Bansilal RamnathAgarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

Curriculum for
S.Y. B. Tech.
Electronics & Telecommunication

Department of
Electronics & Telecommunication
Engineering

VISION:

- Excellence in Electronics & Telecommunication Engineering Education

MISSION:

- Provide excellent blend of theory and practical knowledge
- Establish centre of excellence in post graduate studies and research
- Prepare engineering professionals with highest ethical values and a sense of responsible citizenship

Program Educational Objectives (PEO):

1. Graduates of the program will become competent electronic engineers suitable for industry.
2. Graduates of the program will apply the mathematical and analytical abilities gained through core courses of Electronics and Communication engineering.
3. Graduates of the program will apply problem solving skills to develop hardware and/or software.
4. Graduates of the program will become responsible citizen.

Program Outcomes (PO):

A graduate of the program will have

a) an ability to apply knowledge of mathematics, science, and electronic engineering,
b) an ability to design and conduct experiments, as well as to analyze and interpret data,
c) an ability to design an electronic system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, ethical, health and safety, and manufacturability
d) an ability to function on multidisciplinary teams,
e) an ability to identify, formulate, and solve engineering problems,
f) an understanding of professional and ethical responsibility,
g) an ability to communicate effectively,
h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context,
i) an ability to engage in life-long learning,
j) a knowledge of contemporary issues in technologies related to electronics and communication engineering,
k) an ability to use the techniques, skills, and modern engineering tools necessary for electronic engineering practice and
l) an ability to develop firmware.

Program Specific Outcomes (PSO):

Graduates will be able to

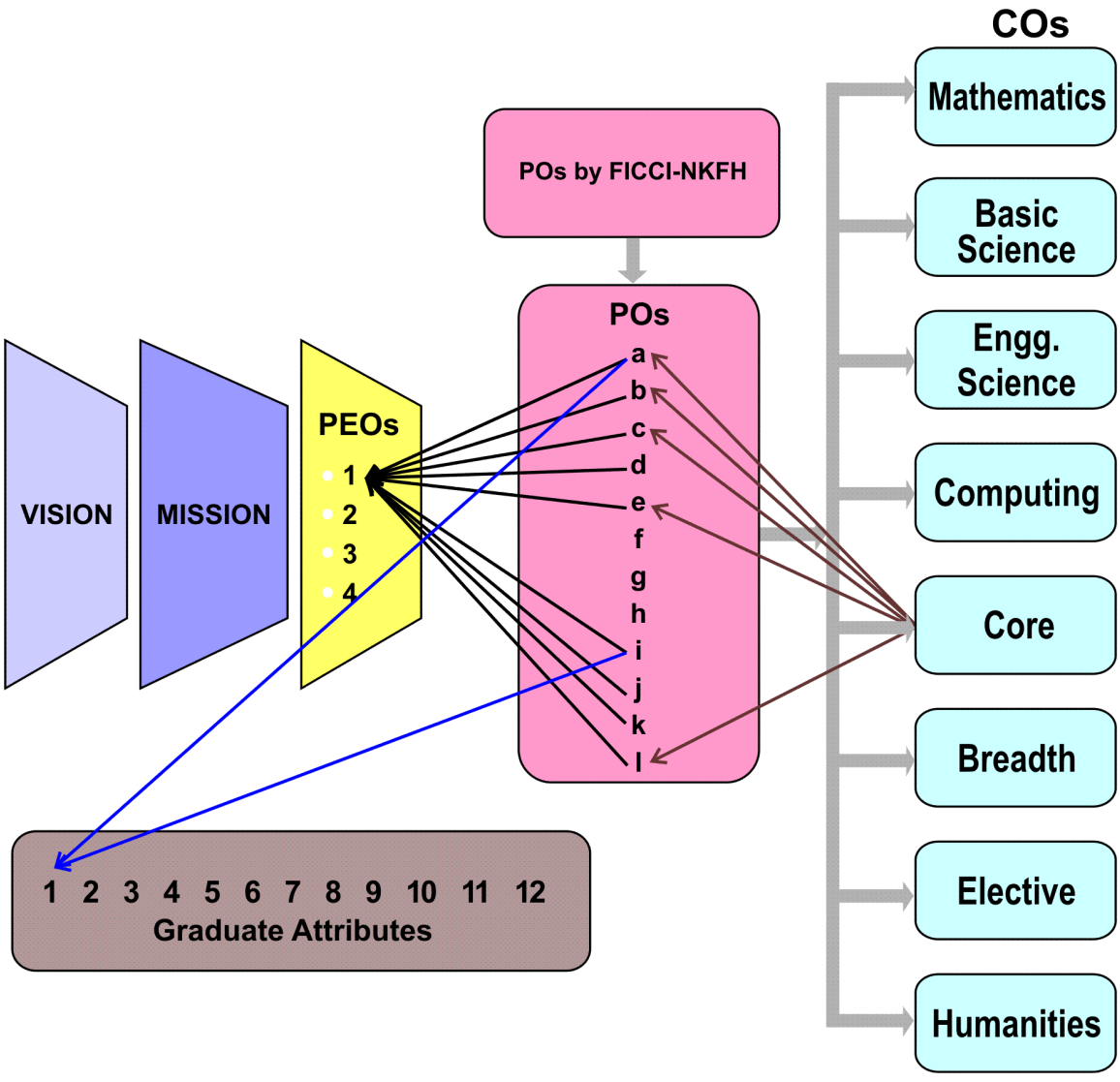
1. Apply and demonstrate the usage of hardware and software platforms for variety of applications.

2. Apply different mathematical and statistical methods for analysis and design of signal processing and communication systems.

Graduate attributes:

1. Engineering knowledge
2. Problem Analysis
3. Design/Development of Solutions
4. Investigations of Complex Problems
5. Modern Tool Usage
6. The Engineer and Society
7. Environment and sustainability
8. Ethics
9. Individual and Teamwork
10. Communication
11. Project management and Finance
12. Life –long Learning

Mapping of Course Outcomes, Program Outcomes and Program Educational Objectives



Second Year B. Tech. Electronics & Telecommunication Engineering (SYBT) - Semester I (Pattern 2017)

Course Code	Course	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
						Formative Assessment			Summative Assessment			
			L	T	P	ISE T1	ISE T2	CE	ESE	PR/ OR		
ETUA21171	Engineering Mathematics III	TH	4	-	-	15	15	20	50	-	100	4
ETUA21172	Mathematics Practice – III	CE	-	1	-	-	-	50	-	-	50	1
ETUA21173	Signals & Systems	TH	3	1	-	15	15	20	50	-	100	4
ETUA21174	Semiconductor Devices & Circuits*	TH	3	-	-	15	15	20	50	-	100	3
ETUA21175	Digital Electronics*	TH	3	-	-	15	15	20	50	-	100	3
ETUA21176	Network Theory*	TH	3	-	-	15	15	20	50	-	100	3
ETUA21177	Lab Practice -I	CE-PR/OR	-	-	6	-	-	50	-	50	100	3
ETUA21178	Skill Development (Electronic Workshop Practice–I)	CE	-	-	2	-	-	50	-	-	50	1
ETUA21179	Environmental Studies	CE	1	-	2	-	-	50	-	-	50	2
A2	Audit Course	-	-	-	-	-	-	-	-	-	-	-
	Total	**-**	**17**	**2**	**10**	**75**	**75**	**300**	**250**	**50**	**750**	**24**

Theory: 1Hr. = 1 Credit, Practical: 2 Hrs. = 1 Credit, #1 hr. = 1 Credit, Audit Course: No Credits
*Courses have lab practice component of 2 hrs./week each under Lab Practice head.

Audit Courses: Professional Ethics; Cyber Security; Value Engineering and Human Rights; Legislative Procedures; Technical Writing/Documentation; Sports/Yoga; Performing Art such as music, dance, and drama etc.; Languages; Online certification course (minimum two weeks); Participation in intercollegiate co-curricular and extra-curricular activities.

Dr. S. V. Kulkarni — **BoS Chairman**

Dr. S.S. Chinchnikar — **Dean Academics**

Dr. B.S. Karkare — **Director**

Second Year B. Tech. Electronics & Telecommunication Engineering (SYBT) - Semester II (Pattern 2017)

Course Code	Course	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
						Formative Assessment			Summative Assessment			
			L	T	P	ISE T1	ISE T2	CE	ESE	PR/ OR		
ETUA22171	Control Systems	TH	4	-	-	15	15	20	50	-	100	4
ETUA22172	Control Systems - Practice	CE	-	1	-	-	-	50	-	-	50	1
ETUA22173	Communication Engineering-I*	TH	3	-	-	15	15	20	50	-	100	3
ETUA22174	Integrated Circuits*	TH	3	-	-	15	15	20	50	-	100	3
ETUA22175	Data Structures*	TH	3	-	-	15	15	20	50	-	100	3
ETUA22176	Economics	TH	3	-	-	15	15	20	50	-	100	3
ETUA22177	Lab Practice-II	CE-PR/OR	-	-	6	-	-	50	-	50	100	3
ETUA22178	Skill Development (Electronic Workshop Practice-II)	CE	-	-	2	-	-	50	-	-	50	1
ETUA22179	Project Management	CE	2	-	-	-	-	50	-	-	50	2
A2	Audit Course	-	-	-	-	-	-	-	-	-	-	-
	Total	**-**	**18**	**1**	**8**	**75**	**75**	**300**	**250**	**50**	**750**	**23**

Theory: 1Hr. = 1 Credit, Practical: 2 Hrs. = 1 Credit, #1 hr. = 1 Credit, Audit Course: No Credits
*Courses have lab practice component of 2 hrs./week each under Lab Practice head.

Audit Courses: Audit Courses: Professional Ethics; Cyber Security; Value Engineering and Human Rights; Legislative Procedures; Technical Writing/Documentation; Sports/Yoga; Performing Art such as music, dance, and drama etc.; Languages; Online certification course (minimum two weeks); Participation in intercollegiate co-curricular and extra-curricular activities.

Dr. S. V. Kulkarni — **BoS Chairman**

Dr. S.S. Chinchnikar — **Dean Academics**

Dr. B.S. Karkare — **Director**

Semester – I

ETUA21171: Engineering Mathematics III

Teaching Scheme
Credits: 4
Lectures: 4 Hrs/week

Examination Scheme
Formative Assessment: 50 Marks
Summative Assessment: 50 Marks

Prerequisite: Readers/students are expected to know the following concepts:
Basics of Derivatives, Integration, Trigonometry, Vector algebra & complex number.

Course Objectives:

- To introduce higher order linear differential equations related to computers and electrical circuit problems
- To introduce Fourier & Z- transform and its properties
- To know Statistics to analyse the data.
- To introduce vector differentiation.
- To introduce vector Integration.
- To introduce analytic functions and study complex integrals

Course Outcomes:

By the end of the course, students will able to

1. Understand the Linear Differential equations, Modeling of problems on Electrical Circuits.
2. Understand the design and analysis of continuous and discrete system, where knowledge of Fourier Transform and Z Transform is required.
3. Use statistics in engineering fields.
4. Understand aspects of vector differential calculus which includes physical phenomenon viz gradient, divergence, curl etc.
5. Understand the applications of vector integral calculus viz work done, electric flux etc.
6. Develop the understanding of analytic functions, complex integration and bilinear transformations

Unit- I : Linear Differential Equations

LDE of nth order with constant coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous and Symmetric Simultaneous DE,
Self-learning: **{Self-study- Modeling of Electrical circuits}.**

Unit –II:Fourier & Z Transforms

Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses,
Introductory Z-Transform (ZT): : Definition, Standard Properties, Z transform of standard sequences and their inverses

Unit –III:Statistics

Standard Deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Correlation and Regression Probability Distribution:- Binomial, Poisson and Normal Distributions, Population & Sample.
{Self study- Sampling Distributions, t-distribution, Chi-Square distribution}

Unit –IV: Vector differential Calculus

Vector Differential Calculus: Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrational and

Conservative Fields, Scalar Potential, Vector Identities.

Unit V:Vector Integral Calculus

Vector integration, Line integral, Greens Theorem, Gauss divergence Theorem. Stokes theorem and application to problems in Electromagnetic fields.

Unit VI:Complex Variables)

Complex Variables Functions of Complex Variables, Analytic Functions,C-R Equations, Conformal Mapping, Bilinear ,Transformation, Cauchy's Theorem, Cauchy's Integral formula,
{Self Study:- Laurent's Series, Residue Theorem}

Text Books

1. 'A Text book of Applied Mathematics', P.N. Wartikar, U.N.Wartikar (Pune Vidyarthi GrihaPrakashan , Pune) (Volume II-ISBN 81-85825-07-6) (Volume III-ISBN 81-85825-01-7)
2. 'Advanced Engineering Mathematics', Erwin Kreyszig (Wiley Eastern Ltd.).(*ISBN* 978-0-470-45836-5)

Reference Books :

1. 'Higher Engineering Mathematics', B.S.Grewal (KhannaPublication,Delhi)(*ISBN*-13. 978-81-7409-195-5. *ISBN*-10. 81-7409-195-5)
2. 'Advanced Engineering Mathematics', Wylie C.R & Barrett L.C., (McGraw-Hill,INC), (*ISBN* 0 -07 -463841 – 6)
3. 'Advanced Engineering Mathematics', Peter V.O'Neiol, (ISBN-13: 9781111427429 / ISBN-10: 1111427429)

Course Coordinator : Mrs. M.A. Mohite

BOS Member: Dr. Y.H. Dandawate

BOS Chairman: Dr. S. V. Kulkarni

ETUA21172: Mathematics Practice – III

Teaching Scheme
Credit: 1
Tutorial work: 1 Hr./week

Examination Scheme
Formative Assessment : 50 Marks

Course Objective:

- To introduce higher order linear differential equations related to computers and electrical circuit problems
- To introduce Fourier & Z- transform and its properties
- To know Statistics to analyse the data.
- To introduce vector differentiation.
- To introduce vector Integration.

Course Outcome:

By the end of the course, students will able to

1. Understand the Linear Differential equations, modeling of problems on Electrical Circuits.
2. Understand the design and analysis of continuous and discrete system, where knowledge of Fourier Transform and Z Transform is required.
3. Use statistics in engineering fields.
4. Understand aspects of vector differential calculus which includes physical phenomenon viz gradient, divergence, curl etc.
5. Understand the applications of vector integral calculus viz work done, electric flux etc.
6. Develop the understanding of analytic functions, complex integration and bilinear transformations

Tutorial (Assignments)

1. Practice Problems on C.F & P.I, Method of Variation of Parameters, Cauchy's & Legendre's DE
2. Practice Problems on Modeling of Electrical circuits
3. Practice Problems on Fourier Transform (FT)
4. Practice Problems on Z-Transform
5. Practice Problems on Statistics
6. Practice Problems on Probability
7. Practice Problems on Vector Differentiation, Gradient, Divergence and Curl, Directional Derivative,
8. Practice Problems on Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities.
9. Practice Problems on Line integral, Greens Theorem, Gauss divergence Theorem. Stokes theorem
10. Practice Problems on Analytic Functions, Bilinear Transformation and Complex Integration

Text Books

1. A Text book of Applied Mathematics', P. N. Wartikar, U. N. Wartikar (Pune VidyarthiGrihaPrakashan , Pune) (Volume II-ISBN 81-85825-07-6) (Volume III-ISBN 81-

85825-01-7)
2 'Advanced Engineering Mathematics', Erwin Kreyszig (Wiley Eastern Ltd.).(*ISBN* 978-0-470-45836-5)

Reference Books :

1. 'Higher Engineering Mathematics', B. S. Grewal (Khanna Publication, Delhi)(*ISBN*-13. 978-81-7409-195-5. *ISBN*-10. 81-7409-195-5)
2. 'Advanced Engineering Mathematics', Wylie C.R & Barrett L.C., (McGraw-Hill,INC), (*ISBN* 0 - 07 -463841 – 6)
3 'Advanced Engineering Mathematics', Peter V.O' Neiol, (ISBN-13: 9781111427429 / ISBN-10: 1111427429)

Course Coordinator : Mrs. M.A. Mohite

BOS Member: Dr. Y.H. Dandawate

BOS Chairman: Dr. S. V. Kulkarni

ETUA21173 : Signals & Systems

Teaching Scheme

Credits: 4
Lectures: 3 Hrs/week
Tutorial: 1 Hr/week

Examination Scheme

Formative Assessment: 50 Marks
Summative Assessment: 50 Marks

Prerequisite: Readers/students are expected to know the following concepts:
Basics of integration, derivatives, basics of series and it's convergence criterion, graph sketching

Course Objectives:

- To model the signals in time and frequency domain mathematically.
- To analyze Linear Time Invariant (LTI) systems in time and transform domain.
- To prepare basics for further understanding of courses like Signal processing and communication related course.
- To provide basis for correlation of different signal parameters at discrete instances.

Course Outcomes:

On completion of the course, students will able to:

1. describeand classify signals mathematically and understand how to perform mathematical operations on signals.
2. classifysystems as linear/ nonlinear, stable/unstable, causal/noncoastal, time variant/ time invariant.
3. understand the process of convolution between signals, its implication for analysis of linear time invariant systems and the notion of an impulse response.
4. compute the Fourier series or Fourier transform of a set of well-defined signals, and further be able to use the properties of the Fourier transform to compute the Fourier transform for a broader class of signals.
5. resolve the signals in complex frequency domain using Laplace Transform. Analyze and characterize the system in S – domain.
6. determine the auto correlation, cross correlation, energy spectral density, and power spectral density of signals.

Unit- I : Introduction to Signals

Definition of signal(Signals related to Communication, control systems etc.). Elementary signals: exponential, sine, step, impulse and its properties, ramp, rectangular, triangular, signum, sinc. Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration, time scaling, time shifting and folding, precedence rule. Classification of signals: Continuous time and discrete time, even/odd, periodic/non periodic, deterministic/non deterministic, energy and power.

Unit –II:Introduction to Systems

Definition of system, Classification of system: linear/non linear, time variant/invariant, causal/non-causal, static/dynamic, stable/unstable, invertible/non-invertible.
System modeling: Input output relation, impulse response, block diagram, integro-differential equation.

Unit –III:Linear Time Invariant (LTI) System Analysis

Definition of convolution, convolution integral, computation of convolution integral using graphical method and mathematical definition for following signals: unit step with unit step, unit step with exponential, exponential with exponential and unit step with rectangular, rectangular with rectangular

only. Computation of convolution sum. Properties of convolution, system interconnection, system properties in terms of impulse response, step response in terms of impulse response.

Unit -IV: System Analysis in Frequency Domain using Fourier Transform

Definition and necessity of continuous time (CT) and discrete time(DT) Fourier series and Fourier transforms. Analogy between continuous time Fourier series(CTFS), discrete time Fourier series (DTFS) and continuous time Fourier transform (CTFT), discrete time Fourier transform (DTFT). continuous time Fourier series (CTFS), continuous time Fourier transform (CTFT) and its properties, problem solving using properties, amplitude spectrum, phase spectrum. Interplay between time and frequency domain.

Unit V:Laplace Transform

Limitations of Fourier transform(FT) and need of Laplace transform (LT). Definition and properties of Laplace transform (LT), Region of convergence (ROC) and pole zero concept. Application of Laplace transforms to the Linear Time Invariant (LTI) system analysis. Inversion using duality, numerical based on properties. Signal analysis using Laplace transform (LT).

Unit VI : Correlation and Spectral Analysis

Definition of Correlation and Spectral Density, correlogram, comparision between computation of correlation and convolution, auto-correlation, cross correlation, energy/power spectral density, properties of correlation and spectral density, relation between correlation and spectral density.

Tutorial:

1. Sketch and write defining mathematical expression for the following signals in continuous time (CT) and discrete time(DT)
   a) Unit Step., b) Rectangular, c) Exponential, d) Signum, e) Sine, f) SinC, g) Triangular h) Unit Impulse., i) Unit Ramp
2. Classify and find the respective value for the above signals
   Periodic / Non Periodic, Energy / Power /Neither
3. Take any two continuous time (CT)signals and perform the following operation Amplitude scaling, addition, multiplication, differentiation, integration, time scaling, time shifting, folding and combination of operations
4. Take any two discrete time(DT) signals and perform the following operation Amplitude scaling, addition, multiplication, differentiation, accumulation, time scaling, time shifting and foldingand combination of operations
5. Express any two system mathematical expressions in input output relation form and determine whether each one of them is, Memory less, Causal, Linear, Stable, Time in variant, Invertible
6. Evaluate continuous time Fourier Series (CTFS) and discrete time Fourier series (DTFS) of given signals.
7. State and prove the properties of Fourier Transform. Take rectangular and sinc signal as examples and demonstrate the applications of CTFT properties. And also demonstrate the interplay between the time and frequency domain.
8. State and prove the properties of Laplace Transform. Take any example of a system in time domain and demonstrate the application of LT in system analysis
9. Find the following for the given energy signal
   a)Autocorrelation, b) Energy from Autocorrelation, c) Energy from definition d) Energy Spectral Density by definition e) ESD from Autocorrelation.
10. Find the following for the given power signal
    a) Autocorrelation, b) Power from Autocorrelation, c) Power from definition,
    d) Power Spectral Density by definition e) PSD from Autocorrelation

Text books :

1. Simon Haykins and Barry Van Veen, "Signals and Systems", 2nd Edition, Wiley India.
2. MrinalMandal, Amir Asif, "Continuous and Discrete Time Signals and Systems" First Edition, Cambridge University Press
3.

Reference Books :

1. B.P. Lathi, "Linear Systems and Signals", 2nd Edition, Oxford University Press, 2004.
2. Charles Phillips, "Signals, Systems and Transforms", 3rd Edition, Pearson Education
3. Simon Haykins, "Introduction to Analog and Digital Communications", Wiley India.

Course Coordinator : Mr. M. S. Patil

BOS Member: Dr. Y.H. Dandawate

BOS Chairman: Dr. S. V. Kulkarni

ETUA21174 : Semiconductor Devices & Circuits

Teaching Scheme
Credits: 3
Lectures: 3 Hrs/week

Examination Scheme
Formative Assessment: 50 Marks
Summative Assessment:50 Marks

Prerequisite: Readers/students are expected to know the following concepts:
Basics of Electronics Engineering

Course Objectives:

- To introduce the students to semiconductor devices (such as BJT, JFET, and MOSFET) and their characteristics, operation, circuits and applications.
- To design and analyze various BJT, JFET and MOSFET circuits for small signal at low and high Frequency.
- To implement hardwired circuit to test its performance as per the design.
- To simulate electronics circuits using computer simulation software to obtain desired results.

Course Outcomes:
On completion of the course, students will be able to:

1. Apply knowledge of mathematics, physics and electronic to understand, design, and analyze BJT based circuits.
2. Design, analyze, and simulate JFET based circuits.
3. Analyze, and design biasing circuits for MOSFET amplifiers.
4. Understand, and analyze AC response of MOSFET amplifiers.
5. Design and simulate CMOS amplifiers.
6. Design and simulate feedback amplifier and oscillator using JFET.
7.

Unit - I : Bipolar Junction Transistors (BJT)
The Operating Point, Bias Stability, Self-Bias or Emitter Bias, Stabilization against Variations in ICO, VBE and β, Thermal Runaway, BJT as a switch, Two Port Devices and the Hybrid Model, Transistor Hybrid Model, Comparison of Common Emitter (CE), Common Collector(CC) & Common Base (CB) configured Amplifiers

Unit - II : JFET and its DC–AC Analysis
Introduction to Junction Field Effect Transistor (JFET), Types, Construction, Operation, Static Characteristics, Pinch off voltage, FET Volt-Ampere characteristics, FET Configurations Common Source(CS), Common Drain(CD), Common Gate(CG) and their Comparison, Biasing of JFET, Small signal model, JFET as CS amplifier and its analysis, frequency response of CS amplifier.

Unit - III :MOSFET and its DC Analysis
Basics of Metal Oxide Semiconductor Field Effect Transistor (MOSFET), Transistor operation, Construction of n-channel and p-channel E-MOSFET, n-channel and p-channel E-MOSFET ideal Id vs. Vgs and Id vs. Vds characteristics & parameters, non-ideal voltage current characteristics, non-ideal effects viz. Finite output resistance, channel length modulation, body effect, sub-threshold conduction, breakdown effects and temperature effects. MOSFET DC circuit analysis: common source circuit, Load Line and Modes of operation.

Unit - IV : AC Circuit Analysis of MOSFET

MOSFET Low frequency and high frequency small signal equivalent circuits, MOSFET small signal parameters: gate transconductance, bulk transconductance and small-signal output resistance, MOSFET parasitic capacitances, Basic MOSFET amplifier configurations: common-source(CS) configuration, Common-source amplifier with source resistor and source bypass capacitor, common-drain(CD) amplifier (source follower), and common-gate(CG) amplifier.

Unit - V : CMOS Circuits

Introduction to Complementary Metal Oxide Semiconductor (CMOS) technology, MOSFET as switch, diode/active resistor, Single-stage CMOS amplifiers: CMOS common-source amplifier with enhancement (diode connected) load, CMOS common-source amplifier with depletion load, CMOS common-source amplifier with active load, CMOS source follower amplifier, CMOS common-gate amplifier, Cascade amplifiers.

Unit - VI : Feedback Amplifiers and Oscillators

Four types of amplifiers. Feedback topologies. Examples of voltage series and Current series FET feedback amplifiers and their analysis. Barkhausen criterion, General form of LC oscillator. FET RC Phase Shift oscillator, Wein bridge oscillator, Hartley and Colpitt oscillators.

Text books :

1. David A.Bell, "Electronic Devices and Circuits", 5th Edition, Oxford press
2. Donald Neamen, "Electronic Circuits Analysis and Design", 3rdEdition, TMH.

Reference Books :

1. Millman, Halkias, "Integrated Electronics- Analog and Digital Circuits and Systems", 2nd TMH.
2. Boylstad, Nashlesky, "Electronic Devices and Circuits Theory", 9th Edition, PHI, 2006.
3. Phillip E. Allen, Douglas R. Holberg, "CMOS Analog Circuit Design", Second Edition, Oxford.

Course Coordinator : Mrs. R. A. Chavan

BOS Member: Dr. Y.H. Dandawate

BOS Chairman: Dr. S. V. Kulkarni

ETUA21175: Digital Electronics

Teaching Scheme
Credits: 3
Lectures: 3 Hrs/week

Examination Scheme
Formative Assessment: 50 Marks
Summative Assessment:50 Marks

Prerequisite: Readers/students are expected to know the following concepts:
Basics of Electronics engineering, Boolean Algebra, Number systems

Course Objectives:

- To understand the different simplification techniques of digital circuits.
- To be familiar with different digital logic families.
- To understand and design combinational and sequential circuits.
-

Course Outcomes: By the end of the course, students will able to

1. Apply minimization technique for effective design of combinational logic design.
2. Design and implementation of widely used combinational circuits.
3. Design and implementation of widely used sequential circuits.
4. Design, implement different digital circuits like BCD adder, code converters etc. to analyze and interpret data
5. Compare and interface different digital logic families.
6. Identify the state machines for practical applications like vending machine, lift controller etc.

Unit –I :Combinational Logic Design
Standard representations for logic functions, k map representation of logic functions (SOP & POS forms), minimization of logical functions for min-terms and max-terms (upto 4 variables), don't care conditions, Quine McCluskey method.

Unit –II :Combinational Logic Design Using MSI Circuits
Design Examples: Arithmetic Circuits, BCD - to – 7 segment decoder, Code converters. Adders and their use as subtractions, look ahead carry, ALU, Digital Comparator, Parity generators/checkers, Multiplexers and their use in combinational logic designs, multiplexer trees, Demultiplexers and their use in combinational logic designs, Decoders, demultiplexer trees.

Unit -III: Flip-Flops
1 Bit Memory Cell, Latch, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, Excitation Table for flip flops. Conversion of flip flops.

Unit IV:Sequential Logic Design
Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, lock out, Clock Skew, Clock jitter. Effect on synchronous designs.

Unit- V : Digital Logic Families
Classification of logic families, Characteristics of digital ICs. TTL logic. Operation of TTL NAND gates. Tri-State logic. CMOS logic – CMOS inverter, NAND, NOR gates, unconnected inputs, wired logic, open drain output. Interfacing CMOS and TTL. Comparison of TTL & CMOS logic families. Memory elements, concept of PLD's like PAL/PLA/PROM/FPGA/CPLD.

Unit VI : State Machines

Basic design steps- State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Implementation, finite state machine implementation, Sequence detector.

Text books :

1. R.P. Jain, "Modern digital electronics", 4th edition, TMH Publication.
2. T. L. Floyd, "Digital Fundamentals", 9th edition, Pearson International Edition.

Reference Books :

1. Anand Kumar, "Fundamentals of digital circuits" 1st edition, PHI publication.
2. J F Wakerly, "Digital Design: Principles and Practices", 3rd edition, Pearson Education.

Course Coordinator : Dr. Y.H. Dandawate

BOS Member: Dr. Y.H. Dandawate

BOS Chairman: Dr. S. V. Kulkarni

ETUA21176: Network Theory

Teaching Scheme
Credits: 3
Lectures: 3 Hrs/week

Examination Scheme
Formative Assessment: 50 Marks
Summative Assessment:50 Marks

Prerequisite: Readers/students are expected to know the following concepts: Basics of Electrical engineering, Engineering Mathematics-II

Course Objectives:

- To understand, analyze the basic AC and DC circuits using KCL,KVL, network theorems and different network simplification techniques.
- To understand, analyze and design different types (low pass, high pass, band pass and band stop) of filters and attenuators (T and Pi).
- To model and analyze the network in terms of network parameters (Z, Y, ABCD and h-parameters).
- To understand and formulate the network transfer functions in s-domain .
- To understand the initial conditions, and apply Laplace transform for RL, RC, and RLC circuits and carry out its transient analysis.

Course Outcomes:

On completion of the course, students will be able to

1. Apply various network simplification techniques for the analysis of networks.
2. Apply different network theorems to analyze ac and dc networks.
3. Analyze frequency selective networks and compare them on the basis of different performance parameters.
4. Formulate and solve the differential equations using Laplace Transform for analysis of different networks.
5. Apply the knowledge of Laplace transform to find two port parameters of networks.
6. Assess the requirements of filters and attenuators and design them for the given specifications.

Unit- I : Basic Circuit Analysis and Simplification Techniques

Kirchoff's Current and Voltage Laws, Independent and dependent sources and their interconnection, Network Analysis: Mesh, Super mesh, Node and Super Node analysis, Source transformation.

Unit–II: Network Theorems

Network Theorems: Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorem, Millman's Theorem. (DC & AC circuit analysis).

Unit–III: Frequency Selective Networks

Significance of Quality factor, Series Resonance: Impedance, Phase angle variations with frequency, Voltage and current variation with frequency, Bandwidth, Selectivity. Effect of Rg on BW & Selectivity, Magnification factor. Parallel resonance: Resonant frequency and admittance variation with frequency, Bandwidth and selectivity.

Unit–IV: Laplace Transform and its Applications

Introduction to Laplace Transform, Initial conditions, transformed circuits, source free RL and RC circuits, properties of exponential response, Driven RL and RC circuits, Natural and Forced response of

RL and RC circuits. Introduction to Source free and driven series RLC circuit. Over damped and Under damped series RLC circuit.

Unit-V:Two Port Networks and Network Functions

Two port parameters: Z, Y, h, ABCD, Condition for reciprocity and symmetry. Network functions for two port networks : Driving point functions and Transfer functions.

Unit-VI : Filters and Attenuators

Classification of Filters, T - Network, π-Network. Characteristics of filters. Constant-K LPF, HPF, BPF and BSF, introduction to concepts of m-derived LPF and HPF.

Attenuators: Introduction to Neper and Decibel. Symmetrical T and π type attenuators

Text books :

1. William H Hayt, Jack E Kemmerly and Steven M. Durbin, Engineering Circuit Analysis Tata McGraw-Hill Publishing Company Ltd., 6th ed.2006.
2. John D. Ryder, Networks, Lines and Fields, Prentice-Hall of India Pvt. Ltd., 2nd ed.

Reference Books :

1. D. Roy Choudhury, Network and Systems, New Age International Publishers
2. M.E. Van Valkenburb, Network Analysis, 3rd Edition
3. Ravish R. Singh, Network Analysis and Synthesis, Tata McGraw-Hill Publishing Company Ltd.

Course Coordinator : Dr. T. R. Jadhav

BOS Member: Dr. Y.H. Dandawate

BOS Chairman: Dr. S. V. Kulkarni

ETUA21177: Lab Practice-I

* Lab Practice I will be conducted for Semiconductors Devices and Circuits , Digital Electronics , Network Theory

Teaching Scheme

Credits : 3
Practical : 6 Hrs/week

Examination Scheme

Formative Assessment : 50 Marks
Summative Assessment: 50 Marks

Course Objectives:

On completion of the course, student will be able to:

1. Design, analyze, and simulate JFET based circuits.
2. Analyze, and design biasing circuits for MOSFET amplifiers.
3. Design and implement combinational logic circuits
4. Design and implement sequential logic circuits
5. Verify various network simplification techniques and network theorems
6. Design and analyze filters and attenuators for the given specifications

A. Semiconductor Devices & Circuits (Experiments)

1. Study of equipment and instruments required to perform experiments.
2. Transistor (BJT) as a switch to drive LED, relay and single seven segment display (common Anode).
3. Design, build and test self-bias circuit using JFET and verify DC operating parameters.
4. Design and build single stage CS amplifier using JFET with and without bypass capacitor. Calculate theoretically Av, Ri, Ro.
5. Test single stage CS amplifier using JFET with and without bypass capacitor. Calculate practically Av, Ri, Ro.
6. Simulate transient, AC and DC response of JFET single stage CS amplifier (use same circuit).
7. Simulate transient, AC and DC response of MOSFET single stage CS amplifier.
8. Simulate Voltage-Series feedback amplifier and calculate Rif, Rof, Avf and Bandwidth.
9. Simulate LC/RC oscillator using JFET.
10. Build and test MOSFET as a switch.

B. Digital Electronics (List of Experiments) (any 9 experiments from 1 to 11)

1. Verify four voltage and current parameters for TTL and CMOS (IC 74LSXX, 74HCXX)
2. Design & Implement the given 4 variable function using IC74LS153 (MUX). Verify its Truth-Table.
3. Design and Implement full adder and subtractor function using IC-74LS138.
4. Design & Implement 3-bit code converter using IC-74LS138.(Gray to Binary/Binary to Gray)
5. Design and Implement 1 digit BCD adder using IC-74LS83 (4 bit Adder)
6. Design and Implement 4-bit Binary subtractor using IC-74LS83.
7. Design and Implement MOD-N and MOD-NN using IC-74LS90 (Decade Counter)
8. Design and Implement MOD-N and MOD-NN using IC-74LS93 (mod 16 Counter)
9. Design & Implement 4-bit Up/down Counter and MOD-N Up/down Counter usingIC-74HC191/IC74HC193. Draw Timing Diagram.
10. Design and Implement Pulse train generator using IC-74HC194/IC74LS95 (Use right shift/left shift).

11.Design and Implement 4-bit Ring Counter/ Twisted ring Counter using shift registers IC 74HC194/IC74LS95.
12. Mini Project based on above experiments.

C. Network Theory (List of Experiments)

1. To analyze resistive network using network simplification technique.
2. To verify Thevenin's theorem
3. To verify Maximum power transfer theorem
4. To verify Superposition theorem
5. To study Series resonance
6. To study parallel resonance
7. To study Z and Y parameters of a two p ort network
8. To design and verify constant-k prototype LPF and HPF for the given specifications
9. To design and verify T and π type of attenuators
10. To analyze network using modern tool such as MATLAB or Multisim.

Text books : A

1. David A.Bell, "Electronic Devices and Circuits", 5th Edition, Oxford press
2. Donald Neamen, "Electronic Circuits Analysis and Design", 3rd Edition, TMH.

Text books : B

1. R.P. Jain, "Modern digital electronics", 4th edition, TMH Publication.
2. T. L. Floyd, "Digital Fundamentals", 9th edition, Pearson International Edition

Text books : C

1. William H Hayt, Jack E Kemmerly and Steven M. Durbin, Engineering Circuit Analysis Tata McGraw-Hill Publishing Company Ltd., 6th ed.2006.
2. John D. Ryder, Networks, Lines and Fields, Prentice-Hall of India Pvt. Ltd., 2nd ed.

Course Coordinator : Dr. Y.H. Dandawate

BOS Member: Dr. T.R. Jadhav

BOS Chairman: Dr. S. V. Kulkarni

ETUA21178: Skill Development (Electronic Workshop Practice– I)

Teaching Scheme
Credits: 1
Practical: 2 Hrs/week

Examination Scheme
Formative Assessment :50 Marks

Prerequisite: Students are expected to know the following concepts:
Theory of electronic devices and its construction

Course Objectives:

- To make the student familiar with electronic components
- To imbibe good soldering design practices for robust design of electronic systems.
- To highlight the importance and teach PCB artwork with an EDA tool.
- To orient the students towards hardware implementation

Course Outcomes:

- Understand and interpret the specifications of components.
- interpret datasheets and thus select appropriate electronic components and devices
- Use an EDA tool for PCB Artwork design.
- Develop good soldering skills

A : Introduction to Components(Through Hole)

a)Passive Components:

i) Resistor: Types (Fixed, Variable),Standard Values, Tolerance, Wattage
ii) Capacitor: Types(Ceramic, Electrolytic), Standard Values, Tolerance, WVDC, Temperature, Application Areas
iii) Inductor: Core Types, Construction, SWG Table, Application Areas

b)Active Components:

i) Diodes: Types (small signal,rectifier, Switching, zener) Parameters(PIV,IF, IFM(rep.)IFM(non rep),trr, Bulk resistance,PZmax, IZmax, IZK,Derating)
ii) BJT: Types(Small signal,Power), Parameters(BVCEO, ICmax, Pdmax, Derating, SOA)
iii) FET: Types(FET,MOSFET), Parameters(BVDS, IDmax, Pdmax, Rds)
iv) Transformer: Power Transformer construction, Audio Frequency Transformer, High Frequency Transformer, Relay Types

B : Soldering :

Solder Iron Types(Wattage),Solder metal types, flux, Types of solderingand soldering process, Desoldering

C : EDA Tools for PCB Artwork Design

Types of PCB, Concept of PTH, Design Guidelines for PCB, Routing topology, Grounding Methodologies, Simple artwork on single sided PCB

D : LAB Instruments

Multimeter , CRO, Lab Power Supply, Function Generator

Reference Books :

1. "Encyclopedia of Electronic components volume 1",Charles Platt
2. "The Circuit Designer's Companion", Peter Wilson, Elsevier Ltd, 2012
3. "Printed circuit board design and technology", Walter C Bosshart, Tata McGraw-Hill.

4. "Grob's Basic Electronics", Mitchel E.Schultz

Course Coordinator : Mr. R. S. Pol

BOS Member: Dr. T. R. Jadhav

BOS Chairman: Dr. S. V. Kulkarni

ETUA21179: Environmental Studies

Teaching Scheme
Credits : 2
Lectures : - 1 Hr/week
Practical : 2 Hrs/week

Examination Scheme
Formative Assessment : 50 Marks

Course Objectives:
Student will be able to
- Understand the basis of Environmental Studies
- Understand different types of pollution and remedial actions to maintain ecology

Course Outcomes:
At the end of the course the students will have an ability to:
1 Identify ambient air pollutant and control techniques.
2 To analysis physical, chemical and biological characteristics of waste water.
3 Identify ambient noise pollution.

Unit I :Introduction to environmental science and pollution
Define pollution, types of pollutants, elements of environmental science and its effect on human and environment. Environmental standards for drinking water, waste water, air quality and noise.(As per IS code 10500 and National Ambient Standards for air and noise)

Unit II:-Introduction to air and water pollution with methods to control
Meteorological parameters such as wind speed, wind direction, wind rose diagram, temperature and moisture, atmospheric stability, Control techniques for particulate matter such as bag house, cyclone chamber, scrubber
Types of water pollutant, characteristics of water such as physical, chemical water quality parameter with respect to total dissolved solids, chlorides, pH and alkanity etc.
Flow diagram of water treatment plant (WTP) and working of its units.

Unit III: Noise pollution and control
Ambient noise measurement, sound pressure, intensity, sound pressure level, decibel scale, numerical on decibel scale , addition and subtraction of noise level.
Noise pollution control and source, path, receiver. Noise level standards. Study of sound level meter.

List of experiments:
Part A:
1. Determination of PM_{10} by using high volume sampler.
2. Determination of pH and alkanity.
3. Determination of hardness.
4. Measurement of TDS water.
5. Measurement of turbidity of raw water sample.
6. Determination of conductivity of waste water sample.
7. Determination of moisture content and pH of solid waste.
8. Determination of ambient noise level by sound level meter.

Part B: Assignment1 on Unit I, II & assignment2 on Unit III
Text books: 1 Air pollution and control by M N Rao , Tata McGrawhill Publication. 2 Waste water engineering by B C Punmia, Laxmi Publication. 3 Environmental engineering by H.S. Pavey Rowe , Tata McGrawhill Publication.
Reference books: 1. Introduction to environmental engineering by Mackenzie L Davis. Tata McGrawhill Publication
Course Coordinator : Mrs. M.S. Deshmukh **BOS Member: Dr. T. R. Jadhav** **BOS Chairman: Dr. S. V. Kulkarni**

Semester – II

ETUA22171 : Control Systems

Teaching Scheme
Credits : 4
Lectures : 4 Hrs/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Prerequisite: Readers/students are expected to know the following concepts:
1) Partial Fractions , 2) Laplace Transform, 3) Matrices

Course Objectives:

- To introduce various types of control system and transfer function of the system.
- To introduce methods for analyzing the time response, the frequency response and the stability of systems.
- To introduce the concept of root locus, Bode plots, Nyquist plots.
- To introduce the state variable analysis method.
- To introduce concepts of PID controllers and digital and control systems.
- To introduce concepts programmable logic controller.

Course Outcomes :
On completion of the course, student will be able to:

1. Calculate transfer function of the system using various reduction techniques.
2. Determine the (absolute) stability of a closed-loop control system.
3. Perform time domain analysis of control systems using root-locus technique required for stability analysis.
4. Perform frequency domain analysis using frequency plots required for stability analysis.
5. Express and solve system equations in state variable form.
6. Model digital control system using pulse transfer function.

Unit- I : Basics of Control Systems

Introduction, Types of Control Systems: Open loop & Closed loop, Feedback Control System, Effect of Feed Back, Signal flow graphs, Concept of Transfer Function, Characteristics Equation, Poles and Zeros, Block Diagram Algebra, Control system Components

Unit –II : Time Domain Analysis

Type and Order of the Control Systems, Types of Standard Inputs , Response of First Order System to Step, Ramp and Parabolic Inputs , Response of Second Order System to Step Input , Time Domain Specifications of Second Order Systems, Steady State Error and Error Coefficients, Effects of addition of Poles and Zeros

Unit III : Frequency Domain Analysis

Need of Frequency Domain Analysis , Correlation between Time & Frequency Domain, Frequency Domain Specifications , Bandwidth , Bode Plot , Construction of Bode Plot , Gain and Phase Margin , Determination of Relative Stability, Nyquist Stability Criterion, Relative Stability Using Nyquist Criterion.

Unit IV: Stability

Concept of Stability, Absolute, Relative, Marginal and Unstable Stability analysis in S Plane , Dominant Poles and Zeros, Routh Hurwitz Criterion, Concept of Root Locus

Unit V: State Space Analysis

Concept of State , State Variables and State Model, State Space Representation using State Model, State Transition Matrix and its properties, Concept of Controllability and Observability

Unit VI : Digital Control Systems
Introduction, Advantages over analog control system, Sampled Data Control System, Transfer Function of Digital Control System, Introduction to Digital PID Controller, Introduction to PLC, application of PLC with Ladder diagram.
Text Books : 1. Katsuhiko Ogata, Modern Control Engineering, Fifth Edition, PHI Learning Private Limited, New Delhi, 2010 2. I.J. Nagrath, M.Gopal, Control Systems Engineering, Fifth Edition, New Age International Publishers, New Delhi, 2007 **3.** D. Roy choudhary, Modern Control Engineering, First Edition, PHI Learning Private Limited, New Delhi.
Reference Books : 1 Curtis D Johnson, Process Control Instrumentation Technology, Eighth Edition, PHI Private Limited, New Delhi, 2011 2 W. Bolton, Programmable Logic Controllers, Sixth Edition, Newness Publications. 3 B.C. Kuo, Digital Control Systems, Second Edition, Oxford University Press, New York, 1992
Course Coordinator : Mrs. A.P. Navghane **BOS Member: Dr. T. R. Jadhav** **BOS Chairman: Dr. S. V. Kulkarni**

ETUA22172 : Control Systems – Practice

Teaching Scheme

Credit : 1
Tutorial : 1 Hr/week

Examination Scheme

Formative Assessment : 50 Marks

Prerequisite: Readers/students are expected to know the following concepts:
1) Partial Fractions , 2) Laplace Transform, 3) Matrices

Course Objectives:

- To introduce various types of control system and transfer function of the system.
- To introduce methods for analyzing the time response, the frequency response and the stability of systems.
- To introduce the concept of root locus, Bode plots, Nyquist plots.
- To introduce the state variable analysis method.
- To introduce concepts of PID controllers and digital and control systems.
- To introduce concepts programmable logic controller.

Course Outcomes :

On completion of the course, student will be able to:

1. Calculate transfer function of the system using various reduction techniques.
2. Determine the (absolute) stability of a closed-loop control system.
3. Perform time domain analysis of control systems using root-locus technique required for stability analysis.
4. Perform frequency domain analysis using frequency plots required for stability analysis.
5. Express and solve system equations in state variable form.
6. Model digital control system using pulse transfer function.

Tutorials :

1. Find overall transfer function of the system using block diagram algebra.
2. Find the time domain specifications of the given system.
3. Construct the root locus.
4. Estimate the stability of s system using root locus technique.
5. Draw Bode Plot, find Phase Margin and Gain Margin and Comment on the stability.
6. Find stability of the system using Nyquist Plot.
7. Calculate State Transition Matrix for given system and verify the properties of the same.
8. Calculate transfer function of a Digital System.
9. Study of Digital Proportional-Integral-Differential (PID) Controller with reference to response time, steady state error.
10. Implement Programmable Logic Controller (PLC) applications using Ladder Diagram.

Text Books :

1. Katsuhiko Ogata, Modern Control Engineering, Fifth Edition, PHI Learning Private Limited, New Delhi, 2010
2. I.J. Nagrath, M.Gopal, Control Systems Engineering, Fifth Edition, New Age International Publishers, New Delhi, 2007

3. D. Roy choudhary, Modern Control Engineering, First Edition, PHI Learning Private Limited, New Delhi.

Reference Books :

1 Curtis D Johnson, Process Control Instrumentation Technology, Eighth Edition, PHI Private Limited, New Delhi, 2011

2 W. Bolton, Programmable Logic Controllers, Sixth Edition, Newness Publications.

3 B.C. Kuo, Digital Control Systems, Second Edition, Oxford University Press, New York, 1992

Course Coordinator : Mrs. A.P. Navghane

BOS Member: Dr. T. R. Jadhav

BOS Chairman: Dr. S. V. Kulkarni

ETUA22173 : Communication Engineering I

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Formative Assessment : 50Marks
Summative Assessment :50 Marks

Prerequisite: Readers/students are expected to know the following concepts:
1) Fourier Transform, 2) Different signals like periodic signal and their analysis.

Course Objectives:

- To introduce analog communication system, Signal to noise ratio, different modulation and demodulation techniques, its spectrum analysis and bandwidth calculations.
- To equip the students with mathematical tool like Fourier transform for signal analysis and interpretation.
- To familiarize the students with the concepts of AM, FM detection and the performance characteristics of the receiver.
- To familiarize the students to pulse and digital modulation and its reconstruction techniques.

Course Outcomes:

1. Understand and apply the fundamentals of communication systems using Fourier transform.
2. Apply sampling theorem to understand A/D conversion and pulse modulation and reconstruction techniques.
3. Select a suitable modulation and demodulation technique for the given specifications.
4. Design system-level blocks to transmit and recover message signals from the following analog modulation formats: amplitude modulation (AM with carrier), double-sideband (DSB), single-sideband (SSB), and frequency modulation (FM).
5. Compare, contrast and identify different communication techniques under the presence of noise.
6. Identify and design building blocks of basic communication system

Unit- I : Fundamentals of Communication Systems

An introduction to Electronic Communication System, Modulation and Multiplexing, Need for modulation, Transmission media, Introduction to Noise , Signal to Noise ratio, Base band and carrier communication. Electromagnetic spectrum and its application

Unit –II : Amplitude (Linear) Modulation

Generation of AM (DSBFC) and its spectrum, Power relations applied to sinusoidal signals, DSBSC – multiplier modulator, switching modulator & its spectrum, Modulation Index. SSBSC generation methods & ISB & VSB, their Comparison

Unit III: AM Receiver

Block diagram of AM and FM Receivers, Super heterodyne Receiver, Performance Characteristics: Sensitivity, Selectivity, Fidelity, Image Frequency Rejection and IFRR. Tracking, Mixers. AM Detection: Rectifier detection, Envelope detection; Demodulation of DSBSC: Synchronous detection; Demodulation of SSBSC.

Unit IV :Angle (Exponential) Modulation

Instantaneous frequency, Concept of Angle modulation, frequency spectrum, Narrow band & wide band FM, Modulation index, Bandwidth, Phase Modulation, Bessel's Function and its mathematical analysis,

Generation of FM (Direct & Indirect Method), Comparison of FM and PM.

Unit V:FM Receiver

Super heterodyne FM Receiver, Pre emphasis &De emphasis, limiter in FM, FM Detection using PLL, Threshold in angle modulation,Comparison of performance of AM & FM systems.

Unit VI:Pulse Analog modulation

Band limited & time limited signals, Narrowband signals and systems, Sampling theorem in time domain, Nyquist criteria, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect. PAM PWM & PPM. Pulse Code Modulation – Generation & reconstruction

Text Books :

1. B. P. Lathi , "Modern Digital and Analog. Communication Systems", 3rd Edition, Oxford
2. Dennis Roddy&Coolen, "Electronic Communication",4th Edition, Prentice Hall

Reference Books :

1. Simon Haykin, "Communication Systems", 4th Edition, John Wiley & Sons
2. Frenzel, "Principles of Electronic Communication Systems"3rd Edition, Tata McGraw-Hill
3. Taub, Schilling, "Principles of communication system"3rd Edition, Tata McGraw-Hill

Course Coordinator : Mrs. S.H. Bhagwat

BOS Member: Dr. T. R. Jadhav

BOS Chairman: Dr. S. V. Kulkarni

ETUA22174 : Integrated Circuits

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Formative Assessment : 50Marks
Summative Assessment :50 Marks

Prerequisite: Readers/students are expected to know the following concepts/courses:
Basics of Electronics engineering, Network Theory (Network theorems, KVL, KCL etc), Semiconductor Devices & Circuits

Course Objectives:

- To understand the characteristics of Op-Amp and study the internal structure.
- To introduce various manufacturing techniques.
- To study of various op-amp parameters, frequency response and transient response for Op-Amp.
- To analyze and design linear and nonlinear applications of Op-Amp.
- To analyze and design PLL and understand working of its applications

Course Outcomes:

1. Apply mathematical knowledge to analyze op-amp based circuits.
2. Design and analyze linear applications of operational amplifier
3. Design and analyze nonlinear applications of operational amplifier
4. Design active filters for given specifications
5. Understand the working of different converters and compare them based on performance parameters
6. Understand the working principle of phase locked loop(PLL) and its applications

Unit- I : OP-AMP Fundamentals and Parameters
Block diagram of OP-AMP, Explanation of each block, Differential Amplifier configurations, Differential amplifier analysis for dual-input balanced-output configurations using 'r' parameters, Need of level shifter, ideal parameters and practical parameters of OP-AMP and their comparison, Current Mirror, Ideal equivalent circuit of OP-AMP, frequency response of operational amplifier, Frequency compensation

Unit –II : Linear Applications of OP-AMP
Inverting and Non-inverting amplifier, voltage follower, voltage scaling, difference amplifier, Ideal integrator, errors in ideal integrator, practical integrator, frequency response of practical integrator, applications of integrator, Ideal differentiator, errors in ideal differentiator, practical differentiator, frequency response of practical differentiator, applications of differentiator, Requirements of Instrumentation amplifier, 3 OP-AMP Instrumentation amplifier, Instrumentation amplifier Applications

Unit III : Non-linear Applications of OP-AMP
Comparator, characteristics of comparator, applications of comparator, Schmitt trigger(symmetrical/asymmetrical), Square wave generator, triangular wave generator, Problems in basic rectifier, Need of precision rectifier, Full wave precision rectifiers, peak detectors

Unit IV: Active Filters
Difference between active and passive filters, Order of filter, First order and second order Butterworth LPF, First order and second order Butterworth HPF, Higher order filters(Concept level only),Need of higher order filters, Band pass and band stop filter (Concept level)

Unit V:Converters using OP-AMP

I-V and V-I converter, ADC And DAC ,V-F and F-V converter(concept level only)

Unit VI : PLL and its applications

PLL types block diagram of PLL, function and types of each block, characteristics/parameters of PLL and different applications of PLL.

Text Books :

1. Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", Pearson Education
2. Salivahanan and Kanchana bhaskaran, "Linear Integrated Circuits", TMH

Reference Books :

1. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", TMH
2. George Clayton and Steve Winder, "Operational Amplifiers"
3. Millman, Integrated Electronics, MH

Course Coordinator : Dr. T. R. Jadhav

BOS Member: Mr. A. V. Chitre

BOS Chairman: Dr. S. V. Kulkarni

ETUA22175 : Data Structures

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Formative assessment:50 marks
Summative assessment: 50 marks

Prerequisite: Readers/students are expected to know the following concepts:
1. Fundamentals of Programming Languages, 'C' programming

Course Objectives:
- To choose the appropriate data structure and algorithm design method for a specified application.
- To learn how the algorithm design methods impact the performance of programs.
- To study the systematic way of solving problems, various methods of organizing large amounts of data.
- To solve problems using data structures such as linear lists, stacks, queues, binary trees, binary search trees, and graphs and writing programs for these solutions.

Course Outcomes:
On completion of the course , students will be able to

1. Write and understand the programs that use arrays & pointers in C
2. Discuss the computational efficiency of the principal algorithms such as sorting & searching.
3. Describe how arrays, records, linked structures are represented in memory and use them in algorithms.
4. Implement stacks & queues for various applications.
5. Understand various terminologies and traversals of trees and use them for various applications.
6. Understand various terminologies and traversals of graphs and use them for various applications.

Unit- I : Introduction to Algorithm & Program Design
Basic Terminology; Elementary data organization, Data Structures, Data structure operations, Abstract Data Type. Algorithm: Complexity, Time Space Tradeoff, Algorithmic Notations, Control Structures, Functions in C: Passing by value, recursive functions, Local & Global Variables, Arrays: Arrays in C and various operations, pointers

Unit II :Searching and Sorting
Need of searching and sorting, why various methods of searching and sorting, Sorting methods: Linear, binary search and fibonnaci Search. Sorting methods: Bubble, insertion, selection, merge, Time complexity of each searching and sorting algorithm..

Unit III : Linked Lists
Singly Linked Lists: Concept, Representation of Linked list in Memory, Traversing a linked list, Searching a linked list, Memory Allocation; Garbage collection, Insertion into Linked list, Deletion from a linked list, Circularly Linked list, Doubly Linked List.

Unit IV: Stacks, Queues, Recursion
Stacks: Concept, Array representation of stacks, Linked representation of stacks, Arithmetic expressions; Polish notation. Application of stacks Queues: Concept, Array representation of queues, Linked representation of queues, Circular queue Application of queues.

Unit V:Trees
Binary Trees: Concept & Terminologies, Representation of Binary Tree in memory, Traversing a binary

tree, Binary Search Trees (BST), Searching, Traversing a binary search tree,Balanced Binary Trees. Application of Trees: Expression Tree, Game Trees.

Unit VI : Graphs

Graph theory terminology, Sequential representation of graphs; Adjacency matrix, Linked representation of a graph, Operations on graph, Traversing a graph, Spanning trees; Minimum Spanning tree, Kruskal's Algorithm, Prim's Algorithm.

Text Books :

1. Yashavant Kanetkar, Data Structures Through C, BPB Publication, 2nd Edition
2. Yashavant Kanetkar," LET US C"

Reference Books :

1. Yedidyah Langsam, Moshe J Augenstein, Aaron M Tenenbaum – Data structures using C and C++ - PHI Publications (2nd Edition).
2. Ellis Horowitz, Sartaj Sahni- Fundamentals of Data Structures – Galgotia Books source.

Course Coordinator : Mrs. G. V. Ghule

BOS Member: Mr. A. V. Chitre

BOS Chairman: Dr. S. V. Kulkarni

ETUA22176: Economics

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Formative assessment:50 marks
Summative assessment: 50 marks

Prerequisite: Readers/students are expected to know the following concepts:

1. Basics of economics

Course Objectives:

- To learn the basics of economics and cost analysis relevant to engineering so as to take economically sound decisions.
- To identify conditions for present worth comparison and future worth comparison and find appropriate solutions for the information challenges.
- To learn and calculate the Rate of interest.
- To understand different costs and overheads.
- To understand profit and loss accounts.

Course Outcomes:

- Understand the economics and cost analysis.
- Aware of present worth comparison and future worth comparison.
- Understand rate of return and different taxes.
- Understand different cost
- Aware of finance, profit and loss.

Unit- I : Introduction

Engineering Decision-Makers, Engineering and Economics, Problem solving and Decision making, Intuition and Analysis, Tactics and Strategy. Engineering Economic Decision, Maze. Law of demand and supply, Law of returns, Interest and Interest factors: Interest rate, Simple interest, Compound interest, Cash - flow diagrams, Personal loans and EMI Payment, Exercises and Discussion.

Unit –II : Present-Worth Comparisons

Present-Worth Comparisons: Conditions for present worth comparisons, Basic Present worth comparisons, Present-worth equivalence, Net Present worth, Assets with unequal lives, infinite lives, Future-worth comparison, Pay-back comparison, Exercises, Discussions and problems.

Unit III : Equivalent Annual-Worth Comparisons

Equivalent Annual-Worth Comparison methods, Situations for Equivalent Annual-Worth Comparisons, Consideration of asset life, Comparison of assets with equal and unequal lives, Use of shrinking fund method, Annuity contract for guaranteed income, Exercises, Problems.

Unit IV: Rate-Of-Return Calculations And Depreciation

Rate of return, Minimum acceptable rate of return, IRR, IRR misconceptions, Cost of capital concepts. Causes of Depreciation, Basic methods of computing depreciation charges, Tax concepts, corporate income tax.

Unit V:Estimating and Costing

Components of costs such as Direct Material Costs, Direct Labor Costs, Fixed Over-Heads, Factory cost, Administrative Over-Heads, First cost, Marginal cost, Selling price, Estimation for simple components.

Unit VI : Introduction, Scope Of Finance, Finance Functions

Statements of Financial Information: Introduction, Source of financial information, Financial statements, Balance sheet, Profit and Loss account, relation between Balance sheet and Profit and Loss

account.

Reference Books :

1 Leland T. Blank and Anthony J. Tarquin , "Engineering Economy" 4th Edition ,McGraw Hill Publication .
2 Chan S. Park "Contemporary Engineering Economics", 3rd Edition,PHI Publications.
3 Dr.K.K.Dewett and M. H. Navalur ," Modern Economic Theory"Revised Edition,S Chand Publication.

Course Coordinator : Dr. S. V. Kulkarni

BOS Member: Mr. A. V. Chitre

BOS Chairman: Dr. S. V. Kulkarni

ETUA22177 : * Lab Practice-II

* Lab Practice II will be conducted for Communication Engineering ,Integrated Circuits, Data Structures

Teaching Scheme
Credits : 3
Practical : 6 Hrs/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment: 50 Marks

Course Outcomes :
On completion of the course students will be able to

1. Understand the generation and detection of different analog modulation techniques, analyze AM and FM signals and calculate its power , bandwidth and efficiency.
2. Determine the sampling frequency and analyze the signals in time and frequency domain.
3. Select the operational amplifier to design and analyze linear and nonlinear applications
4. Design ,build and test linear and Non Linear op amp based circuits
5. Discuss the computational efficiency of the principal algorithms such as sorting & searching.
6. Describe how arrays, records, linked structures are represented in memory and use them in algorithms.

A: Communication Engineering I (Practical)

1. Study of Fourier series representation of Sine, Square and Triangular waveforms using DSO.
2. AM Generation (DSB-FC) using IC 1496/1596: Calculation of modulation index by waveform and trapezoidal method,
3. Study of simple diode (envelope) detector : Observe the effect of change in RC time constant which leads to diagonal and negative peak clipping
4. Generation of DSB-SC with the help of Balanced Modulator IC1496/1596 & its detection
5. Generation of SSB-SC using Filter method, phase shift method & its detection
6. AM transmitter: Observe the spectrum and calculate power of AM signal for different values of modulation indices using spectrum analyzer.
7. Frequency Modulator (FM) generation using NE 566 VCO: calculate of modulation index and verify the Bessel's function table and its detection using IC 565 (PLL)
8. Study of FM Transmitter: observe output waveform using Spectrum Analyzer and see the effect of Eigen values on carrier power.
9. Verification of Sampling Theorem and types of sampling: (Flat top & Natural sampling)
10. Generate AM and FM waveform for given modulation index, signal frequency and carrier Frequency using modern tool like MATLAB.

B: Integrated Circuits (Practical)

1 Design, build and test closed loop Inverting and Non inverting amplifier
2 Measurement of Slew Rate and CMRR of an operational amplifier
3 Design, build and test an active integrator
4 Design build and test three Op-amp instrumentation amplifier
5. Design, build and test precision full wave rectifier.
6 Design, build and test Symmetric Schmitt trigger.
7 Design, build and test first order/second order Butterworth Low/high pass active filter
8 Design, build and test PLL

9 Design, build and test square wave generator.
10. Demonstrate V to I convertor with grounded load using LabVIEW / Breadboard

C: Data Structures (Practical)

1. Write C program to perform 1. Linear Search, 2. Binary search
2. Write C program to perform 1. Bubble sort, 2. Insertion sort, 3. Selection sort
3. Perform following String operations : a. copy, b. palindrome, c. compare
4. Create a singly linked list with options: a.Create b.Insert c.Display
5. Implement Stack using arrays. Write a menu driven program to perform following operations on stack a) Push b) Pop c) Display
6. Implement Stack using Linked Lists. Write a menu driven program to perform following operations on stack a) Push b) Pop c) Display
7. Implement Queue using arrays. Write a menu driven program to perform following operations on Queue a) Insert b) Delete c) Display
8. Implement Queue using Linked Lists. Write a menu driven program to perform following operations on Queue a) Insert b) Delete c) Display
9. Binary search tree: Create, search, recursive traversals.
10. Graph using adjacency Matrix with BFS or DFS traversal.

Text Books : A

1. B. P. Lathi , "Modern Digital and Analog. Communication Systems", 3rd Edition, Oxford
2. Dennis Roddy&Coolen, "Electronic Communication",4th Edition, Prentice Hall

Text Books : B

1. Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", Pearson Education
2. Salivahanan and Kanchanabhaskaran, "Linear Integrated Circuits", TMH

Text Books : C

1. Yashavant Kanetkar, Data Structures Through C, BPB Publication, 2nd Edition
2. Yashavant Kanetkar," LET US C"

Course Coordinator : Dr. T. R. Jadhav

BOS Member: Mr. A. V. Chitre

BOS Chairman: Dr. S. V. Kulkarni

ETUA22178 : Skill Development (Electronic Workshop Practice– II)

Teaching Scheme
Credits: 1
Practical: 2Hrs/week

Examination Scheme
Formative Assesment:50 Marks

Prerequisite: Students are expected to know the following concepts:
Theory of electronic devices and its construction

Course Objectives:

- To learn the steps in electronic circuit through simulation and hardware implementation
- To imbibe good soldering design practices for robust design of electronic systems.
- To understand the importance of documentation by compiling Project Report

Course Outcomes:

- Test and Troubleshoot simple electronic circuit.
- Develop good soldering skills
- Use an EDA tools for an analysis and testing purpose.
- Prepare a technical project report with troubleshooting manual

A. Selecting a project involving discrete devices, op amp, LSI devices only

B. Simulating the selected project using EDA Tools Example. Multisim (Transient Analysis/AC analysis/DC Operating parameter sweep/temperature sweep

C. Implementing, Testing &Trouble shooting of selected project and comparing result with simulation results.

D. To prepare consulted project report mentioning simulation results and hardware results.

Reference Books :

1. Simulation Software's Help Manual (Examples. Multisim, Altium Design)
2. Data Books
3. Magzine (Examples. Everyday Practical Electronics ,Elektor, Electronics For You)

Course Coordinator : Mr. R. S. Pol

BOS Member: Mr. A. V. Chitre

BOS Chairman: Dr. S. V. Kulkarni

ETUA22179 : Project Management

Teaching Scheme
Credits : 2
Lectures : 2 Hrs/week

Examination Scheme
Formative Assessment:50 marks

Course Objectives:

- To make students conversant with the importance of project management in construction industry.
- To make students analyze and solve problems on network analysis, resource allocation and updating
- To make students conversant with the concept of materials management and project appraisal.
- To explain the students the importance of TQM in projects
-

Course Outcomes: At the end of the course the students will have an ability to:

1. Develop knowledge about management, project life cycle and importance of organizational structure of a project.
2. Demonstrate the use of project planning, scheduling, monitoring and control techniques for a project.
3. Understand the necessity of materials management and equipment management Use techniques to appraise a project.
4. To define and understand the importance of Total quality management in construction Industry.

Unit- I : Introduction to project management
Importance, objectives & functions of management , Categories of project , Project--- life cycle Concept and Cost Components , Project management Institute and Certified Project Management Professionals (PMP), Importance of organizational Structure in Management- Authority / Responsibility Relation..

Unit –II : Project planning and scheduling
WBS – Work Breakdown, Gantt/Bar chart, Network Analysis, C. P. M .- . Activity on Arrow (A.O.A.), Critical path and type of floats , Precedence network analysis (A.O.N.), P. E. R.T.

Unit III : Project Monitoring and control
Resource Allocation – Resource Smoothening and leveling , Network Crashing – Time- Cost – Resource optimization, Project Monitoring- Updating , Earned Value, Primary and secondary Material Procurement Procedures-material requirement- raising of indents, receipts, Inspection, storage, delivery, record keeping– Use of Excel sheets, ERP software, , Study of Project Feasibility report and Detailed Project Report (DPR) , Role of Project Management Consultants

Unit IV: Total quality Management TQM – Necessity, advantages, Difference between, quality control, quality assurance, total quality control and total quality management (TQM). Benchmarking in TQM, Kaizen in TQM, Process based approach for achieving TQM, Quality manual – Importance, Introduction to ISO.

Text Books :

1. 'Project Management: Engineering, Technology and Implementation, Shtub, Bard and Globerson, PH Inc.
2. Project Management: Systems approach to Planning Scheduling and Controlling, H. Kerzner
3. Total Project Management: The Indian Context, P. K. Joy, Macmillan India Ltd.

Reference Books :

1. Project Scheduling and Monitoring in Practice, S. Choudhury, SAP.
2. Total Quality Management-Dr. GunmalaSuri and Dr. Puja Chhabra Sharma-Biztantra
3. Project Management Handbook, Dock, Gower

Assignments.

1. Use of Project Management Software – MS Project / Primavera for project scheduling for minimum 25 activities
2. Assignment on network crashing/resource allocation
3. Assignment on ABC analysis/ EOQ.
4. Assignment on Project economics.
5. Assignment on Project appraisal Assignment on construction equipment

Course Coordinator : Dr. S. V. Kulkarni

BOS Member: Mr. A. V. Chitre

BOS Chairman: Dr. S. V. Kulkarni