Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Technology

(*An Autonomous Institute affiliated to Savitribai Phule Pune University*)

Structure & Syllabus of

S. Y. B. Tech.

(Electronics Engineering)

Pattern 'B-19'

Academic Year 2019-20

Prepared by: - Board of Studies in Electronics Engineering

Approved by: - Academic Board, Vishwakarma Institute of Technology, Pune

Signed by

Chairman – Board Of Studies **Chairman – Academic Board**

Institute Vision:

To be a globally acclaimed Institute in Technical Education and Research for holistic Socio-economic development

Institute Mission:

- To ensure that 100% students are employable and employed in Industry, Higher Studies, Become Entrepreneurs, Civil Defense Services / Govt. Jobs and other areas like sports and Theatre.
- To strengthen Academic Practices in terms of Curriculum, Pedagogy, Assessment and Faculty Competence.
- To promote Research Culture amongst Students and Faculty through Projects and Consultancy.
- To make students Socially Responsible Citizen.

Department Vision:

To be an acclaimed department for creating quality engineers imbibed with a spirit of professionalism and social responsibility.

Department Mission:

- To prepare competent professionals to meet current and future demands of industry, academia and society through rigorous curriculum
- To strengthen collaboration with industries and institutes of national and international repute to instill global insight
- To inculcate spirit of research and entrepreneurship amongst the students

Program Educational Objectives (PEOs):

Graduates of the program will

- Have comprehensive knowledge of Electronics engineering fundamentals to face the challenges of real life complex problems
- Be professionals imbibed with a spirit of leadership, ethical behavior and societal commitment
- Be compliant to constantly evolving technology through lifelong learning

Program Outcomes:

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and

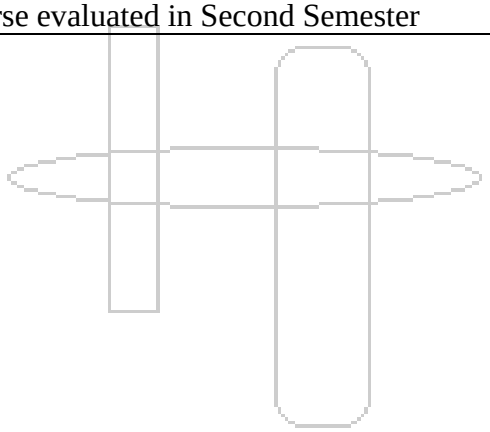
design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Objectives (PSOs)

Electronics Graduates will have Ability to:

1. Analyze analog, digital signals and circuits.
2. Develop algorithms for embedded, networking and signal processing applications.
3. Design electronics systems in compliance with design standards and safety regulations.



Vishwakarma Institute of Technology													Issue 1: Rev No. 1: Dt. 01/07/18
Title: Course Structure													FF No. 653
Branch: Electronics Engineering		SY B.Tech		Academic Year: 2019-20			Semester		Module: III			Pattern: B-19	
Sr. No.	Subject Code	Subject Name	Teaching Scheme (Hrs/Week)			Examination scheme							Credits
			Theory	Lab	Tut	CA			MSE	ESA		Total	
						HA	LAB	GD/PPT		ESE	VIVA		
1	ET2101	Electronic Circuits	3	2		10	30	10	15	15	20	100	4
2	ET2003	Network Theory	3	2		10	30	10	15	15	20	100	4
3	ET2005	Signals & Systems	3	2		10	30	10	15	15	20	100	4
4	ET2002	Data Structures and Algorithms	3	2		10	30	10	15	15	20	100	4
5	ET2111	Probability & Random Variables	2	-		20	-	-	30	30	20	100	2
6	ET2016	Engineering Design & Innovation 1	2	4									4
Total													22

Vishwakarma Institute of Technology													Issue 1: Rev No. 1: Dt. 01/07/18
Title: Course Structure													FF No. 653
Branch: Electronics Engineering		SY B.Tech		Academic Year: 2019-20			Semester		Module: IV			Pattern: B-19	
Sr. No.	Subject Code	Subject Name	Teaching Scheme (Hrs/Week)			Examination scheme							Credits
			Theory	Lab	Tut	CA			MSE	ESA		Total	
						HA	LAB	GD/PPT		ESE	VIVA		
1	ET2007	Control Systems	3	2		10	30	10	15	15	20	100	4
2	ET2004	Communication Engineering	3	2		10	30	10	15	15	20	100	4
3	ET2006	Electromagnetic Engineering	3	2		10	30	10	15	15	20	100	4
4	ET2015	Digital Systems	3	2		10	30	10	15	15	20	100	4
5	ET2012	Multivariate Data Analysis	2	-		20	-	-	30	30	20	100	2
6	ET2017	Engineering Design &Innovation 2	2	4									4
	ET2014	**General Proficiency 2											
Total													22

(**) Audit Course evaluated in second semester

Abbreviations Used	
CA	Continuous Assessment
HA	Home Assignment
MSE	Mid Semester Examination
ESE	End Semester Examination
ESA	End Semester Assessment
GD/PPT	Group Discussion /Power Point Presentation

FF No.: 654

Course Code: ET2001 **Course Name: Electronic Circuits**

Credits: 4 **Teaching Scheme: 3 Hours / Week**

Lab: 2 Hours / Week

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Section 1:

Drift, diffusion, Conductivity, Mobility, Mass action law, ,Potential across Graded semiconductor, Open circuited step graded junction, PN junction diode, Forward and reverse biased diode operation, V-I characteristic equation of diode, Temperature dependence of V-I characteristics, Forward and reverse dynamic resistance, Small signal diode models, junction capacitance, analysis of diode circuits like clippers clampers, rectifiers, voltage regulators.

BJT as a device, Construction, typical junction voltages for cutoff, active and saturation regions, concept of amplification, BJT configurations(CE, CB, CC), Input and output characteristics, applications of CE, CB, CC and comparison, their suitability in cascaded stages, small signal-low frequency h-parameter model, Variation of h-parameters with operating point

DC analysis of BJT circuits, Concept of load line, BJT biasing: Fixed bias, voltage divider bias, collector to base bias Determination of Q point

Section 2:

AC Analysis of CE, CC, CB configuration for performance parameters in terms of h parameters, Comparison of performance parameters in CE, CC and CB configurations

Introduction to JFET, I-V Characteristics, MOS capacitor,), Cut-off & Pinch-off voltages, Transconductance, Input resistance & Capacitance, MOS capacitor, concept of accumulation, depletion and inversion, Types of MOSFET, I-V characteristics, drain current equation, Channel length modulation, Non ideal characteristics

JFET/ MOSFET biasing, DC analysis of FET circuits, FET small signal AC equivalent model, AC Analysis of CS, CD , CG amplifiers for performance parameters

List of Practicals:

1. Clipper circuits
2. Clamper circuits
3. Diode rectifiers
4. JFET characteristics
5. JFET biasing
6. MOSFET as a switch
7. BJT Characteristics

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8. BJT as a switch
9. BJT CE Amplifier
10. BJT CC amplifier

List of Project areas:

1. BJT as a switch
2. Cascaded amplifier
3. Unregulated power supply
4. Regulated power supply
5. MOSFET applications

Text Books

1. Integrated Electronics, Millman Halkias, Tata McGraw Hill
2. Electronic Devices, Thomas L. Floyd, Pearson Education

Reference Books

1. Solid State Electronic Devices, B.G. Streetman, PHI, New Delhi.
2. Electronic Devices & Circuit Theory, R. L. Boylestad, L. Nashelsky, PHI, New Delhi.

Course Outcomes:

Students will be able to

1. Elaborate operation and characteristics of semiconductor diodes
2. Analyze diode circuits
3. Compare BJT configurations
4. Elaborate operation and characteristics of FET
5. Analyze BJT/ FET circuits to find Q point
6. Analyze BJT/ FET amplifiers to find amplifier parameters

FF No. : 654

Course Code: ET2003 **Course Name: Network Theory**

Credits: 4 **Teaching Scheme: 3 Hours / Week**

Lab: 2 Hours / Week

Section 1:

Network Theorems: Superposition, Thevenin's Norton's and Maximum Power transfer Theorems. (DC and AC)

Concept of Network Topology, Terms used in Topology, Relation between Twigs and Links Properties of a Tree in a Graph, Formation of Incidence Matrix [Ai], number of tree in Graph. Cut –Set Matrix, Network Equilibrium Equation.

Terminal characteristics of network: Z, Y, h, ABCD Parameters; Reciprocity & Symmetry conditions, Interrelation of Parameters, interconnection of parameters. Network functions for one port and two port networks. Pole-zeros of network functions and network stability

Section 2:

Classifications: Symmetrical and Asymmetrical networks. Properties of two port Network: Symmetrical Networks (T and Π only). Z0 and γ in terms of circuit components, open and short circuit parameters, Filter fundamentals, Constant K -LPF, HPF, BPF and BSF, m derived LPF and HPF, introduction to Neper and Decibel, Relation between Neper and Decibel, Symmetrical T and Π type attenuators, Lattice attenuator, Bridge T-attenuator. Asymmetrical Networks: Image Impedance and Iterative Impedance (L-Section only).Terminating half sections, Asymmetrical L- type.

Transient response of passive circuits, transient response of series RL, RC and RLC circuits with DC and sinusoidal excitation

Significance of Quality factor, Series Resonance: Impedance, Phase angle variations with frequency, Voltage and current variation with frequency, Bandwidth, Selectivity Resonant frequency and admittance variation with frequency, Bandwidth and selectivity. Magnification factor, Parallel resonance: General case: Resistance present in both branches

List of Practicals:

1. To study and verify the Thevenin's Theorem and Norton's Theorem,
2. To study the Superposition Theorem and Maximum Power Transfer Theorem
3. To Measure and Verify of Z, Y, Parameters of a Two-port Network
4. To determine equivalent parameters of parallel connection of two-port network.
5. To find critical frequencies (poles and zeros) of LC impedance driving point function.
6. To study the operation of low pass and high pass prototype filters.
7. To study the operation of band pass and band stop prototype filters

8. To study of T –type and π- type attenuator.
9. To study the transient response of a RL and RC circuit
10. To study the frequency response of a RLC series circuit

List of Projects:

1. Design Passive Prototype Low pass filter having cut-off frequency 2 KHz with design impedance 600 Ω in T and π section. Select frequency range up to 1 MHz with input voltage 5V
2. Design Passive Prototype High pass filter having cut-off frequency 10 KHz with design impedance 600 Ω in T and π section. Select frequency range up to 1 MHz with input voltage 5V
3. Design Passive Prototype Band pass filter having cut-off frequencies 3000 Hz and 6000Hz with design impedance 600 Ω in T and π section. Select frequency range up to 1 MHz with input voltage 5V
4. Design Passive Prototype Band pass filter having cut-off frequencies 2000 Hz and 5000Hz with design impedance 600 Ω in T and π section. Select frequency range up to 1 MHz with input voltage 5V
5. Design a π-type attenuator to give attenuation of 20 dB and characteristic resistance of 500 Ω.
6. Design a T-type attenuator to give attenuation of 20 dB and characteristic resistance of 500 Ω

Text Books:

1. *"Circuit Theory (Analysis and Synthesis)",Chakrabarti, Dhanpat Rai and Co.*
2. *"Electrical Networks", Ravish R Singh, Tata Mc-Graw Hill*

Reference Books:

1. *"Network Analysis", Van Valkenberg, PHI*
2. *"Kuo F. F., "Network Analysis and Synthesis", 2nd Ed., Wiley India.*
3. *"Engineering Circuit Analysis, Hayt W. H., Kemmerly J. E. and Durbin S. M., 6th Ed., Tata McGraw-Hill Publishing Company Ltd*

Course Outcomes:

The students will be able to

1. Simplify networks and circuits using network theorems and graph theory.
2. Simplify networks and circuits using graph theory and Network Topology.
3. Find network parameters and network function.
4. Design Attenuators and filters.
5. Analyze RL, RC and RLC Circuits using steady state and transient response.
6. Analyze Resonance Circuits.

FF No. : 654

Course Code: ET2005 **Course Name: Signals and Systems**

Credits: 4 **Teaching Scheme: 3 Hours / Week**

Lab: 2 Hours / Week

Section 1:

Introduction to signals and systems, signal classification, elementary signals, signal operations on dependent and independent variables, sampling theorem. Classification of systems, time domain analysis of LTI systems: convolution integral, convolution sum, correlation. Continuous time Fourier series: Trigonometric, exponential form of Fourier series, Frequency spectrum of CT periodic signals, Gibbs phenomenon.

Section 2:

Continuous time Fourier transform, existence of Fourier transform, properties, system analysis using Fourier transform. Introduction to energy spectral density (ESD) and power spectral density (PSD). Discrete time Fourier transform, discrete frequency spectrum, analysis of discrete-time LTI systems using DFT. Laplace transform, region of convergence, properties, Pole-zero plots, inverse Laplace transform, circuit analysis using Laplace transform.

List of Practicals (Any Six):

1. To generate different continuous time and discrete time signals like sinusoidal signal, ramp signal, step signals, exponential signal etc.
2. To perform different operations on the signals.
3. To find the response of a given discrete time system to any arbitrary discrete time input signal
4. To perform Fourier analysis of the given signal to find the spectral components.
5. To find autocorrelation and cross correlation of given sequences.
6. Generate a discrete time sequence by sampling the given continuous time signal by varying the sampling frequency and to observe the aliasing.
7. To obtain the step response and impulse response of the given system.
8. To analyze the given discrete time signal in frequency domain using DFT.
9. To obtain ESD and/or PSD of a given signal.
10. To perform the pole-zero analysis of the given system using Laplace Transform

List of Projects (Any One):

1. To separate voiced/unvoiced/silence part of the speech signal.
2. Design a MATLAB app to generate different continuous and discrete time signals and to plot their spectra.

3. Design a MATLAB app for Fourier series synthesis of different signals.
4. ECG signal Analysis
5. Isolated word recognition using correlation
6. Generation of different audio effects like echo, reverberation flanger etc.
7. Analysis of given CT-LTI system using Laplace transform
8. Analysis of different musical instruments (air instruments like harmonium, flute)
9. Analysis of different musical instruments (string instruments like guitar, sitar)

Text Books:

1. *Alan V. Oppenheim, Alan S. Wiisky and S. Hamid Nawab, "Signals and systems," Pearson Education, 2004.*
2. *Ramesh Babu and Anandnatarajan, "Signals and Systems," Scitech Publication, Fourth Edition.*

Reference Books:

1. *Haykin Simon and Veen Barry Van, "Signals and Systems," New York. John Wiley & Sons.*
2. *Roberts Michael J, "Signals and Systems," Tata McGraw Hill Publishing Company Limited, 2003.*
3. *A. Nagoor Kani, "Signals and Systems," McGraw Hill, 2013.*

Course Outcomes:

The student will be able to –

1. Perform operations on dependent and independent variable of one dimensional signals Synthesize the signal using elementary signals
2. Classify the systems and determine response of given CT/DT LTI system to any arbitrary input using convolution integral/sum
3. Analyze the given CT deterministic signal in spectral domain using Fourier series/transform.
4. Apply sampling theorem to obtain a discrete time signal from a continuous signal and to find the spectral components of the discrete-time signal using discrete Fourier transform (DFT).
5. Analyze the given LTI systems using Laplace transform.

FF No. : 654

Course Code: ET2002 **Course Name: Data Structures and Algorithms**

Credits: 4 **Teaching Scheme: 3 Hours / Week**

Lab: 2 Hours / Week

Section 1:

Analysis of algorithms. Asymptotic analysis, asymptotic notations, Searching and sorting algorithms. Linear Data Structures: Stack, Queue, Linked list, Expression conversion and evaluation, Generalized liked list

Section 2:

Tree, Binary search tree, Tree traversal, threaded binary tree, implementation of tree using linked list, Expression tree, application of trees, Graphs, representation of graphs, Graph traversal, minimum spanning tree and algorithms, shortest path algorithms.

List of Practicals (Any Six):

1. Implement sorting algorithms
2. Implement searching algorithms
3. Create and manipulate Database using Array
4. Create and manipulate Database using Linked List
5. Addition of two single variable polynomials using Linked List.
6. Implementation of Stacks
7. Conversion of infix expression to postfix expression and evaluation of postfix expression
8. Implementation of Queue
9. Operations on Binary Search Tree.
10. Create a graph using adjacency list

List of Projects (Any One):

Project based on

1. Dijkstra's algorithm
2. Prim's algorithm
3. Kruskal algorithm
4. Binary Trees
5. Expression trees
6. Binary heap
7. Stack and it application
8. Queue and its application
9. Linked list based project.

10. Hash tables.

Text Books:

1. Tenenbaum A M &Langsam Y: Data Structure Using C. Prentice Hall Of India, New Delhi.
2. Horowits E &Sahni S: Fundamentals of Data Structures. Gurgaon. Galgotia Book Source New Delhi.

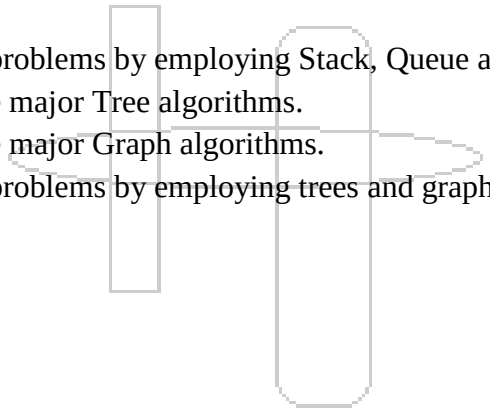
Reference Books:

1. Kruse R L, Leung B P &Tondo C L: Data Structure And Programming Design In C. Prentice Hall Of India Pvt.ltd.
2. Data Structures : Schaum Outline Series, TMH

Course Outcomes:

The student will be able to –

1. Find time complexity using Big-O notation.
2. Explain the concept of sequential organization, ordered list and dynamic memory management.
3. Solve Engineering problems by employing Stack, Queue and Linked list data structure.
4. Explain and analyze major Tree algorithms.
5. Explain and analyze major Graph algorithms.
6. Solve Engineering problems by employing trees and graph data structure.



FF No. : 654

Course Code: ET2111 **Course Name: Probability and Radom Variables**

Credits: 2 **Teaching Scheme: 2 Hours / Week**

Section 1:

Data basics – numerical and categorical variables, Observational studies and experiments, sampling and sources of bias - exploratory analysis and inference, sampling methods – simple, stratified, cluster and multistage sampling, experimental design – principles of experimental design, Experimental terminology – placebo, blinding etc., Measures of center and spread, data transformation

Probability basics; Independence; Conditional probability; Probability trees; Bayesian inference; Probability distributions such as Normal distribution, Binomial distribution etc.

Section 2:

Sampling variability and central limit theorem, Confidence interval for mean, hypothesis testing for mean, Inference, Inference for comparing means, ANOVA, Bootstrapping, Proportions, Hypothesis testing for proportions, Chi-square GOF test, Chi-square independence test

Cumulative distribution function, probability density function, Random Processes such as Laplace, Erlang, Gamma, Chi-square etc.; conditional distributions and density functions; Expected value, moments, central moments; Joint Cumulative distribution function, joint probability density function, Probability mass function

Text Books:

1. *Probability and Statistics for Engineers – Johnson, Gupta, Pearson Prentice Hall, 3rd edition*
2. *Applied statistics and probability for Engineers – Montgomery, Runger, Wiley India, 3rd Edition*

Reference Books:

1. *Probability and random processes – Miller, Childers, Elsevier, 2nd Edition.*

Course Outcomes:

The Student will be able to-

1. Distinguish between various types of variables
2. Apply concepts of probability such as independence, conditional probability
3. Apply Normal distribution and Binomial distribution concepts in case studies
4. 4.Apply variance analysis tests for data analysis
5. Apply Central limit theorem and carry out hypothesis testing
6. Use and apply concepts of various Random Processes in modeling data

FF No. : 654

Course Code: ET2007 **Course Name: Control Systems**

Credits: 4 **Teaching Scheme: 3 Hours / Week**

Lab: 2 Hours / Week

Section 1:

Introduction, Terminology, Mathematical modeling of electrical, mechanical and electro mechanical systems, Transfer function, State space modeling of dynamical system. Block Diagram, Signal flow graph. Time domain analysis, response to step, ramp and parabolic input, steady state error, transient and steady state analysis. Introduction to PI, PD and PID Controller. Stability, Stability criterion, Root Locus Analysis, Construction of root loci.

Section 2:

Frequency Domain Analysis:- correlation between time and frequency responses, Frequency domain specifications. Bode plots, Gain and Phase margin, Polar plot, Nyquist criterion and plot. Design of Compensators

List of Practicals:

1. Using Matlab
    a. find the transfer function from Poles and Zeros
    b. find zero's and pole's from transfer function.
2. Using Matlab
    a. Step response of transfer function.
    b. Impulse response of transfer function.
    c. Ramp response of transfer function.
3. Using Matlab find the time response of second order system.
4. Using Matlab
    a. Transfer function from state model.
    b. State model from transfer function.
    c. Step and impulse response of a state model.
5. To perform stability analysis of the system and plot root locus from the transfer function.
6. To plot Bode plot from transfer function.
7. To plot Nyquist plot from transfer function.
8. To find the transfer function of DC motor.
9. To study and simulate PID Controller.
10. To study using Matlab
    a. Lag Compensator
    b. Lead Compensator
    c. Lead lag compensator

11. System identification of DC motor using Matlab.
12. Simulation of any closed loop system.

List of Projects :

1. Model a given electrical / Mechanical system.
2. Closed loop control of D C Motor.
3. Design and implementation of filter.
4. Compensator design for a low pass filter ad realize using op amp.
5. Eyeball Controlled Automatic Wheelchair.
6. Health Condition Monitoring System.
7. Hardware realization and implementation of closed loop system using Matlab and microcontroller.
8. Implementation of Accelerometer Based Wireless Gesture Controlled Rover.

Text Books:

1. *Ogata Katsuhiko, "Modern Control Engineering", 5th Edition, PHI*
2. *Nagrath I. J. and M. Gopal, "Control Systems Engineering", 6th edition, New Age International*

Reference Books:

1. *Norman S. Nise, "Control System Engineering", 6th Edition, Wiley.*
2. *F. Golnaraghi, B.C. Kuo, "Automatic Control Systems", 10th Edition, McGraw-Hill.*

Course Outcomes:

The student will be able to –

1. Model a given system using transfer function approach
2. Find steady state and transient response of control systems and understand the behavior of LTI systems qualitatively and quantitatively, both in the transient and steady-state region.
3. Analyze given system for stability using root locus
4. Demonstrate various techniques of frequency domain analysis.
5. Analyze given system for stability in frequency domain
6. Design proportional, proportional-integral, proportional-derivative, and proportional-integral-derivative feedback control systems meeting specific system performance requirements.

FF No. : 654

Course Code: ET2004 **Course Name: Communication Engineering**

Credits: 4 **Teaching Scheme: 3 Hours / Week**

Lab: 2 Hours / Week

Section 1:

1.1 Introduction To Communication System : Analog & Digital Communication System Overview, The Electromagnetic & Optical Spectrum and its usage, Types of Electronic Communication, Need of modulation, Communication Channels, Classification of noise, Noise in Cascaded Stages.

1.2 Analog Modulation Techniques: Mathematical treatment for an AM and FM signal, Spectral Analysis, Modulation Index, Efficiency, Power calculations, DSB-SC and SSB-SC ,FM generators, pre-emphasis and de-emphasis in FM signal.

1.3 Analog Receivers: TRF Receiver, Super Heterodyne Receiver, Intermediate Frequency and Image Frequency, Diode detector, DSB-SC and SSB-SC, FM Detector

Section 2:

2.1 Sampling and Waveform Coding: Sampling, ideal sampling, Flat top & Natural Sampling, Aliasing, Pulse amplitude modulation, Quantization, Pulse code modulation & reconstruction, Delta modulation, Line Coding, Companded PCM, ISI and eye diagram, Time division multiplexing.

2.2 Digital Modulation Techniques: Digital modulation techniques - Binary Phase Shift Keying, Quadrature Phase Shift Keying, Binary Frequency Shift Keying, Quadrature amplitude modulation, Minimum shift keying.

2.3 Detection and Performance analysis of digital signal: Base Band signal receiver ,Derivation for Error prob of integrate& dump Filter, Optimum Filter, white noise matched filter, probability error of match filter, correlation.

List of Practicals (Any Six):

1. Observe spectral components of time-domain signal using Digital Storage Oscilloscope (DSO).
2. Experiment with Double side band suppressed carrier (DSBSC) modulator and demodulator.
3. Experiment with Single side band suppressed carrier (SSBSC) modulator an demodulator.
4. Experiment with Frequency modulator (FM).
5. Simulation of Analog communication system.
6. Experiment with Pulse Amplitude modulation.

7. Experiment with Pulse Code modulation and demodulation.
8. Experiment with Delta modulation and demodulation.
9. Experiment with Quadrature phase shift keying modulation and demodulation.
10. Experiment with frequency shift keying modulation and demodulation

List of Projects (Any One):

1. Simulation of Analog Communication System
2. Double Side Band –Suppressed Carrier
3. Implementation of Pre-emphasis and De-emphasis for FM
4. Implementation of Antialiasing filter
5. Implementation of Adaptive Delta modulator to avoid slope overload distortion
6. Generation of discrete PAM signal

Text Books:

1. "Principles of Electronic Communication Systems", Louis E Frenzel, Tata McGraw Hill Publications, Third Edition.
2. "Electronic Communication", Kennedy &Devis, Tata McGraw Hill Publications.
3. "Principles of Communication Systems", Taub Schilling, Tata McGraw Hill Fourth Edition.

Reference Books:

1. "Electronic Communication", Dennis Roddy & Coolen, Tata McGraw Hill Publications.
2. "Electronic Communication Systems", Wayne Tomasi, Fourth Edition.
3. "Digital Communications", Simon Haykin, Wiley Publications, Fourth Edition.
4. "Communication Systems", Carlson, McGrawHill, Fourth Edition.
5. "Analog& Digital Communications", Simon Haykin, Wiley Publications.
6. "Digital Communication",B. Sklar, Pearson, Second Edition.

Course Outcomes:

The student will be able to –

1. Classify communication channels and noise. (CO Attainment level : 4)
2. Analyze amplitude and frequency modulated signal and their spectrum. (CO Attainment level : 3)
3. Explain working of analog receivers. (CO Attainment level : 3)
4. Discuss encoding of analog signals in digital formats. (CO Attainment level : 3)
5. Analyze modulation techniques with respect to bandwidth, Euclidian distance. (CO Attainment level : 2)
6. Evaluate performance of optimum filter. (CO Attainment level : 1)

FF No. : 654

Course Code: ET2006 **Course Name: Electromagnetic Engineering**

Credits: 4 **Teaching Scheme: 3 Hours / Week**

Lab: 2 Hours / Week

Section 1:

Vector Calculus basics; Gradient, Curl and Divergence; Co-ordinate systems; Coulomb's Law, Electric Field Intensity, Electric flux density, Gauss' law, Electrostatic potential, Boundary conditions, Laplace and Poisson's equations, Capacitance; Biot Savart law, Magnetic flux density, Magnetic field intensity, scalar and vector magnetic potential, Ampere's circuital law, boundary conditions, self inductance, continuity equation.

Section2:

Maxwell equation in differential form, point form, integral form; Phasor concept; time periodic fields; Poynting vector and concept of power flow; Helmholtz equations, Transverse Electromagnetic (TEM) wave, properties of Uniform Plane Wave, Intrinsic impedance; wave propagation ; Behavior of Uniform Plane wave at an interface between ideal medium and ideal conductor, concept of standing wave; Behavior at an interface between two dielectrics; Uniform Plane wave in a good dielectric, Uniform plane wave in a good conductor

Text Books:

1. *Engineering Electromagnetics – William Hayt, J.A. Buck, 6th Edition, McGraw Hill publications*
2. *Elements of Electromagnetics – Matthew Sadiku, 3rd Edition, Oxford University Press*

Reference Books:

1. *Electromagnetic Waves and Radiating Systems – Pearson Education*
2. *Electromagnetic Field Theory Fundamentals – Guru, Hiziroglu, Cambridge University Press*

List of Tutorials (Any Six):

1. Co-ordinate systems and their conversions, Gradient & Divergence
2. Coulomb's Law, Electric Flux Density, Electric field intensity, Gauss' law
3. Electrostatic potential, Boundary conditions, Laplace and Poisson's equations
4. Magnetic flux density, Magnetic field intensity, scalar and vector magnetic potential
5. Ampere's circuital law, boundary conditions
6. Maxwell equation in differential form, point form, integral form
7. Phasor concept; time periodic fields; Poynting vector and concept of power flow

8. Helmholtz equations, Transverse Electromagnetic (TEM) wave, properties of Uniform Plane Wave
9. Intrinsic impedance; wave propagation
10. Behavior of Uniform Plane Wave at various interfaces; Behavior of Uniform Plane wave in a good dielectric & Uniform plane wave in a good conductor

Course Outcomes:

The Student will be able to-

1. Apply knowledge of Vector Calculus
2. Use Boundary conditions and Laplace equations for realization of capacitance
3. Use Boundary conditions and Laplace equations for realization of Inductance
4. Implement Maxwell's Equations in various forms
5. Apply Phasors and Power flow concept
6. Understand the concept of Uniform Plane wave propagation and behavior at interfaces.

FF No. : 654

Course Code: ET2015 **Course Name: Digital Systems**

Credits: 4 **Teaching Scheme: 3 Hours / Week**

Lab: 2 Hours / Week

Section 1

Binary arithmetic & logic simplification: Binary, Hexadecimal number systems, Inter conversions, 1's complement, 2's complement arithmetic, Binary Coded Decimal codes, Excess-3 Code, Gray code, Standard logic gates, Universal logic gates, Derived gates, Simplification of logic function using Boolean algebra, De Morgan's Theorem, Sum-of-Products and Product-of-Sums forms of Boolean function, NAND and NOR implementation, Canonical and Standard forms, Karnaugh map up to 4 variables.

Combinational circuits: Design procedure for combinational logic circuits, Code conversion, Half Adder, Full Adder, 4- bit binary adder, BCD Adder, BCD Subtractor, Parity generator, Parity checker, Digital Comparator, Multiplexer and Demultiplexer, their use in combinational logic designs, multiplexer and Demultiplexer trees, Encoder and Decoder.

Latches and Flip-flops: Latches and flip-flops: SR,D, JK, Master-Slave JK,andT,use of preset and clear terminals, schematic symbol, truth table and excitation table, conversion of flip flops.

Section 2

Sequential Circuits: Shift registers: SISO, SIPO, PISO, PIPO, bi-directional shift registers, Johnson and Ring counters, design and analysis of asynchronous and synchronous counters, up/down counters, modulo counters, Pseudo Random Binary Sequence (PRBS) generator.

Finite State Machines: Introduction to state machine, Basic Design steps for these sequential circuits using state diagram, State Table, State assignment, finite state machine, Mealy machine and Moore machine representation and implementation, sequence detector, designing vending machine based on state machine. Design problems based on finite state machine.

Logic Families: Classification of Logic Families: TTL, CMOS, ECL, RTL, I2L and DCTL, Characteristics of Digital ICs: Speed of Operation, Power Dissipation, Figure of Merit, Fan in, Fan out, Current and Voltage Parameters, Noise Immunity, Operation of TTL NAND gate, Tri-State logic, Comparison of logic families.

List of Practicals:

1. Design & implement code converters / comparators
2. Design & implement BCD Adder
3. Design & implement combinational logic circuit using multiplexer & de-multiplexer
4. Design & implement 3 bit bidirectional shift register using D flip-flop

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5. Decade counter output to be displayed on 7 segment display
6. Design & implement pulse train generator
7. Design & implement 3 bit up-down ripple counter using flip-flop
8. Verification of mod-n counters
9. Design & implement sequence generator.
10. Simulation of combinational circuit like Half adder, Full adder, Multiplexer, De multiplexer etc.

List of Project areas:

1. Applications of Combinational Circuits
2. Applications of Digital Counters
3. Applications of Shift registers
4. Applications of Finite state machines

Text Books:

1. *M. Morris Mano, "Digital Design", Pearson Education, Third Edition*
2. *Jan M. Rabaey, Anantha P. Chandrakasan, Borivoje Nikolić, "Digital Integrated Circuits", Pearson Education, Second Edition20032.*

Reference Books:

1. *Thomas L Floyd, "Digital Fundamentals", Pearson Education, 11th Edition*
2. *R.P. Jain, "Modern Digital Electronics", Tata McGraw Hill, 3rd Edition*

Course Outcomes:

The student will be able to–

1. Interpret Binary arithmetic/ logic simplification
2. Design combinational digital circuits
3. Compare flip flops and latches
4. Design sequential digital circuits
5. Design finite state machine
6. Compare different parameters of logic families

FF No. : 654

Course Code: ET2012 **Course Name: Multivariate Data Analysis**

Credits: 2 **Teaching Scheme: 2 Hours / Week**

Section 1:

An introduction to multivariate statistical models, Multivariate normal distributions-Multivariate Normal Density Function, Properties of Multivariate Normal Random Processes, Estimation in the Multivariate Normal. Discriminant analysis: The Discriminant Function for Two Groups, Discriminant Analysis for Several Groups, Standardized Discriminant Functions, Interpretation of Discriminant Functions. Classification analysis: Classification into Two Groups, Classification into Several Groups, Estimating Misclassification Rates, Improved Estimates of Error Rates, Subset Selection.

Section2:

Multivariate regression: Multiple Regression: Fixed *x*'s, Multiple Regression: Random *x*'s, Multivariate Multiple Regression: Estimation. Principal component analysis: Geometric and Algebraic Bases of Principal Components, Principal Components and Perpendicular Regression, Principal Components from the Correlation Matrix, Deciding How Many Components to Retain, Information in the Last Few Principal Components, Interpretation of Principal Components. Cluster Analysis: Measures of Similarity or Dissimilarity, Hierarchical Clustering, Nonhierarchical Methods, Choosing the Number of Clusters, Cluster Validity, Clustering Variables. Dimension reduction.

Text Books:

1. *R.A. Jonhson, D.W. Wichern, "Applied multivariate statistical analysis", Pearson prentice Hall 6th Edition.*
2. *W.K. Hardle, L. Simer, ""Applied multivariate statistical analysis" Springer*

Reference Books:

1. *T. Hastie, R. Tibsirani, J. Friedman, "Element of statistical learning: Data mining, inference and prediction", Springer.*

Course Outcomes:

The student will be able to –

1. Demonstrate knowledge and understanding of the basic ideas behind several common statistical techniques for analyzing multivariate data (Discriminant analysis, classification analysis, linear regression analysis, principal component analysis, cluster analysis
2. Identify the most appropriate statistical techniques for analyzing multivariate dataset.

3. Apply commonly used multivariate data analysis techniques for real data and interpret results.
4. Describe the relationship between two or more independent variables and the dependent variable using a multiple regression equation
5. Compare and contrast the methods for a given data analysis situation considering the benefits and the pitfalls of the methods.
6. Select and apply an appropriate technique to achieve dimensionality reduction