Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

S.Y. B. TECH. (E & TC), SEMESTER III (PATTERN 2020)

Course Code	Course Title	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
			L	T	P	CIE	ISE	SCE	ESE	PR/ OR/ TW		
ES21201ET	Probability and Statistics	TH	3	1	-	20	30	20	30	25	125	4
ETUA21202	Engineering Circuit Analysis	TH	3	-	2	20	30	20	30	25	125	4
ETUA21203	Data Structures	TH	3	-	2	20	30	20	30	25	125	4
ETUA21204	Digital System Design	TH	3	-	2	20	30	20	30	25	125	4
ETUA21205	Signals and Linear Systems	TH	3	-	-	20	30	20	30	-	100	3
ETUA21206	Electronics Workshop	CE	1		4	-	-	-	-	50	50	3
ETUA21207	Fundamentals of Electrical Machines and Drives	CE	1	0	2	-	-	-	-	50	50	2
M2	Mandatory Course	AU	-	-	-	-	-	-	-	-	-	-
	Total		17	1	12	100	150	100	150	200	700	24

S.Y. B. TECH. (ETC), SEMESTER IV (PATTERN 2020)

Course Code	Course Title	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
			L	T	P	CIE	ISE	SCE	ESE	PR/ OR/ TW		
ETUA22201	Control system	TH	3	-	2	20	30	20	30	25	125	4
ETUA22202	Microcontroller and Applications	TH	3	-	2	20	30	20	30	25	125	4
ETUA22203	Analog Circuits	TH	3	-	2	20	30	20	30	25	125	4
ETUA22204	Analog and Digital Communication	TH	3	-	2	20	30	20	30	25	125	4
ES20205	Universal Human values 2	TH	2	1	-	20	30	20	30	25	125	3
ETUA22206	Object Oriented Programming	CE	1	-	4	-	-	-	-	50	50	3
ES22207ET	Soft Skills	CE	1	-	2	-	-	-	-	50	50	2
M2	Mandatory Course	AU	-	-	-	-	-	-	-	-	-	-
	Total		16	1	14	100	150	100	150	225	725	24

List of Mandatory Courses [FYBT: Induction training, SYBT: Environmental Sciences, TYBT: Indian Constitution, and Final Year B.Tech.: Essence of Indian Traditional Knowledge]. Please refer AICTE model curriculum for course contents.

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Semester III

ES21201ET: Probability and Statistics

Teaching Scheme	Examination Scheme						
Credits:4 Lecture (L): 3 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
Practical (P): -- hr. Tutorial (T): --1hr./week	20	30	20	30	-	25	125

Prerequisite: Basics of Integration and differentiation, Concepts of set theory

Course objectives:

- To provide students with a good understanding of the concepts probability, random variables and statistics
- To help the students develop the ability to solve problems using probability and statistics.
- To connect probability and statistics to other fields both within and without mathematics.
- To develop abstract and critical reasoning by studying logical proofs and the axiomatic method as applied to probability and statistics.

Course Outcomes:

Upon completion of the course, students will be able to

1. apply basic of probability and related theorems to real life problems.
2. map the given input to desired range of output using random variable.
3. evaluate different statistical measure and classify observed samples into standard random distribution
4. demonstrated the concepts of joint distribution
5. identify and apply appropriate hypothesis test on given data
6. select and apply suitable regression model on given dataset

Unit I– Probability

Introduction to probability, sets, fields, events, Axiomatic definition of probability, Joint, Conditional and Total Probabilities, Bayes theorem and its applications. Bernoulli trials, Binomial theorem

Unit II – Random Variable

Discrete random variables, probability mass function, probability distribution function, example random variables and distributions; Continuous random variables, probability density function, probability distribution function
One dimensional Random variable, Problems on one dimensional RV, Mean variance and moments

Unit III – Pairs of Random Variables

Two Random Variables, Pairs of Discrete Random Variables, The Joint cdf of X and Y, The Joint pdf of Two Continuous Random Variables, Independence of Two Random Variables, Joint Moments and Expected Values of a Function of Two Random Variables, Conditional Probability and Conditional Expectation

Unit IV – Standard Distribution and Statistical Parameters

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions:
Binomial, Poisson, Uniform, exponential and Normal - evaluation of statistical parameters for these distributions.
Functions of Two Random Variables Pairs of Jointly Gaussian Random Variables, Generating Independent Gaussian Random Variables

Unit V- Tests of Hypothesis and Significance

Population and Sample, Statistical inference, Sampling with and without replacement, Random samples, Population parameters, Sample statics, Sampling distributions, Sample mean, Sampling distribution of means, Sample variances, Sampling distribution of variances, Case where population variances is unknown

Central Limit theorem and its significance; Some sampling distributions like chi-square, t, F

Unit VI – Correlation and Regression

Correlation, Rank correlation, (Pearson, Kendall, Spearman), Regression Analysis, Linear and Nonlinear Regression, Multiple regression, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves.

Text Books:

1. H. Stark and J. Woods, ``Probability and Random Processes with Applications to Signal Processing," Third Edition, Pearson Education
2. Schaum's outline Of Theory and Problems of Probability, Random Variables, and Random Processes

Reference Books:

1. Papoulis and S. Unnikrishnan Pillai, ``Probability, Random Variables and Stochastic Processes," Fourth Edition, McGraw Hill
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability, UBS Publishers
3. S. Ross, Introduction to Stochastic Models, Harcourt Asia, Academic Press

ETUA21202: Engineering Circuit Analysis

Teaching Scheme	Examination Scheme						
Credits: 4	CIE	ISE	SCE	ESE	PR/OR	TW	Total
Lecture (L): 3 hrs./week Tutorial (T): 0 Practical (P): 2 hrs/week	20	30	20	30	25	--	125

Prerequisite::
Basics of Electrical and Electronics 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 series and parallel resonance circuits and filters (low pass, high pass, band pass and band stop).
- To understand the initial conditions, and apply Laplace transform for RL, RC, and RLC circuits and carry out its transient analysis.
- To introduce the students to JFETs and MOSFETs and their characteristics, operation, circuits and applications.
- To design and analyze the response of various JFET and MOSFET amplifier circuits for small signal at low and high Frequency.
- To understand the importance of negative and positive feedback by studying different feedback amplifier and oscillator topologies.

Course Outcomes:

On completion of the course, students will be able to

1. Apply various network simplification techniques for the analysis of networks and apply different network theorems to analyze ac and dc networks.
2. Analyze frequency selective networks and assess the requirements of filters and design them for the given specifications.
3. Formulate and solve the differential equations using Laplace Transform for analysis of first and second order electric networks
4. Analyze, and design different biasing techniques for JFET amplifiers.
5. Interpret, Design and analyze DC and AC response of MOSFET amplifiers.
6. Understand different design alternatives for feedback amplifiers and oscillators.

Unit- I : Circuit Analysis and Network Theorems

Network Analysis: Mesh, Super mesh, Node and Super Node analysis, Network Theorems: Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorem (DC & AC circuit analysis).

Unit–II: Frequency Selective Networks

Quality factor, Series and Parallel Resonance: Impedance/ Admittance, Phase angle, Voltage and current variations with frequency, Bandwidth, Selectivity. Four terminal Networks: Z0 and alpha, Classification of Filters, T - Network, π-Network. Characteristics of filters. Constant-K LPF, HPF, BPF and BSF

Unit–III: Laplace Transform for analysis of Electric circuits

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.

Unit-IV: Junction Field Effect Transistor (JFET)

Introduction to Junction Field Effect Transistor (JFET), Types, Construction, Operation, Static characteristics, Pinch off voltage, FET Volt-Ampere characteristics, FET amplifier 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–V: Metal Oxide Semiconductor Field Effect Transistor (MOSFET)

Structure and working of MOSFET, I-V characteristics of MOSFETs, DC analysis of MOSFET circuits, Non-ideal effects in MOSFET viz. Finite output resistance, channel length modulation, body effect, sub-threshold conduction, breakdown effects and temperature effects.

AC Analysis of MOSFET Circuits: The basic MOSFET amplifier and small-signal parameters: gate transconductance, bulk transconductance and small-signal output resistance, MOSFET low frequency small signal AC equivalent circuit, AC analysis of common source MOSFET amplifiers, MOSFET capacitances, high frequency small signal AC equivalent circuit, Analysis of common gate and common drain MOSFET amplifiers.

Unit–VI: Feedback Amplifiers and Oscillators

Feedback concepts, feedback topologies. Examples of voltage series and current series FET feedback amplifiers and their analysis. Barkhausen criterion, FET RC phase shift oscillator, Wein bridge oscillator, General form of LC oscillator, Hartley and Colpitts oscillators using transistors. The IC 555 timer as an oscillator.

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. D. Roy Choudhury, Network and Systems, New Age International Publishers
3. Sedra and Smith, "Microelectronic Circuits," 7th Ed., Oxford University Press.
4. Donald A. Neamen, "Microelectronics Circuit Analysis and Design," 4th Ed., Mc Graw Hill

Reference Books :

1. M.E. Van Valkenburb, Network Analysis, 3rd Edition
2. Ravish R. Singh, Network Analysis and Synthesis, Tata McGraw-Hill Publishing Company Ltd.
3. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory," 11th Edition, Pearson Education.
4. Thomas L. Floyd, "Electronic Devices," Conventional Current Version, 9th Edition, Prentice Hall.

List of Experiments

1. To analyze resistive network using network simplification technique.
2. To verify Superposition theorem
3. To verify Maximum power transfer theorem
4. To verify Thevenin's theorem
5. To analyze a given network using modern tool such as MATLAB or Multisim.
6. Design, build and test single stage CS amplifier using JFET with and without bypass capacitor. Calculate Av, Ri, Ro theoretically and practically.
7. Simulate transient, AC, and DC response of MOSFET single stage CS amplifier.
8. Design, build, and test RC/LC oscillator using JFET/MOSFET

ETUA21203: Data Structures

Teaching Scheme	Examination Scheme						
Credits: 4	CIE	ISE	SCE	ESE	PR/OR	TW	Total
Lecture (L): 3 hrs./week Tutorial (T): 0 Practical (P): 2 hrs/week	20	30	20	30	25	--	125

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

Course Objectives:

- To impart basic concepts of data structures.
- To understand various data searching and sorting methods
- To understand basic concepts of stacks, queues, lists, trees and graphs.
- To enable them to write algorithms of solving problems with the help of fundamental data structures.

Course Outcomes: At the end of this course, students will demonstrate the ability to

1. Apply theory and principles of classes, objects in C++ language to solve a programming problem
2. Select appropriate searching and sorting techniques in the application development
3. Evaluate problem statement and solve using Linked list
4. Identify appropriate algorithm from stack, queue to solve given problem
5. Compare different terminologies and traversals of trees to find best method
6. Use graph data structure for problem solving and programming. 2. Use graph data structure for problem solving and programming

Course Outcomes(Practical)

1. Describe how arrays, linked lists are represented in memory and write programs using them.
2. Apply basic principles of JAVA to write simple programs.

Unit I : Introduction to Data Structures and C++ programming concepts

Basic Terminology; Elementary data organization, Data Structures, Data structure operations, Review of C++, Declaration of variable, Reference variables, Scope resolution operator, Classes & Objects: Specifying a class, Defining member functions, A C++ program with class, Constructors & Destructors, Analysis of algorithm: Frequency count and its importance in analysis of an algorithm, Asymptotic Notation

Unit- II : Searching and Sorting

Representation of one dimensional array, multidimensional arrays
Searching: Linear and Binary search, Fibonacci search.
Sorting: Bubble sort, Selection sort, Insertion Sort, Merge Sort, Quick Sort & their Complexity Analysis.

Unit- III : Linked List

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.
Linked list for embedded system programming.

Unit IV: Stacks and Queues

Stacks: Concept, operations of stacks, Array representation of stack, Linked representation of stack, Application of stacks: Arithmetic expressions.
Concept, Array representation of queues, Linked representation of queue, Circular queue , Applications of queue

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, Application of Trees: Expression Tree.

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. Sartaj Sahni , "Data structures, Algorithms and Applications in C++", 2nd Edition, Universities Press.

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 – Computer Science Press.

List of Experiments:

1. Implement Linear and Binary search for given set of numbers.
2. Sort the data in ascending order using Bubble sort (Display pass by pass output)
3. Create a singly linked list with options: a. Create b. Insert c. Display
4. Implement Stack using arrays. Write a menu driven program to perform following operations on stack a) Push b) Pop c) Display
5. Implement Queue using arrays. Write a menu driven program to perform following operations on Queue a) Insert b) Delete 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 linked List. Write a menu driven program to perform following operations on Queue a) Insert b) Delete c) Display
8. Binary search tree: Create, Display, recursive traversals.
9. Graph using adjacency Matrix with BFS or DFS traversal.
10. Develop an application based on linear and non-linear data structures.

ETUA21204: Digital System Design

Teaching Scheme	Examination Scheme						
Credits: 4	CIE	ISE	SCE	ESE	PR/OR	TW	Total
Lecture (L): 3 hrs./week Tutorial (T): 0 Practical (P): 2 hrs/week	20	30	20	30	25	--	125

Prerequisite: Readers/students are expected to know the following concepts:
Boolean Algebra, Electronic Devices

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. Understand number systems and minimization techniques.
2. Apply minimization techniques to design combinational logic circuits.
3. Understand and interpret fundamentals of sequential circuits.
4. Design and analyze finite state machines.
5. Understand digital logic families and PLDs.
6. Write VHDL codes of basic combinational and sequential circuits.

Unit –I: Number Systems and Minimization Techniques

Introduction to number systems, conversion, binary arithmetic, digital codes, logic gates, Boolean algebra and logic simplification using Boolean rules and laws.
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

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, De multiplexers and their use in combinational logic designs, Decoders, de multiplexer 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, Registers, Shift registers and its applications.

Unit IV: Sequential Logic Design

Counters, ripple counters, up/down counters, synchronous counters, lock out. Clock Skew, Clock jitter effect on synchronous designs. Basic design steps- State diagram, State table, State reduction, State assignment, FSM (Mealy and Moore machines)

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: Introduction to HDLs

Library, Entity, Architecture, Modeling styles, Data types and objects, Concurrent and sequential statements, Design examples on basic combinational and sequential circuits.

Text books :

1. R. P. Jain, "Modern digital electronics", 4th edition, TMH Publication.
2. T. L. Floyd, "Digital Fundamentals", 9th edition, Pearson International Edition.
3. J. Bhaskar, "VHDL Primer", 3rd Edition, PHI Publication.

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.

List of Practicals:

1. Design and Implement full adder and subtractor function using IC-74LS138.
2. Design and Implement 1 digit BCD adder using IC-74LS83 (4 bit Adder)
3. Study of IC74LS85 as a magnitude comparator
4. Study of IC 74LS153 as a Multiplexer
5. Design and Implement MOD-N and MOD-NN using IC-74LS90 (Decade Counter)
6. Design and Implement MOD-N and MOD-NN using IC-74LS93 (mod 16 Counter)
7. Design and Implement Pulse train generator using IC-74HC194/IC74LS95 (Use right shift/left shift).
8. Design and simulate the given combinational circuit using EDA tools.
9. Design and simulate the given sequential circuit using EDA tools.
10. Write, simulate and verify, VHDL code for ALU (four bit logical and arithmetic operations).

Mini Project/Seminar (SCE)

ETUA21205: Signals & Linear Systems

Teaching Scheme	Examination Scheme						
Credits: 3	CIE	ISE	SCE	ESE	PR/OR	TW	Total
Lecture (L): 3 hrs./week Tutorial (T): 0 Practical (P): 0	20	30	20	30	--	--	100

Prerequisite: Students are expected to know the concepts studied in following courses:

1. Basics of integration, derivatives, basics of series and it's convergence criterion, graph sketching (EM-I, EM-II)

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
- To develop basis of probability and random variables.

Course Outcomes: At the end of this course, students will demonstrate the ability to

1. classify and evaluate signals and systems mathematically.
2. apply convolution to analyze LTI systems.
3. illustrate Fourier analysis for characterizing signal in frequency domain.
4. apply Laplace transform for analysis and simplification of LTI systems.
5. calculate the similarity measures and evaluate the spectral characteristics of signals**.**
6. calculate expected values and probabilities associated with the distributions of random variables using rules of PDF and CDF

Unit I: Introduction to Signals and Systems

Definition of signals and systems, communication and control systems as examples, Classification of signals: Continuous time and discrete time, even, odd, periodic and non-periodic, deterministic and non-deterministic, energy and power. Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration (Accumulator for DT), time scaling, time shifting and folding, precedence rule. Elementary signals: exponential, sine, step, impulse and its properties, ramp, rectangular, triangular, signum, sinc.

Systems: Definition, Classification: linear and nonlinear, time variant and invariant, causal and non-causal, static and dynamic, stable and unstable, invertible

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

Impulse response, 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 III: Fourier transform

Fourier Transform (FT) representation of aperiodic CT signals, Dirichlet condition for existence of Fourier transform, evaluation of magnitude and phase response, FT of standard CT signals, FT of standard periodic CT signals, Properties and their significance, Interplay between time and frequency domain using sinc and

rectangular signals, Fourier Transform for periodic signals, introduction to Discrete Time Fourier Transform

Unit IV: Laplace transform and its applications

Definition of Laplace Transform (LT), Limitations of Fourier transform and need of Laplace transform, ROC, Laplace transform of standard periodic and aperiodic functions, properties of Laplace transform and their significance, Laplace transform evaluation using properties, Inverse Laplace transform based on partial fraction expansion, stability considerations in S domain, Application of Laplace transforms to the LTI system analysis.

Unit V: Correlation and Spectral Analysis

Definition of Correlation and Spectral Density, correlogram, comparison 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.

Unit VI: Probability and Random Signals

Probability: Experiment, sample space, event, probability, conditional probability and statistical independence

Random variables: Continuous and Discrete random variables, cumulative distributive function, Probability density function, properties of CDF and PDF. Statistical averages, mean, moments and expectations, standard deviation and variance.

Text Books :

1. Simon Haykins and Barry Van Veen, "Signals and Systems", 2nd Edition, Wiley India.
2. Simon Haykins, " An Introduction to Analog and Digital Communications", Wiley India

Reference Books :

1. Mrinal Mandal and Amir Asif, Continuous and Discrete Time Signals and Systems, Cambridge University Press, 2007
2. Charles Phillips, "Signals, Systems and Transforms", 3rd Edition, Pearson Education.
3. Peyton Peebles, "Probability, Random Variable, Random Processes", 4th Edition, Tata Mc Graw Hill.
4. Luis F. Chaparro, Signals and Systems using MATLAB, Academic Press an imprint of Elsevier Inc., 2011
5. M.J.Roberts and Govind Sharma, "Fundamentals of Signals and Systems",2nd edition,Mc Graw Hill,2010

ETUA21206: Electronics Workshop

Teaching Scheme	Examination Scheme						
Credits: 3	CIE	ISE	SCE	ESE	PR/OR	TW	Total
Lecture (L): 1 hrs./week Tutorial (T): 0 Practical (P): 4 hrs/week	--	-	-	-	-	50	50

Prerequisite: Students are expected to know the concepts studied in following courses:

1. Digital System Design,
2. Electronics Devices and circuits,
3. Electronic Circuit analysis

Course Objectives:

- To make the student familiar with electronic components
- To highlight the importance and teach PCB artwork with an EDA tool.
- To learn the steps in electronic circuit through simulation and hardware implementation
- To imbibe good soldering design practices for robust design of electronic systems.

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

1. Interpret and summaries the specifications of different passive, active and Integrated components required to build electronic circuit
2. Use skillful an EDA tool in designing of electronic circuit schematic and simulation
3. Select optimal PCB design for building small circuit with skillfully solders any robust design PCB of electronic systems.
4. Elaborate the use of designed circuit in different applications

Unit I : Introduction to Passive Electronic Components

a) Passive Components:

i) Resistor: Types, Standard Values, Tolerance, Wattage, Linear and Log Potentiometer.
ii) Capacitor: Types (Ceramic, Electrolytic, tantalum etc.) Standard Values, Tolerance, WVDC,
iii) Inductor: Core Types, Construction, SWG Table, Transformer: Power Transformer construction, Audio Frequency Transformer, High Frequency Transformer, Relay Types

b) Active Components:

i) Diodes: Types (small signal, rectifier, Switching, zener, Power) Parameters (PIV,IF, IFM(rep.)IFM(non rep), trr, Bulk resistance,
ii) BJT: Types(Small signal, Power), Parameters (ICmax, Pdmax, Derating, SOA)
iii) FET: Types (FET, MOSFET), Parameters (IDmax, Pdmax, Rds)

c) Integrated Circuits Family : SSI, MSI and LSI, Analog and Digital IC, Hybrid IC, packages

Unit - II : Building and simulating small electronic circuit using EDA Tool

Selecting a small electronic circuit involving discrete devices, op amp, and LSI devices only. Understanding the working of circuit with validating the circuit feasibility, category, component selection. Simulating the selected circuit using EDA tools e.g. Proteus, Multisim, design guidelines for PCB, routing topology, grounding methodologies, generating simple artwork on single sided PCB Software

Unit - III : Design and Development of PCB

Types of PCB, concept of SMT and multilayer PCB boards, electrochemical etching mechanism of PCB board, drilling, automation in PCB design, automatic copper track routing machine, automatic component placer machines, wave soldering, etc.

Solder Iron Types (Wattage), Solder metal types, flux, Types of soldering and soldering process, Disordering. Building own PCB.

Unit - IV : Circuit Testing and Documentation

Bare board testing and final completed PCB testing with the help of various electronic instruments. To prepare report using Latex Tool suit following standard project report format, such as introduction with literature, block diagram to electronic circuit implementation, discussion about circuit simulation and

practical circuit testing results, comparison and analysis of circuit, Bill of Materials, future scope and applications, bibliography,

Text Books :

1. Simulation Software's Help Manual (Examples. Multisim, Proteus, Altium Design) Data Books
2. Magazine (Examples. Everyday Practical Electronics, Elektor, Electronics For You, various online magazines)
3. Electronic Instrumentation; by H. S. Kalsi; McGraw-Hill Education India Pvt. Ltd.
4. Principles of Measurement Systems by John P. Bently (Pearson)

Reference Books :

1. Electrical and Electronic Measurements and Instrumentation by A. K. Sawhney; Dhanpat Rai & Co.
2. Instrumentation measurement and Analysis by B.C. Nakra, K.K.Chaudhary
3. D. Roy Choudhury and Shail B. Jain, "Linear integrated Circuits," 5th Edition, New Age International Publishers.
4. Thomas L. Floyd, "Electronic Devices," Conventional Current Version, 9th Edition, Prentice Hall.

List of Experiments:

1. Study of Electronics Passive Components and their application.
2. Study of Electronics Active Components and their application.
3. Study of Electronics Integrated circuits and their application.
4. Study of Electronics Instruments and their laboratory usage.
5. Searching and collecting information for small electronics circuit (PBL statement)
6. Simulating circuit using open source or licensed EDA tools.
7. PCB Designing using open source or licensed EDA tool
8. PCB etching, components mounting and soldering.
9. Circuit testing, analysis and result presentation
10. Preparing technical report using rich open source document editing tools.

Mini Project/Seminar (SCE)

1. **Students are asked to design a small electronic circuit based on the real world socio problem / any suitable electronic circuit which help them to understand the complete electronics circuit design and implementation process through different open source or licensed EDA tools.**

ETUA21207: Fundamentals of Electrical Machines and Drives

Teaching Scheme	Examination Scheme						
Credits: 2	CIE	ISE	SCE	ESE	PR/OR	TW	Total
Lecture (L): 1 hr./week Tutorial (T): - Practical (P): 2 hrs/week	--	--	--	--	--	50	50

Prerequisite: Students are expected to know the fundamental concepts studied in following courses:
1. Basic Electrical Engineering

Course Objectives:
- To study the basic concepts of rotating electrical machines and performance characteristics of electrical motors.
- To apply different performance indicators of electrical motors for their selection in specific applications.
- To study various speed control and braking mechanisms employed in case of electrical motors.

Course Outcomes: At the end of this course, students will demonstrate the ability to
1. Draw the performance characteristics of electrical motors using fundamental concepts and laboratory tests.
2. Select electrical motors for industrial applications using their operating characteristics.

Unit I : Basic Concepts in rotating machines

Principle of electromechanical energy conversion: Generating and motoring action, Physical concept of torque production,

Constructional features of rotating electrical machines; polyphase induction machines, synchronous machines, dc machines

General concepts such as electrical and mechanical degrees, production of rotating magnetic field,

Losses and efficiency, safe operating area for electric machines, Loss dissipation and cooling,

Machine ratings

Unit II : Electrical Drives and applications

Introduction to electrical drive, Types of loads, quadrantal diagram of speed-torque characteristics, Load torque characteristics

Dynamics of motor-load combination

Motor applications,
Selection of motors based on load requirements and various operating conditions

Text Books :

1. Dr. P.S.Bimbhra, "Electrical Machinery," 5th Edition, Khanna Publishers, Delhi.
2. I. J. Nagrath and D. P. Kothari, "Electric Machines," 2nd Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3. S. K. Pillai, "A first course on Electrical Drives", 2nd Edition, New Age International(P) Ltd.

Reference Books :

1. Ned Mohan, "Electrical Machines and Drives: A first course," Wiley student edition, Wiley India Pvt. Ltd., New Delhi.
2. G.K.Dubey, "Fundamentals of Electrical Drives," 2nd Edition, Narosa Publishing House.
3. Vedam Subrahmanyam, " Electric Drives concepts and applications", 2nd Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4. S.G.Tarnekar and P.K.Kharbanda, " Laboratory courses in Electrical Engineering", 5th revised and enlarged edition, 2008, S.Chand and Company Ltd.

List of Experiments: (Any eight experiments from the following list can be performed)

1. To perform a load test on a separately excited / shunt motor.
2. To perform a load test on a dc series motor.
3. To perform the speed control of a dc shunt motor.
4. To perform speed control of a dc series motor.
5. To perform braking and speed reversal in case of dc motors.
6. To perform a load test on a three phase induction motor.
7. To perform a no load and blocked rotor test on a three phase induction motor.
8. To perform speed control of a three phase induction motor.
9. To perform speed control and speed reversal in case of a three phase induction motor.
10. To perform braking in case of a three phase induction motor.
11. To study various types of starters used in induction motors.
12. To perform a load test on a single phase induction motor.

Semester IV

ETUA22201: Control Systems

Teaching Scheme	Examination Scheme						
Credits: 4	CIE	ISE	SCE	ESE	PR/OR	TW	Total
Lecture (L): 3 hrs./week Tutorial (T): - Practical (P): 2 hrs/week	20	30	20	30	-	25	125

Prerequisite: Students are expected to know the concepts studied in following courses:
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 digital control systems.

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

Unit III : 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, Effects of addition of Poles and Zeros on system stability.

Unit IV: 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 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

List of Practicals :

To be performed in Scilab. At least 2-3 system examples should be taken in each experiment.

1. To study Scilab Control Systems toolbox
2. To calculate Transfer function of a system.
3. To perform transient response analysis of first and second order system.
4. To study effect of variation of zeta on system response
5. To study effect of location of poles on system stability.
6. To perform stability analysis of LTI system using Root locus.
7. To perform stability analysis of LTI system using Bode Plot.
8. To design state space model for a transfer function.

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

ETUA22202: Microcontroller and Applications

Teaching Scheme	Examination Scheme						
Credits: 4	CIE	ISE	SCE	ESE	PR/OR	TW	Total
Lecture (L): 3 hrs./week Tutorial (T): - Practical (P): 2 hrs/week	20	30	20	30	25		125

Prerequisite: Students are expected to know the concepts studied in following courses:

1. Digital System Design
2. Electronics Workshop
3. Fundamentals of Programming

Course Objectives:

- To give an overview of 8 bit architecture
- To justify the use of microcontroller in embedded system.
- To understand architecture and features of 8051 and AVR microcontroller.
- To learn interfacing of real world peripherals inputs (sensors) and output (actuators) with microcontroller.
- To study various hardware and software tools for developing applications
- To develop small application based assignment using Microcontrollers and sensors.

Course Outcomes: At the end of this course, students will demonstrate the ability to

1. Explain the architecture of 8051 CISC and RISC microcontroller.
2. Study of various 8051internal modules and instruction set of 8051.
3. Demonstrate programming environment and programming of 8051.
4. Draw the interfacing diagram of microcontroller with peripherals and demonstrate its working by Programming.
5. Compare serial communication protocols used in industrial environment
6. Explain the architecture of AVR microcontroller and develop the program in high level language.

Unit- I: Introduction to 8051 Microcontrollers

Basics of Microprocessor, Evolution of microcontrollers, Microcontroller selection criteria for particular application, MCS-51 architecture, family devices & its derivatives. Pin configuration, Port architecture, memory organization, external memory interfacing. Timers and its modes,

Unit- II: 8051 Interrupt, serial communication, Instruction Set and Programming

Interrupt structure, Serial communication and its modes.

Addressing modes: Introduction, Instruction syntax, Data types, Subroutines, Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing,

8051 Instruction set: Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction.

Unit –III: 8051 programming

Programming environment: Study of software development tool chain (IDE), hardware debugging tools (timing analysis using logic analyzer),

Assembly language programs

Unit IV : 8051 Microcontroller based Real World Interfacing and programming – I

Interfacing peripheral devices using GPIO: Generating various delays using Timer/counter and interfacing of LEDs, 7 segment displays, Switches, Relay, Stepper Motor, LCD interfacing, Keyboard Interfacing, ADC0809 and DAC interfacing with 8051. (Programming in Assembly/C)

Unit V : 8051 Microcontroller based Real World Interfacing and programming using serial communication – II

Basics of serial communication protocol: Synchronous and Asynchronous Communication, RS232, RS485, SPI, I2C.

Interfacing of devices using serial communication protocols: Interfacing of peripherals using UART, Interfacing RTC DS1307 using I2C protocol, Interfacing of memory using SPI protocol.
(Programming in Assembly/C)

DAS: Implement simple multichannel data acquisition system using AVR/8051. (Programming in Assembly/C)

Unit VI: Introduction to AVR RISC Microcontroller Architecture and programming

Overview of AVR family, AVR Microcontroller architecture, Introduction To 8-bit AVR Microcontroller, AVR register, AVR status register, ROM space and other hardware modules, ATmega32 pin configuration & function of each pins,

Interfacing peripheral devices with AVR: 7 segment displays, Servo motor interfacing, DC motor control using PWM programming, ADC and temperature sensor LM35 interfacing,
(Sample Programme in Assembly/C)

Text Books :

1. Mazidi Muhammad Ali; Mazidi Janice Gillispie; McKinlay Rolin D, "The 8051 Microcontroller and Embedded Systems Using Assembly and C", 2nd Edition, Dorling Kindersley.
2. The AVR Microcontroller and Embedded Systems Using Assembly and C, By Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, Pearson Education.

Reference Books :

1. Programming and Customizing the AVR Microcontroller, By Dhananjay Gadre, McGraw Hill Education
2. Richard Barnett, Sarah Cox , Larry O'Cull, "Embedded C Programming and the AVR Microcontrollers", 2nd edition Thomson publication.
3. Ayala Kenneth J, Gadre Dhananjay V, "8051 Microcontroller and Embedded Systems ", Cengage Learning.

Datasheets (from websites):

1. ATMEL 8051/52 data sheet
   Atmel AT89C51/52 AT89S51/52 Data Sheet www.keil.com › docs › datashts › atmel
2. AVR ATmega32 data sheet
   ATmega32A - 8-bit AVR Microcontrollers - Microchip Technology
   www.microchip.com › wwwproducts › ATmega32A

List of Experiments: Microcontroller and Applications

After completion of this course student should be able to

1. Demonstrate modern engineering tools necessary for simulating, configuring and monitoring embedded system (BT-3, Applying)
2. Design and Built microcontroller based system with peripheral interfacing and programming for real time applications. (BT-6 Creating)

(Any 8 experiments from 1 to 9)
***PBL compulsory**

I. 8051 based practical's (Programs in assembly language)

1. Simple programs to explore 8051 IDE (Addition, subtraction, multiplication etc)
2. Interfacing of LED's, switches, buzzer, relay with 8051 Microcontroller.
3. Interfacing of 16x2 LCD in 8 bit/4 bit mode with 8051 Microcontroller and display message on it.
4. Interface 4x4 matrix keyboard with 8051 Microcontroller. Display value of pressed switch on LCD.
5. Interface Computer with 8051 Microcontroller using UART communication.
6. Interface stepper Motor with 8051Microcontroller and write program to rotate it in clockwise and anticlockwise direction using different drives (Full step drive, Half step drive and wave drive).
7. Interfacing of ADC PCF8591 with 8051 Microcontroller using IIC protocol read the analog voltage from ADC and display its equivalent digital value on LCD.

II. AVR based practical's (Programs in C language)

8. AVR based Temperature indicator using sensor LM35
9. Colour object sorting system using AVR

Mini Project/Seminar (SCE)
III. Project Based Learning

Implementation of hardware and software for specific application using 8051 or AVR Microcontroller.

ETUA22203: Analog Circuits

Teaching Scheme	Examination Scheme						
Credits: 4	CIE	ISE	SCE	ESE	PR/OR	TW	Total
Lecture (L): 3 hrs./week Tutorial (T): 0 Practical (P): 2 hrs/week	20	30	20	30	25	--	125

Prerequisite: Students are expected to know the concepts studied in following courses:
1. Basic Electronics Engineering 2. Engineering Circuit Analysis

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: At the end of this course, students will demonstrate the ability to
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. Gayakwad, "Op-Amps and Linear Integrated Circuits," Pearson Education.
2. S. Salivahanan and V. S. Kanchana Bhaaskaran, "Linear Integrated Circuits", 2nd Edition, McGraw Hill Education (India) Pvt. Ltd.

Reference Books:

1. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits," 4th Edition, McGraw Hill Education.
2. D. Roy Choudhury and Shail B. Jain, "Linear integrated Circuits," 5th Edition, New Age International Publishers.
3. George Clayton and Steve Winder, "Operational Amplifiers"

List of Experiments:

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. Implementation of V-I converter with grounded load on LabVIEW using ELVIS II board (Demonstration).

Mini Project/Seminar (SCE)

ETUA22204: Analog and Digital Communication

Teaching Scheme	Examination Scheme						
Credits: 4	CIE	ISE	SCE	ESE	PR/OR	TW	Total
Lecture (L): 3 hrs./week Tutorial (T): - Practical (P): 2 hrs/week	**20**	**30**	**20**	**30**	**25**	**-**	**125**

Prerequisite: Students are expected to know the concepts studied in following courses:

1. Fundamentals of signals and Linear systems
2. Fundamentals of analog communication systems

Course Objectives:

- To understand the concept of information theory and channel capacity
- To understand the concept of radio receivers
- To learn the different waveform coding techniques used in digital communication.
- To interpret the concept and relationship of bandwidth, data rate, transmit power and error probability.
- To understand the concept of digital modulation and detection techniques.
- To learn spread spectrum modulation concept.

Course Outcomes: At the end of this course, students will demonstrate the ability to

1. Explain analog modulation techniques and receptions for Electronic communication system in context with time & frequency domains representation.
2. Explain the principle of radio receiver and Receivers for AM and FM transmitter.
3. Compare and explain different waveform coding techniques
4. Compare different line coding techniques based on power spectral density, bandwidth, error detection capability and clock(timing) extraction.
5. Compare different digital modulation techniques based on the given performance evaluation criterions.
6. Explain the concept of spread spectrum modulation and evaluate the performance based on bandwidth, error probability and transmitted power.

Unit- I: Analog modulation techniques and Detection (6 Hrs)

Need for frequency translation, Amplitude modulation: Double sideband with carrier (modulator and demodulator), spectrum and power efficiency, SSB modulation and demodulation, Introduction to VSB, FM modulator and demodulator.

Unit- II: Radio Receivers (6 Hrs)

Block diagram of AM and FM Receivers, Super heterodyne Receiver, Performance Characteristics: Sensitivity, Selectivity, Fidelity, Image Frequency Rejection and IFRR. Tracking, Mixers. Super heterodyne FM Receiver, Pre emphasis & De-emphasis.

Unit- III: Sampling and Waveform coding techniques (6 Hrs)

Sampling theorem, pulse code modulation (PCM), nonuniform PCM, PCM in T1 carrier system, DPCM, Adaptive DPCM, DM, ADM.(Focused on calculation of sampling frequency, data rate, quantization noise power, bandwidth requirement etc)

Unit –IV: Principles of Digital data transmission (6 Hrs)

Digital communication system: Source, Line coder, Multiplexer and repeater; Line coding: Computation of PSD of various line codes, Pulse shaping, scrambling, Eye diagram.

Unit V : Digital modulation, detection and baseband receiver (8 Hrs)

Baseband receiver and computation of probability of error, matched filter, Digital modulation and Detection: BPSK, QPSK and M-ary PSK, BFSK and M-ary FSK, MSK (Analysis based on Bandwidth

requirement, signal space representation and probability of error in terms of distance between the symbols based on signal space representation).

Unit VI: Spread spectrum modulation (6 Hrs)

Introduction, Pseudo noise sequences, A notion of spread spectrum, Direct sequence spread spectrum, processing gain, probability of error, Frequency-hop spread spectrum.

Text Books:

1. Modern Digital and Analog Communication Systems, B.P. Lathi and Z. Ding (adapted by H. M. Gupta) Oxford University Press 4th Edition.
2. Communication Systems, Simon Haykin, John Wiley and Sons, 4th Edition
3. Principles of Communication Systems, Herbut Taub, Donald L. Schilling and Goutam Saha, Tata McGraw Hill, 4th Edition.

Reference Books:

1. Digital Communications: Fundamentals and Applications, Bernard Sklar, PHPTR NJ.
2. Analog and Digital Communication, T.L. Singal, McGraw Hill Education.

List of Experiments:

After completion of this course student should be able to

Software based assignment:

1. Fourier series and transform analysis, properties, convolution and correlation interpretation.
2. Implementation of Amplitude and Frequency modulation and its detection (Observe the spectrum and bandwidth requirements of the system).
3. Implementation of sampling, PCM and delta modulation
4. PN sequence generation and verification of properties.
5. Hardware experiments
6. Line codes and spectrum analysis
7. BPSK and QPSK modulation and demodulation
8. DS-SS modulation and demodulation
9. BFSK modulation and demodulation

ES20205: Universal Human Values 2

Teaching Scheme	Examination Scheme						
Credits: 3	CIE	ISE	SCE	ESE	PR/OR	TW	Total
Lecture (L): 2 hrs./week Tutorial (T): 1 hr./week Practical (P): -	**20**	**30**	**20**	**30**	**-**	**25**	**125**

Prerequisite: None. Universal Human Values 1 (desirable)

Course Objectives:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

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

1. Become more aware of themselves, and their surroundings family, society, nature.
2. Become more responsible in life.
3. To handle problems with sustainable solutions.
4. Have better critical ability.
5. Become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
6. To apply what they have learnt to their own self in different day-to-day settings in real life.

Unit- I: Introduction - Need, Basic Guidelines, Content and Process for Value Education

Purpose and motivation for the course,
Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration,
Continuous Happiness and Prosperity- A look at basic Human Aspirations,
Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority,
Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Unit- II: Understanding Harmony in the Human Being - Harmony in Myself!

Understanding human being as a co-existence of the sentient 'I' and the material 'Body',
Understanding the needs of Self ('I') and 'Body' - happiness and physical facility,
Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer),
Understanding the characteristics and activities of 'I' and harmony in 'I',
Understanding the harmony of I with the Body, correct appraisal of Physical needs, meaning of Prosperity in detail

Unit- III: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness, Trust and Respect as the foundational values of relationship
Understanding the meaning of Trust; Difference between intention and Competence,
Understanding the meaning of Respect, Difference between respect and Differentiation; the other salient values in relationship,
Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals,

Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Unit –IV: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence with Implications of the Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values,
Definitiveness of Ethical Human Conduct,
Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order,
Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order
b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,
c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

Discussion on the conduct as an engineer or scientist.

Text Books :

Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books :

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

List of Tutorial: (Any 7 tutorials can be taken)

1. Practice session to discuss natural acceptance in human being.
2. Practice session to discuss the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.
3. Practice session to discuss the role others have played in making material goods available to me. Identifying from one's own life.
4. Practice session to differentiate between prosperity and accumulation.
5. Practice session to discuss program for ensuring health vs dealing with disease.
6. Practice session to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc.
7. Practice session to reflect on Gratitude as a universal value in relationships. Discuss with scenarios.
8. Practice session to reflect on Gratitude Elicit examples from students' lives.
9. Practice session to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.
10. Case Study session e.g. to discuss the conduct as an engineer or scientist etc.

ETUA22206: Object Oriented Programming

Teaching Scheme	Examination Scheme						
Credits: 3	CIE	ISE	SCE	ESE	PR/OR	TW	Total
Lecture (L): 1 hrs./week Tutorial (T): 0 Practical (P): 4 hrs/week	--	--	--	--	--	50	50

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

1. Fundamentals of Programming Languages, 'C++' programming

Course Objectives:

- To use the object-oriented paradigm in program design
- To Provide programming insight using OOP constructs
- To understand object-oriented concepts such as data abstraction, encapsulation, inheritance, packages and interfaces
- To Develop an ability to write programs in Java for problem solving

Course Outcomes:

On completion of the course, students will be able to

1. understand object-oriented programming principles
2. Apply the concepts of classes, methods to write programs Java.
3. Comprehend building blocks of OOPs language, inheritance, package and interfaces.
4. Describe and use the concepts in Java as groundwork for advanced programming

Course Outcomes(Practical)

1. Apply basic principles of object oriented programming to build java applications.
2. Implement java programs for establishing interfaces.

Unit I: Fundamental Concepts in JAVA Programming

Fundamentals of Object-Oriented Programming, JAVA Evolution , Overview of JAVA Language , Data Types, Variables, and Arrays , Operators - new and delete, Control Statements and Decision Making and Looping.

Unit- II: Classes, Objects and Methods

Class Fundamentals, Declaring Objects, Assigning Object reference variables, Introducing Methods, Constructors, The This keyword, Garbage collection, Finalize Method, Overloading Methods, using Objects as parameters, Argument passing, Returning objects

Unit- III: Inheritance, Packages & Interfaces

Inheritance Basics, Using super, Creating Multilevel hierarchy, Method Overriding, Using Abstract Classes, Using Final with Inheritance, The Object Class, Packages, Access Protection, Importing Packages and Interfaces.

Unit- IV: Exception Handling

Exception Handling Fundamentals, Exception Types ,Using try and catch , Nested try Statements, throw, throws ,finally , Java's Built-in Exceptions.

Text Books:

3. Java: A Beginner's Guide, Herbert Schildt
4. Balagurusamy E, Object Oriented Programming Using C++ and JAVA

Reference Books :

1. Java the complete reference , Herbert Schildt.
2. T. Budd, Understanding OOP with Java, Pearson Education.
3. E Balagurusamy, Programming with Java A Primer, Tata McGraw Hill, 3rd Edition.

List of Experiments:

1 Install JDK, write simple "Hello World" or similar java program, compilation, debugging, executing using java compiler and interpreter

2 Write java program:

i) To find factorial of number.

ii) To display first 50 prime numbers.

iii)To find sum and average of N numbers.

3 Write a program in Java to implement a Calculator with simple arithmetic operations such as add, subtract, multiply, divide, factorial etc. using switch case and other simple java statements. The objective of this assignment is to learn Constants, Variables, and Data Types, Operators and Expressions, Decision making statements in Java.

4 Write a program in Java with class Rectangle with the data fields width, length, area and colour. The length, width and area are of double type and colour is of string type. The methods are get_length(), get_width(), get_colour() and find_area(). Create two objects of Rectangle and compare their area and colour. If the area and colour both are the same for the objects, then display " Matching Rectangles", otherwise display " Non-matching Rectangle".

5 Write Programs in Java to sort i) List of integers ii) List of names. The objective of this

assignment is to learn Arrays and Strings in Java

6 Write a Program in Java to add two matrices. The objective of this assignment is to learn

Arrays in Java

7 Write a program in Java to create a player class. Inherit the classes Cricket_player, Football_player and Hockey_player from player class. The objective of this assignment is to learn the concepts of inheritance in Java.

8 Write a Java program which imports user defined package and uses members of the classes contained in the package.

9 Write a Java program which implements interface.

10 Write a program that creates a user interface to perform integer division. The user enters two numbers in

the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 and Num2 were not integers, the program would throw a Number Format Exception. If Num2 were zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box

11 Create an applet with three text Fields and four buttons add, subtract, multiply and divide. User

will enter two values in the Text Fields. When any button is pressed, the corresponding

operation is performed and the result is displayed in the third Text Fields.

12 Write a java program which use try and catch for exception handling.

13 Implement Java program to implement a base class consisting of the data members such as name of the student, roll number and subject. The derived class consists of the data members subject code, internal assessment and university examination marks. The program should have the facilities. i) Build a master table ii) List a table iii) Insert a new entry iv) Delete old entry v) Edit an entry vi) Search for a record. Use virtual functions.

14 Write a program to implement stack or any other data structure in Java

15 Write a program to create multiple threads and demonstrate how two threads communicate with each other.

16 Write a program to implement addition, subtraction and multiplication of two complex numbers in Java

17 A Mini project in Java: A group of 4 students can develop a small application in Java.

Mini Project/Seminar (SCE)

ES22207ET: Soft Skills

Teaching Scheme	Examination Scheme						
Credits: 2	CIE	ISE	SCE	ESE	PR/OR	TW	Total
Lecture (L): 1 hrs./week Tutorial (T): 0 Practical (P): 2 hrs/week	--	--	--	--	--	50	50

Course Objectives:

- To develop student's soft skills through discussions, demonstrations and activities.
- To acquire strategic competence to use L-S-R-W skills to use in a wide range of communication.
- To modify etiquette, team and leadership skills.

Course Outcomes:

On completion of the course, students will be able to

1. appraise themselves as better human beings
2. articulate themselves with better communication skills
3. identify themselves as an effective leader and team player

Unit I - Self Awareness & Self Development (04 Hours)

Introduction to Soft Skills, Self-Awareness, SWOT Analysis, Positive thinking, Confidence and Attitude, Emotional Intelligence & Critical thinking, Career Planning, Handling failure, Prioritization.

Unit II – Communication Skills (06 Hours)

Importance of communication, Types, Barriers of Communication, Effective Communication

a) Listening Skills: Empathic listening, Speech Listening

b) Written Skills – Formal & Informal letter writing, Report writing, Resume writing, Article Writing, Biography Writing, Review Writing

c) Speaking Skills – Public Speaking, Presentation skills, Group discussion, Debate, Personal Interview

d) Reading Skills – Books, Articles

Unit III- Etiquette and Interpersonal Relationship (02 Hours)

Corporate Grooming & Dressing, Email & Telephone Etiquette, Etiquette in Social & Office Setting, Team Work, Conflict Management, Decision making, Leadership Skills

List of Experiments:

1. Self- Introduction in detail.
2. SWOT analysis
3. Self- Assessment
4. Listening Skills activities
5. Letter/Application writing
6. Report writing
7. Resume writing
8. Personal Interview
9. Presentation skills
10. Group Discussion
11. Debate
12. Activities related to Leadership and team work

Reference Books:

1. Communication Skills: Sanjay Kumar and Pushpa Lata , Oxford University Press
2. Developing Communication Skill: Krishna Mohan, Meera Banerji,- McMillan India Ltd.
3. English for Business Communication: Simon Sweeney , Cambridge University Press
4. NASSCOM-Global Business Foudation Skills: Accenture,Convergys,Dell et.al.Foundation Books : Cambridge University Press
5. Basic Managerial Skills for all E. H. McGrath, Eastern Economy Edition, Prentice hall India.
6. Personality Development and Group Discussions,Barun K. Mitra, Oxford University Press
7. Group Dissussions and Interview Skills : Priyadarshi Patnaik : Foundation Books :Cambridge University Press
8. Thinks and Grow Rich: Napoleon Hill, Ebury Publishing, ISBN 9781407029252
9. Change Your Thoughts, Change Your Life: Wayne Dyer, Hay House India, ISBN-139788189988050
10. Habits of Highly Effective People: Stephen Covey Pocket Books, ISBN-13 9781416502494
11. The Power of Your Subconscious Mind: Dr Joseph Murphy Maanu Graphics ,ISBN-13 9789381529560
12. 10- The new Leaders: Daniel Coleman Sphere Books Ltd , ISBN-139780751533811
13. The 80/20 Principal: by Richard Koch, Nicholas Brealey Publishings ,ISBN-13 9781857883992
14. You can win: Shiv Khera, Macmillan, ISBN-139789350591932
15. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success: Gopalaswamy Ramesh, Mahadevan Ramesh