuits, Electrical circuits	Semester	III			
Course Objectives:						
- To review analysis & design of single stage amplifiers using BJT & MOSFETs at low and high frequencies. - To understand the characteristics of Differential amplifiers, feedback and power amplifiers. - To examine the response of tuned amplifiers and multivibrators - To categorize different oscillator circuits based on the application - To design the electronic circuits for the given specifications and for a given application.						
Course Outcomes (CO):						
CO1: Understand the characteristics of differential amplifiers, feedback and power amplifiers. (L2)						
CO2: Examine the frequency response of multistage and differential amplifier circuits using BJT & MOSFETs at low and high frequencies. (L3)						
CO3: Investigate different feedback and power amplifier circuits based on the application. (L4)						
CO4: Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillator circuits. (L4)						
CO5: Evaluate the performance of different tuned amplifiers and multivibrators (L5)						
CO6: Design analog circuits for the given specifications and application. (L6)						
UNIT - I	Multistage and Differential Amplifiers		10Hrs			
Introduction – Recap of Small Signal Amplifiers, Multistage Amplifiers, Cascode amplifier, Darlington pair, the MOS Differential Pair, Small-Signal Operation of the MOS Differential Pair, The BJT Differential Pair, and other Nonideal Characteristics of the Differential Amplifier.						
UNIT - II	Frequency Response		15Hrs			
Low-Frequency Response of the CS and CE Amplifiers, Internal Capacitive Effects and the High-Frequency Model of the MOSFET and the BJT, High-Frequency Response of the CS and CE Amplifiers, High-Frequency Response of the CG and Cascode Amplifiers, High-Frequency Response of the Source and Emitter Followers, High-Frequency Response of Differential Amplifiers and Multistage amplifiers.						
UNIT - III	Feedback Amplifiers & Oscillators		12Hrs			
Feedback Amplifiers: Introduction, The General Feedback Structure, Some Properties of Negative Feedback, The Four Basic Feedback Topologies, The Feedback Voltage Amplifier (Series—Shunt), The Feedback Transconductance Amplifier (Series—Series), The Feedback Trans-resistance Amplifier (Shunt—Shunt), The Feedback Current Amplifier (Shunt—Series), Summary.						
Oscillators: General Considerations, Phase Shift Oscillator, Wien-Bridge Oscillator, LC Oscillators, Relaxation Oscillator, Crystal Oscillators, Illustrative Problems.						
UNIT - IV	Power Amplifiers		10Hrs			
Introduction, Classification of Output Stages, Class A Output Stage, Class B Output Stage, Class AB Output Stage, Biasing the Class AB Circuit, CMOS Class AB Output Stages, Power BJTs, Variations on the Class AB Configuration, MOS Power Transistors.						
UNIT - V	Tuned Amplifiers and Multivibrators		11Hrs			
Tuned Amplifiers: Basic Principle, Use of Transformers, Single Tuned Amplifiers, Amplifiers with multiple Tuned Circuits, Stagger Tuned Amplifiers.						
Multivibrators: Analysis and Design of Bistable, Monostable, and Astable Multivibrators.						



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Textbooks:

1. Adel. S. Sedra and Kenneth C. Smith, “Micro Electronic Circuits,” 6th Edition, Oxford University Press, 2011.
2. J. Millman, C Chalkias, “Integrated Electronics”, 4th Edition, McGraw Hill Education (India) Private Ltd., 2015.
3. Millman and Taub, “Pulse, Digital and Switching Waveforms”, 3rd Edition, Tata McGraw-Hill Education, 2011.

Reference Books:

1. Behzad Razavi, “Fundamentals of Micro Electronics”, Wiley, 2010.
2. Donald A Neamen, “Electronic Circuits – Analysis and Design,” 3rd Edition, McGraw Hill (India), 2019.
3. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits Theory”, 9th Edition, Pearson/Prentice Hall, 2006.
4. K.Lal Kishore, “Electronic Circuit Analysis”, 2nd Edition, B S Publications, 2008.



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Course Code	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (Common to All branches of Engineering)		L	T	P	C
20A52301			3	0	0	3
Pre-requisite	NIL	Semester	III			
Course Objectives:						
• To inculcate the basic knowledge of micro economics and financial accounting • To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost • To Know the Various types of market structure and pricing methods and strategy • To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions. • To provide fundamental skills on accounting and to explain the process of preparing financial statements						
Course Outcomes (CO):						
• Define the concepts related to Managerial Economics, financial accounting and management. • Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets • Apply the Concept of Production cost and revenues for effective Business decision • Analyze how to invest their capital and maximize returns • Evaluate the capital budgeting techniques • Develop the accounting statements and evaluate the financial performance of business entity.						
UNIT - I	Managerial Economics					
Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.						
UNIT - II	Production and Cost Analysis					
Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least-cost combination– Short run and Long run Production Function- Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale. Cost & Break-Even Analysis - Cost concepts and Cost behavior- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.						
UNIT - III	Business Organizations and Markets					
Introduction – Nature, meaning, significance, functions and advantages. Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly-Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies						
UNIT - IV	Capital Budgeting					
Introduction – Nature, meaning, significance, functions and advantages. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)						
UNIT - V	Financial Accounting and Analysis					



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Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions- Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). **Financial Analysis** - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

Reference Books:

1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

Online Learning Resources:

<https://www.slideshare.net/123ps/managerial-economics-ppt>
<https://www.slideshare.net/rossanz/production-and-cost-45827016>
<https://www.slideshare.net/darkyla/business-organizations-19917607>
<https://www.slideshare.net/balarajbl/market-and-classification-of-market>
<https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396>
<https://www.slideshare.net/ashu1983/financial-accounting>



Course Code	ORGANISATIONAL BEHAVIOUR (Common to All branches of Engineering)		L	T	P	C
20A52302			3	0	0	3
Pre-requisite	NIL	Semester	III			
Course Objectives:						
- To enable student's comprehension of organizational behavior - To offer knowledge to students on self-motivation, leadership and management - To facilitate them to become powerful leaders - To Impart knowledge about group dynamics - To make them understand the importance of change and development						
Course Outcomes (CO):						
- Define the Organizational Behaviour, its nature and scope. - Understand the nature and concept of Organizational behaviour - Apply theories of motivation to analyse the performance problems - Analyse the different theories of leadership - Evaluate group dynamics - Develop as powerful leader						
UNIT - I	Introduction to Organizational Behavior					
Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective -Understanding Individual Behaviour –Attitude -Perception - Learning – Personality.						
UNIT - II	Motivation and Leading					
Theories of Motivation- Maslow's Hierarchy of Needs - Herzberg's Two Factor Theory - Vroom's theory of expectancy – Mc Clelland's theory of needs–Mc Gregor's theory X and theory Y– Adam's equity theory – Locke's goal setting theory– Alderfer's ERG theory .						
UNIT - III	Organizational Culture					
Introduction – Meaning, scope, definition, Nature - Organizational Climate - Leadership - Traits Theory–Managerial Grid - Transactional Vs Transformational Leadership - Qualities of good Leader - Conflict Management -Evaluating Leader- Women and Corporate leadership.						
UNIT - IV	Group Dynamics					
Introduction – Meaning, scope, definition, Nature- Types of groups - Determinants of group behavior - Group process – Group Development - Group norms - Group cohesiveness - Small Groups - Group decision making - Team building - Conflict in the organization– Conflict resolution						
UNIT - V	Organizational Change and Development					
Introduction –Nature, Meaning, scope, definition and functions- Organizational Culture - Changing the Culture – Change Management – Work Stress Management - Organizational management – Managerial implications of organization's change and development						
Textbooks:						
1. Luthans, Fred, Organisational Behaviour, McGraw-Hill, 12 Th edition 2011 2. P Subba Ran, Organisational Behaviour, Himalya Publishing House 2017						
Reference Books:						
- McShane, Organizational Behaviour, TMH 2009 - Nelson, Organisational Behaviour, Thomson, 2009. - Robbins, P. Stephen, Timothy A. Judge, Organisational Behaviour, Pearson 2009. - Aswathappa, Organisational Behaviour, Himalaya, 2009						
Online Learning Resources:						
https://www.slideshare.net/Knight1040/organizational-culture-9608857s://www.slideshare.net/AbhayRajpoot3/motivation-165556714 https://www.slideshare.net/harshrastogi1/group-dynamics-159412405 https://www.slideshare.net/vanvasingla1/organizational-change-development-26565951						



Course Code	Business Environment (Common to All branches of Engineering)		L	T	P	C
20A52303			3	0	0	3
Pre-requisite	NIL	Semester	III			
Course Objectives:						
- To make the student to understand about the business environment - To enable them in knowing the importance of fiscal and monetary policy - To facilitate them in understanding the export policy of the country - To Impart knowledge about the functioning and role of WTO - To Encourage the student in knowing the structure of stock markets						
Course Outcomes (CO):						
- Define Business Environment and its Importance. - Understand various types of business environment. - Apply the knowledge of Money markets in future investment - Analyse India's Trade Policy - Evaluate fiscal and monetary policy - Develop a personal synthesis and approach for identifying business opportunities						
UNIT - I	Overview of Business Environment					
Introduction – meaning Nature, Scope, significance, functions and advantages. Types-Internal & External, Micro and Macro. Competitive structure of industries -Environmental analysis- advantages & limitations of environmental analysis& Characteristics of business.						
UNIT - II	Fiscal & Monetary Policy					
Introduction – Nature, meaning, significance, functions and advantages. Public Revenues - Public Expenditure - Evaluation of recent fiscal policy of GOI. Highlights of Budget- Monetary Policy - Demand and Supply of Money –RBI -Objectives of monetary and credit policy - Recent trends- Role of Finance Commission.						
UNIT - III	India's Trade Policy					
Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank -Balance of Payments– Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures.						
UNIT - IV	World Trade Organization					
Introduction – Nature, significance, functions and advantages. Organization and Structure - Role and functions of WTO in promoting world trade - GATT -Agreements in the Uruguay Round –TRIPS, TRIMS - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.						
UNIT - V	Money Markets and Capital Markets					
Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI – Stock Exchanges - Investor protection and role of SEBI, Introduction to international finance.						
Textbooks:						
1. Francis Cherunilam (2009), International Business: Text and Cases, Prentice Hall of India. 2. K. Aswathappa, Essentials of Business Environment: Texts and Cases & Exercises 13th Revised Edition.HPH2016						
Reference Books:						



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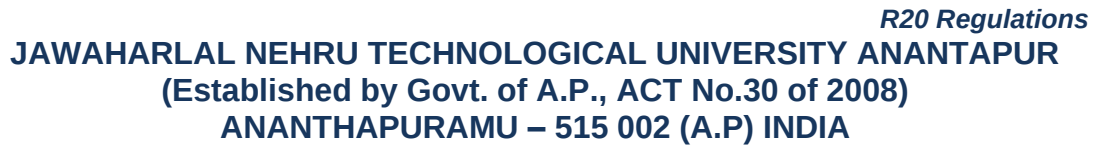
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| <ol style="list-style-type: none">1.K. V. Sivayya, V. B. M Das (2009), Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.2. Sundaram, Black (2009), International Business Environment Text and Cases, Prentice Hall of India, New Delhi, India.3. Chari. S. N (2009), International Business, Wiley India.4.E. Bhattacharya (2009), International Business, Excel Publications, New Delhi. |
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Online Learning Resources:

https://www.slideshare.net/ShompaDhali/business-environment-53111245 https://www.slideshare.net/rbalsells/fiscal-policy-ppt https://www.slideshare.net/aguness/monetary-policy-presentationppt https://www.slideshare.net/DaudRizwan/monetary-policy-of-india-69561982 https://www.slideshare.net/ShikhaGupta31/indias-trade-policyppt https://www.slideshare.net/viking2690/wto-ppt-60260883 https://www.slideshare.net/prateeknepal3/ppt-mo
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Course Code	SIMULATION LAB		L	T	P	C
20A04301P			0	0	3	1.5
Pre-requisite	Linear Algebra	Semester	III			
Course Objectives:						
- To realize the concepts studied in theory - To simulate various Signals and Systems through MATLAB - To apply the concepts of signals to determine their energy, power, psd etc. - To analyze the output of a system when it is excited by different types of deterministic and random signals. - To generate random signals for the given specifications						
Course Outcomes (CO):						
CO1: Learn how to use the MATLAB software and know syntax of MATLAB programming.						
CO2: Understand how to simulate different types of signals and system response.						
CO3: Find the Fourier Transform of a given signal and plot amplitude and phase characteristics.						
CO4: Analyze the response of different systems when they are excited by different signals and plot power spectral density of signals.						
CO5: Generate/Simulate different random signals for the given specifications						
List of Experiments:						
- Write a program to generate various Signals and Sequences: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc function. - Perform operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power. - Write a program to find the trigonometric & exponential Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings- Plot the discrete spectrum of the signal. - Write a program to find Fourier transform of a given signal. Plot its amplitude and phase spectrum. - Write a program to convolve two discrete time sequences. Plot all the sequences. - Write a program to find autocorrelation and cross correlation of given sequences. - Write a program to verify Linearity and Time Invariance properties of a given Continuous/Discrete System. - Write a program to generate discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal. - Write a program to find magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale. - Write a program to find response of a low pass filter and high pass filter, when a speech signal is passed through these filters. - Write a program to generate Complex Gaussian noise and find its mean, variance, Probability Density Function (PDF) and Power Spectral Density (PSD). - Generate a Random data (with bipolar) for a given data rate (say 10kbps). Plot the same for a time period of 0.2 sec. - To plot pole-zero diagram in S-plane of given signal/sequence and verify its stability.						
Note: All the experiments are to be simulated using MATLAB or equivalent software.						
References:						
Stephen J. Chapman, "MATLAB Programming for Engineers", Cengage, November 2012.						
Online Learning Resources/Virtual Labs:						
https://www.vlab.co.in/						



Course Code	ELECTRICAL ENGINEERING LAB		L	T	P	C
20A02303P			0	0	3	1.5
Pre-requisite	Fundamentals of Electrical Circuits	Semester	III			
Course Objectives:						
• Understand and experimentally verify various resonance circuits • Apply and experimentally analyze two port network parameters • To do experiments on DC Machines • To do experiments on AC Machines						
Course Outcomes (CO):						
• To determine the various parameters experimentally • To understand various characteristics of DC generators and DC motors • To predetermine the efficiency and regulation of a 1-ϕ transformer						
Experiments						
1. Response of RL, RC, and R-L-C circuits for step and pulse inputs 2. Series Resonance and its Frequency Response 3. Parallel Resonance and its Frequency Response 4. Determination of Z & Y parameters for the given two port network. 5. Determination of Transmission and Hybrid Parameters of a given two port network 6. OCC of a separately excited DC generator 7. Load characteristics of DC shunt generator 8. Load characteristics of DC shunt motor 9. Swinburne's test 10. Speed control of DC shunt motor 11. OC & SC tests on a 1-ϕ transformer 12. Load test on Squirrel cage Induction motor 13. Predetermination of regulation of alternator by Synchronous impedance method						
Note: Student has to perform at least 10 experiments						
Online learning resources/Virtual Labs: https://www.vlab.co.in/						



Course Code	ANALOG CIRCUITS LAB		L	T	P	C
20A04302P			0	0	3	1.5
Pre-requisite	Electronic Devices and Circuits lab	Semester	III			
Course Objectives:						
- To review analysis & design of single stage amplifiers using BJT & MOSFETs at low and high frequencies. - To understand the characteristics of Differential amplifiers, feedback and power amplifiers. - To examine the response of tuned amplifiers and multivibrators - To categorize different oscillator circuits based on the application - To design the electronic circuits for the given specifications and for a given application.						
Course Outcomes (CO):						
CO1: Know about the usage of equipment/components/software tools used to conduct the experiments in analog circuits.						
CO2: Conduct the experiment based on the knowledge acquired in the theory about various analog circuits using BJT/MOSFETs to find the important parameters of the circuit (viz. Voltage gain, Current gain, bandwidth, input and output impedances etc) experimentally.						
CO3: Analyze the given analog circuit to find required important metrics of it theoretically.						
CO4: Draw the relevant graphs between important metrics of the system from the observed measurements.						
CO5: Compare the experimental results with that of theoretical ones and infer the conclusions.						
CO6: Design the circuit for the given specifications.						
List of Experiments:						
- Design and Analysis of Darlington pair. - Frequency response of CE – CC multistage Amplifier - Design and Analysis of Cascode Amplifier. - Frequency Response of Differential Amplifier - Design and Analysis of Series – Series feedback amplifier and find the frequency response of it. - Design and Analysis of Shunt – Shunt feedback amplifier and find the frequency response of it. - Design and Analysis of Class A power amplifier - Design and Analysis of Class AB amplifier - Design and Analysis of RC phase shift oscillator - Design and Analysis of LC Oscillator - Frequency Response of Single Tuned amplifier - Design and Analysis of Bistable Multivibrator - Design and Analysis of Monostable Multivibrator - Design and Analysis of Astable Multivibrator						
Note: At least 12 experiments shall be performed. Both BJT and MOSFET based circuits shall be implemented. Faculty members who are handling the laboratory shall see that students are given design specifications for a given circuit appropriately and monitor the design and analysis aspects of the circuit.						
Online learning resources/Virtual labs: https://www.vlab.co.in/						



Course Code	Application Development with Python		L	T	P	C
20A05305			1	0	2	2
Pre-requisite	NIL	Semester	III			

Course Objectives:

- To learn the basic concepts of software engineering and life cycle models
- To explore the importance of Databases in application Development
- Acquire programming skills in core Python
- To understand the importance of Object-oriented Programming

Course Outcomes (CO):

Students should be able to

- Identify the issues in software requirements specification and enable to write SRS documents for software development problems
- Explore the use of Object oriented concepts to solve Real-life problems
- Design database for any real-world problem
- Solve mathematical problems using Python programming language

Module 1. Basic concepts in software engineering and software project management

Basic concepts: abstraction versus decomposition, the evolution of software engineering techniques, Software development life cycle
 Software project management: project planning and project scheduling

Task:

- [Identifying the Requirements from Problem Statements](#)

Module 2. Basic Concepts of Databases

Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Relational Databases, Data Definition Language(DDL) Statements: (Create table, Alter table, Drop table), Data Manipulation Language(DML) Statements

Task:

- Implement [Data Definition Language\(DDL\) Statements: \(Create table, Alter table, Drop table\)](#)
- Implement [Data Manipulation Language\(DML\) Statements](#)

Module 3. Python Programming:

Introduction to Python: Features of Python, Data types, Operators, Input and output, Control Statements, Looping statements

Python Data Structures: Lists, Dictionaries, Tuples.

Strings: Creating strings and basic operations on strings, string testing methods.

Functions: Defining a function- Calling a function- Types of functions-Function Arguments- Anonymous functions- Global and local variables

OOPS Concepts; Classes and objects- Attributes- Inheritance- Overloading- Overriding- Data hiding

Modules and Packages: Standard modules-Importing own module as well as external modules
 Understanding Packages Powerful Lamda function in python Programming using functions, modules and external packages



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Working with Data in Python: Printing on screen- Reading data from keyboard- Opening and closing file- Reading and writing files- Functions-Loading Data with Pandas-Numpy

Tasks:

1. OPERATORS

- a. Read a list of numbers and write a program to check whether a particular element is present or not using membership operators.
- b. Read your name and age and write a program to display the year in which you will turn 100 years old.
- c. Read radius and height of a cone and write a program to find the volume of a cone.
- d. Write a program to compute distance between two points taking input from the user (Hint: use Pythagorean theorem)

2. CONTROL STRUCTURES

- a. Read your email id and write a program to display the no of vowels, consonants, digits and white spaces in it using if...elif...else statement.
- b. Write a program to create and display a dictionary by storing the antonyms of words. Find the antonym of a particular word given by the user from the dictionary using while loop.
- c. Write a Program to find the sum of a Series $1/1! + 2/2! + 3/3! + 4/4! + \dots + n/n!$. (Input :n = 5, Output : 2.70833)
- d. In number theory, an abundant number or excessive number is a number for which the sum of its proper divisors is greater than the number itself. Write a program to find out, if the given number is abundant. (Input: 12, Sum of divisors of 12 = 1 + 2 + 3 + 4 + 6 = 16, sum of divisors 16 > original number 12)

3: LIST

- a. Read a list of numbers and print the numbers divisible by x but not by y (Assume x = 4 and y = 5).
- b. Read a list of numbers and print the sum of odd integers and even integers from the list.(Ex: [23, 10, 15, 14, 63], odd numbers sum = 101, even numbers sum = 24)
- c. Read a list of numbers and print numbers present in odd index position. (Ex: [10, 25, 30, 47, 56, 84, 96], The numbers in odd index position: 25 47 84).
- d. Read a list of numbers and remove the duplicate numbers from it. (Ex: Enter a list with duplicate elements: 10 20 40 10 50 30 20 10 80, The unique list is: [10, 20, 30, 40, 50, 80])

4: TUPLE

- a. Given a list of tuples. Write a program to find tuples which have all elements divisible by K from a list of tuples. test_list = [(6, 24, 12), (60, 12, 6), (12, 18, 21)], K = 6, Output : [(6, 24, 12), (60, 12, 6)]
- b. Given a list of tuples. Write a program to filter all uppercase characters tuples from given list of tuples. (Input: test_list = [(“GFG”, “IS”, “BEST”), (“GFg”, “AVERAGE”), (“GfG”,), (“Gfg”, “CS”)], Output : [(„GFG“, „IS“, „BEST“)]).
- c. Given a tuple and a list as input, write a program to count the occurrences of all items of the list in the tuple. (Input : tuple = ('a', 'a', 'c', 'b', 'd'), list = ['a', 'b'], Output : 3)

5: SET

- a. Write a program to generate and print a dictionary that contains a number (between 1 and n) in the form (x, x*x).
- b. Write a program to perform union, intersection and difference using Set A and Set B.
- c. Write a program to count number of vowels using sets in given string (Input : “Hello World”, Output: No. of vowels : 3)
- d. Write a program to form concatenated string by taking uncommon characters from two strings using set concept (Input : S1 = "aacdb", S2 = "gafd", Output : "cbgfi").



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6: DICTIONARY

- a. Write a program to do the following operations:
 - i. Create a empty dictionary with dict() method
 - ii. Add elements one at a time
 - iii. Update existing key's value
 - iv. Access an element using a key and also get() method
 - v. Deleting a key value using del() method
- b. Write a program to create a dictionary and apply the following methods:
 - i. pop() method
 - ii. popitem() method
 - iii. clear() method
- c. Given a dictionary, write a program to find the sum of all items in the dictionary.
- d. Write a program to merge two dictionaries using update() method.

7: STRINGS

- a. Given a string, write a program to check if the string is symmetrical and palindrome or not. A string is said to be symmetrical if both the halves of the string are the same and a string is said to be a palindrome string if one half of the string is the reverse of the other half or if a string appears same when read forward or backward.
- b. Write a program to read a string and count the number of vowel letters and print all letters except 'e' and 's'.
- c. Write a program to read a line of text and remove the initial word from given text. (Hint: Use split() method, Input : India is my country. Output : is my country)
- d. Write a program to read a string and count how many times each letter appears. (Histogram).

8: USER DEFINED FUNCTIONS

- a. A generator is a function that produces a sequence of results instead of a single value. Write a generator function for Fibonacci numbers up to n.
- b. Write a function merge_dict(dict1, dict2) to merge two Python dictionaries.
- c. Write a fact() function to compute the factorial of a given positive number.
- d. Given a list of n elements, write a linear_search() function to search a given element x in a list.

9: BUILT-IN FUNCTIONS

- a. Write a program to demonstrate the working of built-in statistical functions mean(), mode(), median() by importing statistics library.
- b. Write a program to demonstrate the working of built-in trigonometric functions sin(), cos(), tan(), hypot(), degrees(), radians() by importing math module.
- c. Write a program to demonstrate the working of built-in Logarithmic and Power functions exp(), log(), log2(), log10(), pow() by importing math module.
- d. Write a program to demonstrate the working of built-in numeric functions ceil(), floor(), fabs(), factorial(), gcd() by importing math module.

10. CLASS AND OBJECTS

- a. Write a program to create a BankAccount class. Your class should support the following methods for
 - i) Deposit
 - ii) Withdraw
 - iii) GetBalance
 - iv) PinChange
- b. Create a SavingsAccount class that behaves just like a BankAccount, but also has an interest rate and a method that increases the balance by the appropriate amount of interest (Hint:use Inheritance).



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- c. Write a program to create an employee class and store the employee name, id, age, and salary using the constructor. Display the employee details by invoking employee_info() method and also using dictionary (__dict__).
- d. Access modifiers in Python are used to modify the default scope of variables. Write a program to demonstrate the 3 types of access modifiers: public, private and protected.

11. FILE HANDLING

- a. . Write a program to read a filename from the user, open the file (say firstFile.txt) and then perform the following operations:
- i. Count the sentences in the file.
 - ii. Count the words in the file.
 - iii. Count the characters in the file.
- b. . Create a new file (Hello.txt) and copy the text to other file called target.txt. The target.txt file should store only lower case alphabets and display the number of lines copied.
- c. Write a Python program to store N student"s records containing name, roll number and branch. Print the given branch student"s details only.

References:

1. Rajib Mall, "Fundamentals of Software Engineering", 5th Edition, PHI, 2018.
2. RamezElmasri, Shamkant, B. Navathe, "Database Systems", Pearson Education, 6th Edition, 2013.
3. Reema Thareja, "Python Programming - Using Problem Solving Approach", Oxford Press, 1st Edition, 2017.
4. Larry Lutz, "Python for Beginners: Step-By-Step Guide to Learning Python Programming", CreateSpace Independent Publishing Platform, First edition, 2018

Online Learning Resources/Virtual Labs:

1. <http://vlabs.iitkgp.ernet.in/se/>
2. <http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php>
3. <https://python-iitk.vlabs.ac.in>



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Course Code	UNIVERSAL HUMAN VALUES (Common to all branches of Engineering)		L	T	P	C
20A52201			3	0	0	0
Pre-requisite	NIL	Semester	III			
Course Objectives:						
The objective of the course is fourfold: • Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence. • Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence • Strengthening of self-reflection. • Development of commitment and courage to act.						
Course Outcomes (CO):						
By the end of the course, • Students are expected to become more 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. • They would have better critical ability. • They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). • It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.						
UNIT - I	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education					8 Hrs
Purpose and motivation for the course, recapitulation from Universal Human Values-I Self-Exploration-what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation-as the process for self-exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking						
UNIT - II	Understanding Harmony in the Human Being - Harmony in Myself!					12 Hrs
Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’ Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer) Understanding the characteristics and activities of ‘I’ and harmony in ‘I’ Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one’s own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease						
UNIT - III	Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship					8 Hrs



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Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship Understanding the meaning of Trust; Difference between intention and competence Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives		
UNIT – IV	Understanding Harmony in the Nature and Existence - Whole existence as Coexistence	10 Hrs
Understanding the harmony in the Nature Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature Understanding Existence as Co-existence of mutually interacting units in all- pervasive space Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc.		
UNIT – V	Implications of the above Holistic Understanding of Harmony on Professional Ethics	8 Hrs
Natural acceptance of human values Definitiveness of Ethical Human Conduct Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.		
Textbooks:		
R R Gaur, R Asthana, G P Bagaria, “A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1 R R Gaur, R Asthana, G P Bagaria, “Teachers’ Manual for A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2		
Reference Books:		
Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantik, 1999. A. N. Tripathi, “Human Values”, New Age Intl. Publishers, New Delhi, 2004. The Story of Stuff (Book). 4. Mohandas Karamchand Gandhi “The Story of My Experiments with Truth” 5. E. F.Schumacher. “Small is Beautiful” Slow is Beautiful –Cecile Andrews J C Kumarappa “Economy of Permanence”		



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Pandit Sunderlal “Bharat Mein Angreji Raj”
Dharampal, “Rediscovering India”
Mohandas K. Gandhi, “Hind Swaraj or Indian Home Rule”
India Wins Freedom - Maulana Abdul Kalam Azad
Vivekananda - Romain Rolland(English)
Gandhi - Romain Rolland (English)

MODE OF CONDUCT

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions. While analyzing and discussing the topic, the faculty mentor’s role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one’s own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up “ordinary” situations rather than “extra-ordinary” situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practicals are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.



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:						
- 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):						
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)						
CO2: Formulate and solve the engineering problems involving random variables and random processes. (L2)						
CO3: Analyze various probability density functions of random variables. (L3)						
CO4: Derive the response of linear system for Gaussian noise and random signals as inputs. (L3)						
UNIT - I	Probability & Random Variable					
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.						
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.						
UNIT - II	Operations on Random variable					
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.						
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.						
UNIT - III	Operations on Multiple Random variables					
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.						
UNIT - IV	Random Processes					
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-						



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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.

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:						
- 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- a-head 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", 2nd 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 20A04401	ELECTROMAGNETIC WAVES AND TRANSMISSION LINES		L 3	T 0	P 0	C 3
Pre-requisite			Mathematics II and Mathematics III		Semester IV	
Course Objectives:						
• 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
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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.



Course Code	COMMUNICATION SYSTEMS		L	T	P	C
20A04402T			3	0	0	3
Pre-requisite	Signals & Systems	Semester	IV			
Course Objectives:						
- 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:						
• 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:						
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 and 7 Segment LED and test it.						
ADD on Experiments:						
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:						
- To understandthe 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):						
CO1: Know about the usage of equipment/components/software tools used to conduct the experiments in analog and digital modulation techniques.						
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.						
CO3: Analyze the performance of a given modulation scheme to find the important metrics of the system theoretically.						
CO4: Draw the relevant graphs between important metrics of the system from the observed measurements.						
CO5: Compare the experimental results with that of theoretical ones and infer the conclusions.						
List of Experiments:						
Design the circuits and verify the following experiments taking minimum of six from each section shown below.						
Section-A						
1. AM Modulation and Demodulation 2. DSB-SC Modulation and Demodulation 3. Frquency 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						
Section-B						
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						
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.						
Online learning resources/virtual labs: https://www.vlab.co.in/						
Course Code			L	T	P	C



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/						



Course Code	Soft Skills		L	T	P	C
20A52401			1	0	2	2
Pre-requisite	NIL	Semester	IV			
Course Objectives:						
- 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						
- 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_2iUCG87CQhELCyvXh0E_v-bOO1_q 2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ 3. https://youtu.be/-Y-R9hDI7IU 4. https://youtu.be/gkLsn4ddmTs 5. https://youtu.be/2bf9K2rRWwo 6. https://youtu.be/FchfE3c2jzc		



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):						
- 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 |
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Online Learning Resources:

https://nptel.ac.in/courses/110/106/110106124/ https://nptel.ac.in/courses/109/104/109104109/ https://swayam.gov.in/nd1_noc19_mg60/preview
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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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(Established by Govt. of A.P., ACT No.30 of 2008)
ANANTHAPURAMU – 515 002 (A.P) INDIA

Electronics & Communication Engineering

- 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. Flours 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.