Savitribai Phule Pune University

FACULTY OF ENGINEERING

Syllabus for the

S.E (Electronics /Electronics & Telecommunications Engineering)

2015 Course

(w.e.f . June 2016)

Savitribai Phule Pune University, Pune
SE(E&TC/Electronics Engineering) 2015 Course

(With effect from Academic Year 2016-17)

Semester I

Course Code	Course	Teaching Scheme Hours / Week			Semester Examination Scheme of Marks						Credit	
		Theory	Tutorials	Practicals	In-Sem (On line)	End-Sem (Theory)	TW	PR	OR	Total	TH/TUT	PR+OR
204181	Signals & Systems	3	1	-	50	50	25	-	-	125	4	-
204182	Electronic Devices & Circuits	4	-	2	50	50	-	50	-	150	4	1
204183	Electrical Circuits and Machines	3	-	2	50	50	25	-	-	125	3	1
204184	Data Structures and Algorithms	4	-	2	50	50	-	-	50	150	4	1
204185	Digital Electronics	4	-	2	50	50	-	50	-	150	4	1
204186	Electronic Measuring Instruments & Tools	1	-	2	-	-	50	-	-	50	1	1
204192	**Audit Course 1**	--	--	--	--	--	--	--	--	--		
	Total	19	1	10	250	250	100	100	50	750	20	05
										Total Credits	**25**	

Abbreviations:

Th : Theory
TW: Term Work
OR: Oral
TUT : Tutorial
PR : Practical

Note: Interested students of S.E. (Electronics/E&TC) can opt any one of the audit course from the audit courses prescribed by BoS (Electronics/Computer/IT/Electrical/Instrumentation)

SE(E&TC/Electronics Engineering) 2015 Course

(With effect from Academic Year 2016-17)

Semester II

Course Code	Course	Teaching Scheme Hours / Week			Semester Examination Scheme of Marks						Credit	
		Theory	Tutorials	Practicals	In-Sem (on line)	End-Sem (Theory)	TW	PR	OR	Total	TH/TUT	PR+OR
207005	Engineering Mathematics III	4	1	-	50	50	25	-	-	125	5	-
204187	Integrated Circuits	4	-	2	50	50	25	50	-	175	4	1
204188	Control Systems	3	-	-	50	50	-	-	-	100	3	-
204189	Analog Communication	3	-	2	50	50	-	50	-	150	3	1
204190	Object Oriented Programming	3	-	4	50	50	-	-	50	150	3	2
204191	Employability Skill Development	2	-	2	-	-	50	-	-	50	2	1
204193	**Audit Course 2**	--	--	--	--	--	--	--	--	--		
	Total	19	1	10	250	250	100	100	50	750	20	05
									Total Credits		**25**	

Abbreviations:

TH: Theory
TW: Term Work
OR: Oral
TUT: Tutorial
PR: Practical

Note: Interested students of S.E (Electronics/E&TC) can opt any one of the audit course from the audit courses prescribed by BoS (Electronics/Computer/IT/Electrical/Instrumentation)

204181 Signals and Systems

Credits: Th- 03,Tut-01

Teaching Scheme:

Theory : 03 hr/week
Tutorial: 01 hr/week

Examination Scheme:

In-Sem(Online): 50 Marks
End-Sem(Theory):50 Marks
Term Work : 25 Marks

Course Objectives:

- To understand the mathematical description of continuous and discrete time signals and systems.
- To classify signals into different categories.
- To analyse Linear Time Invariant (LTI) systems in time and transform domains.
- To build basics for understanding of courses such as signal processing, control system and communication.
- To develop basis of probability and random variables.

Course Outcomes:

On completion of the course, student will be able to

1. Understand mathematical description and representation of continuous and discrete time signals and systems.
2. Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.
3. Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms.
4. Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain.
5. Understand the basic concept of probability, random variables & random signals and develop the ability to find correlation, CDF, PDF and probability of a given event.

Course Contents

Unit I : Introduction to Signals and Systems (8 Hrs)

Introduction and Classification of signals: Definition of signal and systems, communication and control systems as examples. Sampling of analog signals, sampling theorem, Continuous time and discrete time signal, Classification of signals as even, odd, periodic and non-periodic, deterministic and non-deterministic, energy and power.

Elementary signals used for testing: reasons for using standard test signals, exponential, sine, impulse, step and its properties, ramp, rectangular, triangular, signum, sinc.

Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration (Accumulator for DT), time scaling, time shifting and time folding.

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

Unit II : Time domain representation of LTI System (6 Hrs)

System modeling: Input-output relation, definition of impulse response, convolution sum, convolution integral, computation of convolution integral using graphical method for unit step to unit step, unit step to exponential, exponential to exponential, unit step to rectangular and rectangular to 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 Series (6 Hrs)

Fourier series (FS) representation of periodic Continuous Time (CT) signals, Dirichlet condition for existence of Fourier series, orthogonality, basis functions, Amplitude and phase response, FS representation of CT signals using trigonometric and exponential Fourier series. Applications of Fourier series, properties of Fourier series and their physical significance, Gibbs phenomenon, Discrete Time Fourier Series, properties, convergence of DTFS.

Unit IV : Fourier transform (7Hrs)

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 V : Laplace transform and its applications (7Hrs)

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 VI : Probability and Random Signals (6 Hrs)

Probability: Experiment, sample space, event, probability, conditional probability and statistical independence, Bayes theorem, Uniform and Gaussian probability models.

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.

Introduction to Correlation: Autocorrelation, Cross correlation, and their properties.

Text Books:

1. Simon Haykins and Barry Van Veen, “Signals and Systems”, 2nd Edition, Wiley India.
2. Charles Phillips, “Signals, Systems and Transforms”, 3rd Edition, Pearson Education.

Reference Books:

1. M.J. Roberts “Signal and Systems”, Tata McGraw Hill 2007.
2. Shaila Apte, “Signals and Systems-principles and applications”, Cambridge University press, 2016.
3. Mrinal Mandal and Amir Asif, Continuous and Discrete Time Signals and Systems, Cambridge University Press, 2007.
4. Peyton Peebles, “Probability, Random Variable, Random Processes”, 4th Edition, Tata Mc Graw Hill.
5. A. NagoorKanni “Signals and Systems”, 2nd edition, Mc Graw Hill.
6. NPTEL video lectures on Signals and Systems.

Guidelines for Tutorial / TW Assessment

Tutorials must be conducted batch wise. Batch size should not be more than 20 students. The main objective of this tutorial is to focus on the outcomes defined in the theory syllabus by solving the following assignments based on paper work.

At least 8 tutorials to be conducted. (Any 4 from first 6)

List of Tutorials

1 A) Sketch and write mathematical expression for the following signals in CT and Discrete Time (DT)
   a) Sine
   b) Rectangular
   c) Triangular
   d) Exponential
   e) Unit Impulse
   f) Unit Step
   g) Ramp
   h) Signum
   i) Sinc

B) Classify and find the respective value for the above signals
   a) Periodic / Non Periodic
   b) Energy / Power /Neither

2. Take any two CT and DT signals and perform the following operation Amplitude scaling, addition, multiplication, differentiation, integration (accumulator for DT), time scaling, and time shifting and folding.
3. 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 invariant, Invertible.
4. Express any two system mathematical expressions in impulse response form and determine whether each one of them is, Memory less, Causal, Linear, Stable, Time in variant, Invertible.
5. Perform Convolution Integral of Two Continuous time Signals. (Various Combinations can be taken for this.)
6. To find Fourier series for the signals and plot its magnitude and phase response. (Signals like: Half/Full wave rectified signal, Saw tooth wave etc.)
7. State and prove the various properties of CT 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 CT Laplace Transform. Take any example of a system in time domain and demonstrate the application of LT in system analysis.
9. To perform auto and cross correlation for DT and CT signals. Also explain the relation between Convolution and Correlation.

10.

A) List and Explain the properties of CDF & PDF, Suppose a certain random variable has the CDF

$$F_X(x)=\begin{cases} 0 & x\le 0 \\ kx^2 & 0<x\le 10 \\ 100k & x>10 \end{cases}$$

Evaluate k, Write the corresponding PDF and find the values of $P(X\le 5)$ and $P(5 < X \le 7)$

(This is only an example. Various Probability functions may be given)

B) Find mean ,mean square , standard deviation , variance of X

when $f_X(x)=ae^{-ax}u(x)$ with a>0

(This is only an example. Various Probability functions may be given)

204182 Electronic Devices and Circuits

Credits: Th- 04, Pr -01

Teaching Scheme:

Theory: 04 hrs/week
Practical: 02 hrs/week

Examination Scheme:

In-Sem (Online): 50 Marks
End-Sem(Theory):50Marks
Practical : 50 Marks

Prerequisites: - Basic knowledge of Semiconductor Physics

Course Objectives:

- To introduce semiconductor devices FET and MOSFET, their characteristics, operations, circuits and applications.
- To introduce concepts of both positive and negative feedback in electronic circuits.
- To analyse and interpret FET and MOSFET circuits for small signal at low and high frequencies.
- To simulate electronics circuits using computer simulation software and verify desired results.
- To study the different types of voltage regulators.

Course Outcomes:

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

1. Comply and verify parameters after exciting devices by any stated method.
2. Implement circuit and test the performance.
3. Analyze small signal model of FET and MOSFET.
4. Explain behavior of FET at low frequency.
5. Design an adjustable voltage regulator circuits.

Course Contents

UNIT I: JFET (8 Hrs)

Introduction to JFET, Types, Construction, Operation, Static Characteristics, Pinch off voltage, FET Volt-Ampere characteristics, FET Configurations (CS/CD/CG) and their Comparison. Biasing of FET (Self). FET as an amplifier and its analysis (CS) and its frequency response. Small signal model, FET as High Impedance circuits.

Unit II :MOSFET& its DC Analysis (8 Hrs)

Basics of MOS Transistor operation, Construction of n-channel E-MOSFET, E-MOSFET characteristics & parameters, non-ideal voltage current characteristics viz. Finite output resistance, body effect, sub-threshold conduction, breakdown effects and temperature effects. Common source circuit, Load Line & Modes of operation, common MOSFET configurations: DC Analysis, constant current source biasing.

Unit III : MOSFET AC Circuit Analysis: **(8 Hrs)**

The MOSFET CS small signal amplifier, Small signal parameters, small signal equivalent circuit, Modeling, Body effect, Analysis of CS amplifier. Introduction to BiCMOS technology. The MOSFET internal capacitances and high frequency model.

Introduction to MOSFET as basic element in VLSI, V-I characteristic equation in terms of W/L ratio, MOSFET scaling and small geometry effects, MOSFET capacitances.

Unit IV : MOSFET Circuits **(7 Hrs)**

MOSFET as switch, diode/active resistor, Current sink and source, current mirror, Voltage references, Basic principle of band gap reference, CMOS Inverter as amplifier: Active load, Current source and Push pull configurations.

Unit V : Feedback amplifiers and Oscillators **(8 Hrs)**

Four types of amplifiers. Feedback topologies. Effect of feedback on terminal characteristics of amplifiers. Examples of voltage series and Current series FET feedback amplifiers and their analysis. Barkhausen criterion, stability with feedback. General form of LC oscillator. FET RC Phase Shift oscillator, Wein bridge oscillator, Hartley and Colpitts oscillators.

Unit VI : VoltageRegulator: **(7 Hrs)**

Block diagram of an adjustable three terminal positive and negative regulators (317,337).Typical connection diagram, current boosting. Low drop out voltage regulators. Introduction to Switch Mode Power supply (SMPS), Block diagram of SMPS, Types of SMPS. Comparison of Linear Power supply and SMPS.

Text Books:

1.MillmanHalkias, “Integrated Electronics-Analog and Digital Circuits and Systems”, Tata McGraw Hill, 2000.

2. Donald Neaman, “Electronic Circuit Analysis and Design”,3rd Edition, Tata McGraw Hill.

Reference:

1. David A.Bell,“ElectronicDevicesandCircuits”,5th Edition, Oxford press
2. R. L. Boylstad, L. Nashlesky, “Electronic Devices and circuitsTheory”, 9thEdition, PrenticeHall of India, 2006.
3. Anil K. Maini and Varsha Agarwal “Electronic Devices and Circuits”, Wiley India
4. Phillip E. Allen, Douglas R. Holberg, “CMOS Analog Circuit Design”, Second Edition, Oxford.
5. K. R. Botkar, “Integrated Circuits”, 5th Edition, Khanna Publication.

Guidelines for Laboratory Conduction

Perform minimum eight experiments out of which at least three experiments should be conducted on bread board.

List of Practical

1. Design a single stage FET Amplifier in CS configuration and verify DC operating point.
2. Build and test single stage CS amplifier using FET. Calculate Ri, Ro and Av.
3. Simulate frequency response of single stage CS amplifier (use same circuit) and find the bandwidth.
4. SimulateVoltage-Series feedback amplifier and calculate Rif, Rof, Avf and Bandwidth.
5. Implement current series feedback amplifier and find Rif, Rof, Gmf and Bandwidth.
6. Simulate LC oscillator using FET.

   OR

7. Implement Weinbridge /RC phase shift oscillator using FET/MOSFET.
8. Simulate MOSFET/ CMOS Inverter.

   OR

9. Build and test MOSFET as a switch.
10. Design and implement an adjustable voltage regulator using three terminals voltage regulator IC.

204183 Electrical Circuits and Machines

Credits: Th – 03, Pr -01

Teaching Scheme:

Theory: 03hrs/week
Practical: 02 hrs/week

Examination Scheme:

In-Sem(Online): 50 Marks
End-Sem: (Theory): 50 Marks

Term Work: 25 Marks

Course Objectives:

- To analyse AC and DC networks with network simplification techniques.
- To gain basic knowledge of transformers and their types.
- To conduct experimental procedures on different types of electrical machines.
- To understand the constructional details, characteristics, features and application areas ofvarious types of electric motors.

Course Outcomes:

On completion of the course, student will be able to

1. Analyze basic AC & DC circuit for voltage, current and power by using KVL, KCL, andnetwork theorems.
2. Explain the working principle of different electrical machines.
3. Select proper electrical motor for given application.
4. Design and analyze transformers.

Course Contents

Unit I :Basic Circuit Analysis and Simplification Techniques (8 Hrs)

Kirchhoff's Current and Voltage Laws, Independent and dependent sources and their interconnection, power calculations.

Network Analysis: Mesh, Super mesh, Node and Super Node analysis. Source transformation and source shifting.

Network Theorems: Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems, Millers Theorem and its dual. (AC circuit analysis for all the topics of this unit)

Unit II :Transformer (6 Hrs)

Types, Construction, Transformer on No-load (Transformation ratio, emf equation), impedance transformation, losses in transformer, regulation and efficiency, rating. Auto transformer, coupling transformer, Isolation transformer, C.T. and P.T., Design of single phase transformer for instrument power supply, High frequency transformers.

Unit III :DC Machines (7 Hrs)

Construction of DC Machine, Motoring and generation action, types, EMF equation, Torque equation (Torque-armature current characteristics, Torque-speed characteristics, speed-armature current characteristics), Power flow diagram. Problems on speed, torque & losses. Different methods of speed control, different types of starters for DC shunt motor. Permanent Magnet DC motors, Applications of DC Motors

Unit IV :AC Motors (7 Hrs)

Three phase Induction motors, construction and principle of operation, types, slip and torque equation, Torque-slip characteristics, condition for maximum torque & ratios, types of starters, speed control, V/f control, Applications.

Synchronous motors: Construction, principle of operation, characteristics (V curves) and applications.

Unit V :Special Motors 1 (6 Hrs)

BLDC Motor, Construction, principle, characteristics, control circuit, sensors, applications. Construction, principle & applications of Reluctance Motor, Universal Motor.

Unit VI :Special Motors 2 (6Hrs)

Construction, types, principle, Characteristics, control circuit & applications of Stepper Motor and Servo motor.

Construction, principle, characteristics, Types and applications of single phase Induction Motor.

Text Books:

1. Abhijit Chakrabarti & Sudipta Debnath, “Electrical Machines”,Tata McGraw-hill Publication.
2. William H Hayt, Jack E Kimmerly and Steven M. Durbin, “Engineering Circuit Analysis”, TataMcGraw Hill.

Reference:

1. A.E. Fitzgerald, Charles Kingsley & Jr. Stephen D. Umans,“Electrical Machinery”, TataMcGraw-hill Publication 6th Edition.
2. I.J Nagarath& D.P Kothari, “Electrical Machines”, Tata McGraw-hill Publication 4th Edition.
3. T. J. E. Miller, “Brushless permanent-magnet and reluctance motor drives”,OxfordUniversity Press(1989)
4. Ned Mohan, “Electric Machines and Drives”: A first course, Wiley.
5. B. L. Theraja, ”Electrical technology” volume 2, S. Chand

Guidelines for Laboratory Conduction

Perform any 8 experiments:

List of Practical

1. Network Theorems : To verify Thevenin's and Norton's theorem (DC or AC)
2. O.C. And S.C. Test on single phase transformer
3. Polarity test on single phase transformer.
4. Equivalent Circuit of a Single Phase Induction Motor by performing the no- load and blocked rotor tests.
5. Study of BLDC Motor Drive.
6. Speed control of DC motor using armature voltage and field current control method. Measure RPM and plot graph of speed versus armature voltage and field current.
7. Load test on 3-phase induction motor
8. Determination of equivalent circuit parameters of 3-phase induction motor using no load & blocked-rotor test.
9. To plot speed- torque characteristic of three phase induction motor.
10. To study various operating modes of stepper motor.

Data Structures and Algorithms
Credits: Th – 04, Pr -01

Teaching Scheme:
Theory: 04 hrs/week
Practical: 02 hrs/week

Examination Scheme:
In-Sem(Online): 50 Marks
End-Sem: (Theory):50 Marks

Oral : 50 Marks

Prerequisites: Basic knowledge of C language is required.

Course Objectives:

- To assess how the choice of data structures and algorithm design methods impacts the performance of programs.
- To choose the appropriate data structure and algorithm design method for a specified application.
- 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.

To employ the different data structures to find the solutions for specific problems

Course Outcomes:

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

1. Discuss the computational efficiency of the principal algorithms such as sorting & searching.
2. Write and understand the programs that use arrays & pointers in C
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.

Course Contents

Unit I : Introduction to C and Algorithm (8 Hrs)

Constants, variables and keywords in C, operators and control structure in c(decision, loop and case), functions, macros, arrays and string manipulation, structure, union, enumeration, bitwise operations Functions: Parameter passing call by value and call by reference, scope rules, functions and pointers, function returning pointer, pointer to function, String manipulations using Arrays, pointer to pointer, Dynamic memory management.

Analysis of algorithm: frequency count and its importance in analysis of an algorithm, Time complexity & Space complexity of an algorithm, Big ‘O’ notation

Unit II :Searching and Sorting (8 Hrs)

Need of searching and sorting, why various methods of searching and sorting, Sorting methods: Linear, binary search and Fibonacci Search.

Sorting methods: Bubble, insertion, selection, merge, Time complexity of each searching and sorting algorithm, Hashing Techniques.

Unit III : Stack and Queues (7 Hrs)

Stacks: Concept, Basic Stack operations, Array representation of stacks, Stack as ADT, Stack Applications: Reversing data, Arithmetic expressions conversion and evaluation.

Queues: Concept, Queue operations, Array representation of queues, Queue as ADT, Circular queues, Application of queues: Categorizing data, Simulation of queues.

Unit IV : Linked List (7 Hrs)

Concept of linked organization, singly linked list, stack using linked list, queue using linked list, doubly linked list, circular linked list, Linked list as ADT. Representation and manipulations of polynomials using linked lists, ,comparison of sequential linked organization with linked organization

Unit V : Trees (7 Hrs)

Introduction to trees: Basic Tree Concepts, Binary Trees:Concept & Terminologies, Representation of Binary Tree in memory, Traversing a binary tree, Binary Search Trees (BST): Basic Concepts, BST operations.

Unit VI : Graphs (7 Hrs)

Basic Concepts & terminology, Sequential representation of graphs; Adjacency matrix, Path matrix, Linked representation of a graph, Operations on graph, Traversing a graph, Spanning trees; Minimum Spanning tree, Kruskal's Algorithm, Prim's Algorithm. Dijkstra's Shortest Path Algorithm

Text Books:

1. Ellis Horowitz, SartajSahni, "Fundamentals of Data Structures", Galgotia Books Source. ISBN:10: 0716782928
2. Richard F. Gilberg& Behrouz A. Forouzan, Data Structures APseudocode Approach with C, Cengage Learning, second edition. ISBN-10: 0534390803

Reference:

1. Seymour Lipschutz, Data Structure with C, Schaum's Outlines, Tata McGrawHill. ISBN-10: 1259029964
2. E Balgurusamy - Programming in ANSI C, Tata McGraw-Hill, Third Edition. ISBN-10: 1259004619
3. YedidyahLangsam, Moshe J Augenstein, Aaron M Tenenbaum – Data structures using C and C++ - PHI Publications, Second Edition). ISBN 10: 8120311779

List of Practical

Note: Practical 1-8 are compulsory. Practical 9-15 are optional.

Write C program to implement

1. Write C program to store student information (e.g. RollNo, Name, Percentage etc.).
   a. Display the data in descending order of Percentage (Bubble Sort).
   b. Display data for Roll No specified by user (Linear Search).
   c. Display the number of passes and comparisons for different test cases (Worst, Average, Best case).

2. Perform following String operations with and without pointers to arrays (without using the library functions): a. substring, b. palindrome, c. compare, d. copy, e. reverse.

3. Data base Management using array of structure with operations Create, display, Modify, Append, Search and Sort.(For any database like Employee or Bank database with andwithout pointers to structures)

4. Create a singly linked list with options:
   a. Insert (at front, at end, in the middle),
   b. Delete (at front, at end, in the middle),
   c. Display,
   d. Display Reverse,
   e. Revert the SLL.

5. Implement Stack using arrays & Linked Lists. Write a menu driven program to perform following operations on stack a) Push b) Pop c) Display

6. Implement Queue using arrays & Linked Lists. Write a menu driven program to perform following operations on Queue a) Insert b) Delete c) Display

7. Binary search tree: Create, search, recursive traversals.

8. Graph using adjacency Matrix with BFS & DFS traversals.

9. Implement set operations using arrays and perform union, intersection, difference, symmetric difference

10. Accept input as a string and construct a Doubly Linked List for the input string with eachnode contains, as a data one character from the string and perform:
    a) Insert b) delete, c) Display forward, d) Display backward

11. Represent graph using adjacency list or matrix and generate minimum spanning tree using Prism's algorithm

12 Read & write operations in a text file.

13 Polynomial addition using array of structure.

14 Evaluation of postfix expression (input will be postfix expression)

15 Implement following Matrix operations:

   a. addition with pointers to arrays

   b. multiplication without pointers to arrays

   c. transpose with pointers to arrays

204185 Digital Electronics
Credits: Th – 04, Pr -01

Teaching Scheme	Examination Scheme
Theory: 04 hrs/week	**In-Sem(Online): 50 Marks**
Practicals: 02 hrs/week	**End-Sem (Theory):50 Marks**
	Practical : 50 Marks

Course Objectives:
- To acquaint the students with the fundamental principles of two-valued logic and various devices used to implement logical operations on variables.
- To lay the foundation for further studies in areas such as communication, VLSI, computer, microprocessor.

Course Outcomes:
On completion of the course, student will be able to
1. Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
2. Design combinational and sequential circuits.
3. Design and implement hardware circuit to test performance and application.
4. Understand the architecture and use of microcontrollers for basic operations and Simulate using simulation software.

Course Contents

Unit I : Combinational Logic Design (8 Hrs)
Standard representations for logic functions, k map representation of logic functions (SOP and POS forms), minimization of logical functions for min-terms and max-terms (upto 4 variables), don't care conditions, Design Examples: Arithmetic Circuits, BCD - to – 7 segment decoder, Code converters. Adders and their use as subtractor, 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, demultiplexer trees. Introduction to Quine-McCluskey method.

Unit II :Sequential Logic Design (8 Hrs)
1 Bit Memory Cell, 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. Application of Flip flops: 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 III : State Machines (8 Hrs)
Basic design steps- State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Implementation, finite state machine implementation, Sequencedetector. Introduction to Algorithmic state machines- construction of ASM chart and realization forsequential circuits

Unit IV : Digital Logic Families (8 Hrs)

Classification of logic families, Characteristics of digital ICs-Speed of operation, power dissipation, figure of merit, fan in, fan out, current and voltage parameters, noise immunity, operating temperatures and power supply requirements.TTL logic. Operation of TTL NAND gate, active pull up, wired AND, open collector output, unconnected inputs. Tri-State logic. CMOS logic – CMOS inverter, NAND, NOR gates, unconnected inputs, wired logic , open drain output. Interfacing CMOS and TTL. Comparison table of Characteristics of TTL, CMOS, ECL, RTL, I2L, DCTL.

Unit V : Programmable Logic Devices and Semiconductor Memories (6 Hrs)

Programmable logic devices: Detail architecture, Study of PROM, PAL, PLA, Designing combinational circuits using PLDs. General Architecture of FPGA and CPLD Semiconductor memories: memory organization and operation, expanding memory size, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM,DRAM.

Unit VI : Introduction to Microcontroller 8051 (7 Hrs)

Microprocessors and Microcontrollers comparison, 8051 architecture, Pin description, addressing modes, instruction set of 8051, concepts of Counters and Timers with the help of status registers, Port Structure and Interrupts. Simple programming examples – for addition, subtraction, multiplication and delay.

TextBooks:

1. R.P. Jain , “Modern digital electronics” , 3rd edition , 12threprint Tata McGraw Hill Publication, 2007.
2. M. Morris Mano, “Digital Logic and Computer Design” 4th edition,Prentice Hall of India, 2013.

Reference:

1. Anand Kumar, “Fundamentals of digital circuits” 1st edition, Prentice Hall of India, 2001
2. MykePredko, “Programming and customizing the 8051 microcontroller”, Tata McGraw Hill 2003.
3. Muhammad Mazidi, Janice Mazidi and RolinMcKinlay, ‘The 8051 Microcontroller and Embedded Systems using Assembly and C’, Pearson Education, 2nd edition.

Instructions for Laboratory Conduction

At least six practical (on bread board) from list 1 to 8 and two practicals from list 9 to 11.

List of Practicals

1. Study of IC-74LS153 as a Multiplexer. (Refer Data-Sheet).
   Design and Implement 8:1 MUX using IC-74LS153 & Verify its Truth Table.
   Design & Implement the given 4 variable function using IC74LS153. Verify its Truth-Table.
2. Study of IC-74LS138 as a Demultiplexer / Decoder (Refer Data-Sheet). Practical) (Test Benches and FSM excluded). Design and Implement full adder and subtractor function using IC- 74LS138.
   Design & Implement 3-bit code converter using IC-74LS138.(Gray to Binary/Binary to Gray)
3. Study of IC-74LS83 as a BCD adder,(Refer Data-Sheet).
   Design and Implement 1 digit BCD adder using IC-74LS83
   Design and Implement 4-bit Binary sub tractor using IC-74LS83.
4. Study of IC-74LS85 as a magnitude comparator,(Refer Data-Sheet)
   Design and Implement 4-bit Comparator.
   Design and Implement 8-bit Comparator
5. Study of Counter ICs (74LS90/74LS93). (Refer Data-Sheet)
   Design and Implement MOD-N and MOD-NN using IC-74LS90 and draw Timing diagram.
   Design and Implement MOD-N and MOD-NN using IC-74LS93 and draw Timing diagram.
6. Study of synchronous counter
   Design & Implement 4-bit Up/down Counter and MOD-N Up/down Counter using IC74HC191/ IC74HC193. Draw Timing Diagram
7. Verify four voltage and current parameters for TTL and CMOS (IC 74LSXX, 74HCXX), (Refer Data-Sheet).

8. Study of Shift Register (74HC194/74LS95), (Refer data-Sheet)
   Design and Implement Pulse train generator using IC-74HC194/IC74LS95 (Use right shift/left shift). Design and Implement 4-bit Ring Counter/ Twisted ring Counter using shift registers IC 74HC194/IC74LS95.
9. Write a assembly/C language program to perform arithmetic operations.
10. Write a assembly/C language program to perform internal and external memory transfer operations
11. Write a assembly/C language program to use port pin for simple application

204186 Electronic Measuring Instruments and Tools
Credits: Th – 01, Pr -01

Teaching Scheme:
Theory: 01hrs/week
Practical: 02 hrs/week

Examination Scheme:
Term work : 50 Marks

Course Objective:
- To make student competent for handling measuring instruments and to able to select right instrument for the purpose of measurement under different conditions.

Course Outcomes:
On completion of the course, student will be able to:
1. Understand fundamental of various electrical measurements.
2. Understand and describe specifications, features and capabilities of electronic instruments.
3. Finalize the specifications of instrument and select an appropriate instrument for given measurement.
4. Carry out required measurement using various instruments under different setups.
5. Able to compare measuring instruments for performance parameters
6. Select appropriate instrument for the measurement of electrical parameter professionally.

Course Contents

Theory
It is expected that operating principle, block diagram and other details shall be taught in theory sessions. Teachers will explore these instruments in detail in respective laboratory sessions. Specification sheet / functions of the instrument should be listed and attached in file/journal.

Theory lectures shall cover following topics along-with discussion of practicals
1. Measurement: Necessity, units, ways of measurements.
2. Performance parameters for measuring instruments.
3. Information about OIML standards.
4. Statistical analysis (Definitions and Introductions only), sources of errors and remedies
5. Calibration and Maintenance of Instruments.
6. Techno-commercial Comparative Analysis and Ordering Information of Instruments.

TextBooks:
1. Instrument manuals published by respective Manufactures.
2. KalsiH.S " Electronic Instrumentation", Tata McGraw Hill, 2004.

Guidelines for Laboratory Conduction
At least eight practical must be performed.
1. Use of everyday practicing testing/measuring instruments.
   Electrical tester, cable (continuity) tester, Indicators with Neon and LEDs Megger for insulation test, open/short circuit test Digital Panel Meter (DPM)
2. Perform following using analog and digital multimeter: Measurement of DC voltage, DC current, AC (rms) voltage, AC (rms) current, resistance, capacitance. Understand the effect of decimal point of resolution. Comment on bandwidth (only for digital multimeter) to test continuity, PN junction and transistor. Calculate mean, standard deviation, average deviation and variance of measured quantity.

3. Set up Power Supply for Conduction of Laboratory experiments (30V / 300 V) Set up Current limit, Check Over current (CC mode) and Short circuit. Setting Individual / Dual Power Supply Series / Parallel Operation of Power Supplies
4. Perform following using CRO : Set up CRO for operation: Ground check, Probe check, Dual/ Mono/Component Tester
    1) Check signal coupling. Observe alternate, chop modes.
    2) Perform Probe check and calibration of CRO, adjust if necessary

   Measure unknown frequency and phase using XY mode. Perform locking of input signal using auto, normal, external, edge trigger modes.
5. Perform following using DSO
    1) Perform Roll, Average, Peak detection operations on signal, Capture transients.
    2) Perform FFT analysis of sine and square signals.
    3) Perform various math operations like add, subtract and multiplication of two waves.
    4) Check store and retrieval of signals. Use Print, save on disk/USB
6. Compare True RMS meter with Multi-meter

   Measure RMS, peak and average voltages for half controlled rectifier or Full controlled rectifier by varying firing angle.

   Compare readings of DMM and/or Power-scope with TRMS for analyzing why TRMS is better.
7. Signal Analysis using Logic Analyzer

   Set up logic analyzer for 8/16/32 channels. Use logic analyser in stand-alone mode or with PC / Mixed Signal Oscilloscope. Verify timing diagram for any digital circuit like counter / shift register
8. Measurements using Spectrum Analyzer. Perform harmonic analysis and Total Harmonic Distortion (THD) measurement for sine and square waves. Verify frequency response of filters& high frequency (HF) amplifier.

   Analyze Spectrum of AM & FM and to measure percent modulation and bandwidth.
9. Measurements using programmable LCR meter: Measure L, C & R in series / parallel operation, at different frequencies. Comment on readings in different connections / at different frequencies. Measure Q and Dissipation factor.
10. Set up function generator/Arbitrary waveform generator. Generate signal of required amplitude, frequency, duty cycle, offset etc. Generate special signals such as noise, ECG, sweep, burst, AM, FM, PM etc. Check generated signal on oscilloscope and verify under different attenuation.
11. Compare Frequency Counter with Oscilloscope. Carry out measurements through different modes of measurement. Measure frequency, time, ratio, events & pulse width. Measure signals using oscilloscopes and compare readings with frequency counter. Comment on bandwidth of oscilloscope and compare specifications of scope and freq. counter
12. Measure Sound / Video signal strength using db-meter. Measure signal strength before / after signal amplifier. Measure loss of signal strength in connection splitters / attenuator. Plot signal strength at different frequencies

Audit course-I

204192:Japanese Language module-I

About course:

With changing times, the competitiveness has gotten into the nerves and 'Being the Best' at all times is only the proof of it. Nonetheless, 'being the best' differs significantly from 'Communicating the best'! The best can merely be communicated whilst using the best… suited Language!!

Japanese is the new trend of 21st century. Not only youngsters but even the professionals seek value in it. It is the engineer's companion in current times with an assertion of a thriving future. Pune has indisputably grown to become a major center of Japanese Education in India while increasing the precedence for Japanese connoisseurs.

Japanese certainly serves a great platform to unlock a notoriously tough market & find a booming career. While the companies prefer candidates having the knowledge of the language, it can additionally help connect better with the native people thus prospering in their professional journey. Learning Japanese gives an extra edge to the 'resume' since the recruiters consciously make note of the fact it requires real perseverance and self-discipline to tackle one of the most complex languages.

It would be easy for all time to quit the impossible; however it takes immense courage to reiterate the desired outcomes, recognize that improvement is an ongoing process and ultimately soldier on it.

The need of an hour is to introduce Japanese language with utmost professionalism to create awareness about the bright prospects and to enhance the proficiency and commitment. It will then prove to be the ultimate path to the quest for professional excellence!

Course Objectives:

- To meet the needs of ever growing industry with respect to language support.
- To get introduced to Japanese society and culture through language.

Course Outcomes:
On completion of the course student

- will have ability of basic communication.
- will have the knowledge of Japanese script.
- will get introduced to reading , writing and listening skills
- will develop interest to pursue professional Japanese Language course.

Course Contents

Unit 1 **:** Introduction to Japanese Language.
Hiragana basic Script, colors, Days of the week

Unit 2 : Hiragana : modified Kana, double consonant, Letters combined with ya, yu, yo
Long vowels, Greetings and expressions

Unit 3 : Self Introduction, Introducing other person,
Numbers, Months, Dates, Telephone numbers, Stating one's age.

Text Book:

1. Minna No Nihongo, "Japanese for Everyone", Elementary Main Text book 1-1 (Indian Edition), Goyal Publishers & Distributors Pvt. Ltd.

Guidelines for Conduction

(Any one or more of following but not limited to)

- Guest Lectures
- Visiting lectures
- Language Lab

Guidelines for Assessment (Any one of following but not limited to)

- Written Test
- Practical Test
- Presentation
- Paper
- Report

Audit Course-I
204192: Road Safety Management

Road transport remains the least safe mode of transport, with road accidents representing the main cause of death of people. The boom in the vehicle population without adequate road infrastructure, poor attention to driver training and unsatisfactory regulation has been responsible for increase in the number of accidents. India's vehicle population is negligible as compared to the World statistics; but the comparable proportion for accidents is substantially large.

The need for stricter enforcement of law to ensure greater safety on roads and an environment-friendly road transport operation is of paramount importance. Safety and security are growing concerns for businesses, governments and the traveling public around the world, as also in India. It is, therefore, essential to take new initiatives in raising awareness, skill and knowledge of students as one of the ibid stake holders who are expected to follow the rules and policies of the government in order to facilitate safety of individual and safe mobility of others.

Course Objectives:

- Provide basic overview on road safety & traffic management issues in view of the alarming increase in vehicular population of the country.
- Insight into the transportation system management (TSM) techniques.
- Overview of the engineering & legislative measures for road safety.
- Discuss measures for improving road safety education levels among the public.

Course Outcomes:

On completion of the course, society will observe –

- Changes in awareness levels, knowledge and understanding
- A change in attitudes / behavior e.g. against drink-drive;
- Casualty Reduction;
- That remedial education for those who make mistakes and for low level offences where this is more effective than financial penalties and penalty points;
- Improving Road Safety Together

Course Contents

1. Existing Road Transport Scenario
2. Accident Causes & Remedies
3. Road Accident Investigation & Investigation Methods
4. Vehicle Technology – CMVR & Road Safety
5. Regulatory / Legislative Provisions for Improving Road Safety
6. Behavioral Training for Drivers for Improving Road Safety
7. Road Safety Education
8. Road Engineering Measures for Improving Road Safety

Guidelines for Conduction (Any one or more of following but not limited to)

- Guest Lectures
- Visits and reports
- Assist authorities like RTO for audits (e.g. Particular road safety audit as critical on-site assessment of the shortcomings in the various elements of the road)
- Mini Project

Guidelines for Assessment(Any one of following but not limited to)

- Written Test
- Practical Test
- Presentation
- Paper
- Report

207005 Engineering Mathematics -III
Credits: Th – 04 ,Tut-01

Teaching Scheme:
Theory : 04 hr/week
Tutorial: 01 hr/week

Examination Scheme:
In-Sem(Online): 50 Marks
End-Sem (Theory):50 Marks
Term Work : 25 Marks

Prerequisites: - Differential and Integral Calculus, Taylor series and Infinite series, Differential equations of first order and first degree, Fourier series, Vector algebra, Algebra of complex numbers.

Course Objectives:
After completion of the course, students will have adequate background, conceptual clarity and knowledge of appropriate solution techniques related to:

- Linear differential equations of higher order using analytical methods and numerical methods applicable to Control systems and Network analysis.
- Transforms such as Fourier transform, Z-transform and applications to Communication systems and Signal processing.
- Vector differentiation and integration required in Electro-Magnetics and Wave theory.
- Complex functions, conformal mappings, contour integration applicable to Electrostatics, Digital filters, Signal and Image processing.

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

1. Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits.
2. Solve problems related to Fourier transform, Z-transform and applications to Communication systems and Signal processing.
3. Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing.
4. Perform vector differentiation and integration, analyze the vector fields and apply to Electro-Magnetic fields.
5. Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing.

Course Contents

Unit I: Linear Differential Equations (LDE) and Applications (09 Hours)

LDE of n^{th} order with constant coefficients, Method of variation of parameters, Cauchy's & Legendre's DE, Simultaneous & Symmetric simultaneous DE. Modeling of Electrical circuits.

Unit II: Transforms (09 Hours)

Fourier Transform (**FT**): Complex exponential form of Fourier series, Fourier integral theorem, Fourier Sine & Cosine integrals, Fourier transform, Fourier Sine and Cosine transforms and their inverses.

Z - Transform **(ZT):** Introduction, Definition, Standard properties, ZT of standard sequences and their inverses. Solution of difference equations.

Unit III: Numerical Methods (09 Hours)

Interpolation: Finite Differences, Newton's and Lagrange's Interpolation formulae, Numerical Differentiation.

Numerical Integration: Trapezoidal and Simpson's rules, Bound of truncation error,

Solution of Ordinary differential equations: Euler's, Modified Euler's, Runge-Kutta 4^{th} order methods.

Unit IV: Vector Differential Calculus (09 Hours)

Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities.

Unit V: Vector Integral Calculus and Applications (09 Hours)

Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem. Applications to problems in Electro-magnetic fields.

Unit VI : Complex Variables (09 Hours)

Functions of Complex variables, Analytic functions, Cauchy-Riemann equations, Conformal mapping, Bilinear transformation, Cauchy's integral theorem, Cauchy's integral formula, Laurent's series, Residue theorem.

Text Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9e, Wiley India.
2. Peter V. O'Neil, "Advanced Engineering Mathematics", 7e, Cengage Learning.

Reference Books:

1. M. D. Greenberg, “Advanced Engineering Mathematics”, 2e, Pearson Education.
2. Wylie C.R. & Barrett L.C. , “Advanced Engineering Mathematics”, McGraw-Hill, Inc.
3. B. S. Grewal, “Higher Engineering Mathematics” Khanna Publication, Delhi.
4. P. N. Wartikar & J. N. Wartikar, “Applied Mathematics”, Volumes I and II, Pune VidyarthiGrihaPrakashan,.
5. B.V. Ramana, “Higher Engineering Mathematics”, Tata McGraw-Hill.
6. Thomas L. Harman, James
7. Dabney and Norman Richert, “Advanced Engineering Mathematics with MATLAB”, 2e, Brooks/Cole, Thomson Learning.

Guidelines for Tutorial and Term Work:

i) Tutorial shall be engaged in four batches (batch size of 20 students maximum) per division.
ii) Term work shall be based on continuous assessment of six assignments (one per each unit) and performance in internal tests.

204187 Integrated Circuits
Credits: Th – 04, Pr -01

Teaching Scheme:

Theory: 04hrs/week
Practical: 02 hrs/week

Examination Scheme:

In-Sem(Online): 50 Marks
End-Sem (Theory) :50 Marks
Practical : 50 Marks
Term Work : 25 Marks

Course Objectives:

- To understand characteristics of IC and Op-Amp and identify the internal structure.
- To introduce various manufacturing techniques.
- To study various op-amp parameters and their significance for Op-Amp.
- To learn frequency response, transient response and frequency compensation techniques for Op-Amp.
- To analyse and identify linear and nonlinear applications of Op-Amp.
- To understand functionalities of PLL and its use in various applications in communication and control systems.

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

1. Understand the characteristics of IC and Op-Amp and identify the internal structure.
2. Understand and identify various manufacturing techniques.
3. Derive and determine various performances based parameters and their significance for Op-Amp.
4. Comply and verify parameters after exciting IC by any stated method.
5. Analyze and identify the closed loop stability considerations and I/O limitations.
6. Analyze and identify linear and nonlinear applications of Op-Amp.
7. Understand and verify results (levels of V & I) with hardware implementation.
8. Implement hardwired circuit to test performance and application for what it is being designed.
9. Understand and apply the functionalities of PLL to Frequency synthesizer, multiplier, FM, and AM demodulators

Course Contents

Unit I : OP-AMP Basics (6 Hrs)
Block diagram of OP-AMP, Differential Amplifier configurations, Differential amplifier analysis for dual-input balanced-output configurations using ‘r’ parameters, Need and types of level shifter, current mirror circuits. Voltage series and voltage shunt feedback amplifier and its effect on Ri, Ro, bandwidth and voltage gain.

Unit II : Linear Applications of OP-AMP (8 Hrs)

Inverting and Non-inverting amplifier, voltage follower. Summing, averaging scaling amplifier, difference amplifier, Ideal integrator, practical integrator with frequency response, Ideal differentiator, practical differentiator withfrequency response. Instrumentation amplifiers.

Unit III : Non-linear Applications of OP-AMP (8 Hrs)

Comparator, characteristics of comparator, applications of comparator, Schmitt trigger (symmetrical/asymmetrical), clippers and clampers, voltage limiters, Square wave generator, triangular wave generator, Need of precision rectifier, Half wave , Full wave precision rectifiers, peak detectors, sample and hold circuits.

Unit IV : Converters using OP-AMP (6 Hrs)

V-F, I-V and V-I converter, DAC: types of DAC, characteristics, specifications, advantages and disadvantages of each type of DAC, ADC: types of ADC, characteristics, specifications, advantages and disadvantages of each type of ADC.

Unit V : Phase Locked Loop &Oscillators (8 Hrs)

Block diagram of PLL and its function, PLL types, characteristics/parameters of PLL, and different applications of PLL. Oscillators principle, types and frequency stability, design of phase shift, wein bridge, Quadrature, voltage controlled oscillators.

Unit VI : Active filters (8 Hrs)

Design and frequency scaling of First order and second order Active LP, HP, BP and wide and narrow band BR Butterworthfilters and notch filter. All pass filters.

TextBooks:

1. Ramakant A. Gaikwad, “Op Amps and Linear Integrated Circuits”, Pearson Education 2000.
2. Salivahanan and KanchanaBhaskaran, “Linear Integrated Circuits”, Tata McGraw Hill,India 2008

Reference:

1. George Clayton and Steve Winder, “Operational Amplifiers”, 5th Edition Newnes.
2. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, Tata McGraw Hill.
3. Bali,”Linear Integrated Circuits”, Mc Graw Hill 2008.
4. Gray, Hurst, Lewise, Meyer, “Analysis & Design of Analog Integrated Circuits”, Wiley Publications.

Instructions for Laboratory Conduction

1- 8 experiments are compulsory and should be conducted on bread board.

List of Practical's

1. Measure Op-Amp parameters and compare with the specifications.
Input bias current, input offset current and input offset voltage. slew rate , CMRR
Compare the result with datasheet of corresponding Op-Amp.
2. Design, build and test integrator for given frequency f_a.
3. Design, build and test three Op-Amp instrumentation amplifiers for typical application
4. Design, build and test precision half & full wave rectifier.
5. Design, build and test Schmitt trigger and plot transfer characteristics.
6. Design, build and test PLL.
7. 2 bit DAC and 2 bit ADC.

A) Design and implement 2bit R-2R ladder DAC.

B) Design and implement 2bit flash type ADC.

8. Design, build and test square & triangular wave generator.

Optional Experiments:

1. Verify and understand practically virtual ground and virtual short concept in inverting and non-inverting configuration.
2. Plot DC transfer characteristics of emitter coupled differential amplifier.
3. Study effect of emitter resistance and constant current source on figure of merit (CMRR) of emitter coupled differential amplifier.
4. Design and implement V-I converter.
5. Any experiment based on application of Op-Amp.

204188 Control Systems
Credits: Th – 03

Teaching Scheme:
Theory : 03 hr/week

Examination Scheme:
In-Sem(Online): 50 Marks
End-Sem(Theory): 50 Marks

Course Objectives:
- To introduce the elements of control system and their modelling using various Techniques.
- 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. Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
2. Determine the (absolute) stability of a closed-loop control system.
3. Perform time domain and frequency domain analysis of control systems required for stability analysis.
4. Perform time domain and frequency domain correlation analysis.
5. Apply root-locus, Frequency Plots technique to analyze control systems.
6. Express and solve system equations in state variable form.

Course Contents

Unit I :Control System Modeling (6 Hrs)
Basic Elements of Control System, Open loop and Closed loop systems, Differential equations and Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems, Block diagram reduction Techniques, Signal flow graph

Unit II :Time Response Analysis (6 Hrs)
Standard input signals, Time response analysis of First Order Systems, Time response analysis of second order systems, Steady state errors and error constants, design specifications for second order systems.

Unit III : Stability Analysis (6 Hrs)
Concept of Stability, Routh-Hurwitz Criterion, Relative Stability, Root Locus Technique, Construction of Root Locus, Dominant Poles, Application of Root Locus Diagram.

Unit IV :Frequency Response Analysis (6 Hrs)

Frequency domain Versus Time domain analysis and its correlation, Bode Plots, Polar Plots and development of Nyquist Plots. Frequency Domain specifications from the plots, Stability analysis from plots.

Unit V :State Variable Analysis (6 Hrs)

State space advantages and representation, Transfer function from State space, physical variable form, phase variable forms: controllable canonical form, observable canonical form, Solution of homogeneous state equations, state transition matrix and its properties, computation of state transition matrix by Laplace transform method only, Concepts of Controllability and Observability.

Unit VI :Controllers And Digital Control Systems (6 Hrs)

Introduction to PLC: Block schematic, PLC addressing, any one application of PLC using Ladder diagram. Introduction to PID controller: P, PI, PD and PID Characteristics and concept of Zeigler-Nicholas method.

Digital control systems: Special features of digital control systems, Necessity of sample and hold operations for computer control, z-transform and pulse transfer function, Stability and response of sampled-data systems.

TextBooks:

N. J. Nagrath and M.Gopal, “Control System Engineering”, New Age International Publishers, 5th Edition, 2009.

Reference:

1. Benjamin C. Kuo, “Automatic control systems”, Prentice Hall of India, 7th Edition,1995.
2. M. Gopal, “Control System – Principles and Design”, Tata McGraw Hill, 4th Edition, 2012.
3. Schaum’s Outline Series, “Feedback and Control Systems” Tata McGraw-Hill, 2007.
4. John J. D’Azzo& Constantine H. Houpis, “Linear Control System Analysis and Design”, Tata McGraw-Hill, Inc., 1995.
5. Richard C. Dorf and Robert H. Bishop, “Modern Control Systems”, Addison – Wesley, 1999.

204189 Analog Communications
Credits: Th – 03, Pr -01

Teaching Scheme:
Theory: 03hrs/week
Practical: 02 hrs/week

Examination Scheme:
In-Sem(Online): 50Marks
End-Sem (Theory): 50 Marks
Practical : 50 Marks

Course Objectives:
The students are expected to demonstrate the ability to:
- Describe and analyze the mathematical techniques of generation, transmission and reception of amplitude modulation (AM), frequency modulation (FM) and phase modulation (PM) signals.
- Evaluate the performance levels (Signal-to-Noise Ratio) of AM, FM and PM systems in the presence of additive white noise.
- Convert analog signals to digital format and describe Pulse and digital Modulation techniques.

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

1. Understand and identify the fundamental concepts and various components of analogcommunication systems.
2. Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
3. Describe analog pulse modulation techniques and digital modulation technique.
4. Develop the ability to compare and contrast the strengths and weaknesses of variouscommunication systems.

Course Contents

Unit I :AM Transmission (8 Hrs)
Base band & Carrier communication, Generation of AM (DSBFC) and its spectrum, Power relations applied to sinusoidal signals, DSBSC – multiplier modulator, Nonlinear generation, switching modulator, Ring modulator & its spectrum, Modulation Index. SSBSC, ISB & VSB, their generation methods & Comparison, Block Diagram of AM Transmitter and Broadcast technical standards.

Unit II :AM Reception (8 Hrs)
Block diagram of TRF AM Receivers, Super Heterodyne Receiver, Dual Conversion Super heterodyne Receiver, Concept of Series & Parallel resonant circuits for Bandwidth & Selectivity. 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: Envelope detection

Unit III : FM Transmission (8 Hrs)

Instantaneous frequency, Concept of Angle modulation, frequency spectrum& Eigen Values, Narrow band & wide band FM, Modulation index, Bandwidth, Phase Modulation, Bessel's Function and its mathematical analysis, Generation of FM (Direct & Indirect Method), FM stereo Transmitter, Two way FM Radio Transmitter, Comparison of FM and PM.

Unit IV : FM Reception (6 Hrs)

Block diagram of FM Receiver, FM Stereo Receiver , Two way FM Radio Receiver, FM detection using Phase lock loop(PLL) ,Slope detector, Balanced Slope detector etc.

Unit V :Noise (6 Hrs)

Sources of Noise, Types of Noise, White Noise, Thermal noise, shot noise, partition noise, Low frequency or flicker noise, burst noise, avalanche noise, Signal to Noise Ratio, SNR of tandem connection, Noise Figure, Noise Temperature, Friss formula for Noise Figure, Noise Bandwidth, Behavior of Baseband systems and Amplitude modulated systems i.e.DSBSC and SSBSC in presence of noise.

Unit VI : Pulse Analog Modulation (6 Hrs)

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. Introduction to Pulse Code Modulation.

TextBooks:

1. George Kennedy, "Electronic Communication Systems" 5th Edition, McGraw-Hill.
2 Dennis Roddy &Coolen, "Electronic Communication",4th Edition, Prentice Hall.

Reference:

1. B. P. Lathi, "Modern Digital and Analog. Communication Systems", 3rd Edition, Oxford University Press.
2. Simon Haykin, "Communication Systems", 4th Edition, John Wiley & Sons.
3. Taub& Schilling, "Principles of Communication Systems", Tata McGraw-Hill.
4. Frenzel, "Principles of Electronic Communication Systems"3rd Edition, Tata McGraw-Hill.

Instructions for Laboratory Conduction

Perform any 8 experiments from following

List of Practical

1. Design, Build & Test class C tuned amplifier for AM Generation / Simulate using desirable Software
2. AM Generation (DSB-FC): Calculation of modulation index by graphical method, Power of AM Wave for different modulating signal.
3. Envelope Detector - Practical diode detector, Observe effect of change in RC time constant which leads to diagonal and negative clipping
4. Generation of DSB-SC with the help of Balanced Modulator IC1496/1596 & its detection
5. SSB modulator using Filter method/ phase shift method & its detection
6. Frequency modulator & demodulator using IC 565 (PLL based), calculation of modulation index & BW of FM.
7. Frequency modulator & demodulator using Varicap/Varactor Diode and NE 566 VCO.
8. Study of AM & FM Spectrum: Observe Spectrum of AM & FM on Spectrum Analyzer, Compare & comment on AM & FM spectrum. Observe Effect of Eigen values on carrier power in FM.
9. Measurement of Performance Characteristics of Receiver: Sensitivity, Selectivity, Fidelity
10. Verification of Sampling Theorem, PAM Techniques, (Flat top & Natural sampling), reconstruction of original signal, Observe Aliasing Effect in frequency domain.Following can be performed using suitable software(Any One)
11. Generate AM and FM waveform for given modulation index, signal frequency and carrier Frequency using suitable software.
12. Prove sampling Theorem. Reconstruct the analog signal from its samples. Observe aliasing effect by varying sampling frequency.
13. SNR and PSD of any system (Baseband or AM)(Kit based/Simulated)

Note: Visit to Broadcasting Station is desirable.

204190 **Object Oriented Programming**

Credit:Th-03,Pr-02

Teaching Scheme:
Theory: 3 Hrs/ Week
Practical : 4 Hr/Week

Examination Scheme:
Online: 50 Marks
Paper: 50 Marks
Oral : 50 Marks

Course Objectives:

- Make the students familiar with basic concepts and techniques of object oriented programming in C++ & Java.
- Develop an ability to write programs in C++ and Java for problem solving.

Course Outcomes:

Upon successful completion of this course, students should be able to:

1. Describe the principles of object oriented programming.

2. Apply the concepts of data encapsulation, inheritance in C++.

3. Understand basic program constructs in Java

4. Apply the concepts of classes, methods and inheritance to write programs Java.

5. Use arrays, vectors and strings concepts and interfaces to write programs in Java.

6. Describe and use the concepts in Java to develop user friendly program,

UNIT I: Introduction to Object Oriented Programming (6L)

Principles of OOP: Software crisis, Software evolution, OOP paradigm, Basic Concepts of OOP, Benefits & applications of OOP.

Beginning with C++: What is C++, Applications of C++, A Simple C++ Program, More C++ statements.

Moving from C to C++: Declaration of variable, Reference variables, Scope resolution operator, Member dereferencing operator, memory management operators.

Functions in C++: Function prototyping, Call by reference.

Unit II: Concepts of Object Oriented Programming with C++ (6L)

Classes & Objects: Specifying a class, Defining member functions, A C++ program with class, Making

an outside function inline, Nesting of member function, Private member function, Arrays within class, Member allocation for objects, Arrays of objects, Objects as function arguments.

Constructors & Destructors: Constructors, Parameterized constructors, Multiple constructors in a class, Constructors with default arguments.

Operator overloading concept: Use of operator overloading, defining operator overloading, Binary operator overloading.

Introduction to Inheritance: Concept and types of Inheritance, Defining derived classes, Single inheritance, Making a private member inheritable, multilevel inheritance.

UNIT III: Java Fundamentals (6L)

Evolution of Java, Comparison of Java with other programming languages, Java features, Java Environment, Simple Java Program, Java Tokens, Java Statements, Constants, variables, data types. Declaration of variables, Giving values to variables, Scope of variables, arrays, Symbolic constants, Typecasting, Getting values of variables, Standard default values, Operators, Expressions, Type conversion in expressions, Operator precedence and associativity, Mathematical functions, Control statements- Decision making & branching, Decision making & looping.

UNIT IV: Classes, Methods & Objects in Java (6L)

Class Fundamentals, Declaring Objects, Assigning Object reference variables, Methods, Constructors, The This keyword, Garbage collection, finalize method, Overloading methods, using objects as parameters, Argument passing, returning objects, Recursion, access control, static, final, arrays, strings class, Command line arguments.

UNIT V: Inheritance, Packages and Interfaces (6L)

Inheritance basics, Using Super, Creating Multilevel hierarchy, Constructors in derived class, Method overriding, Dynamic method dispatch, Using Abstract classes, Using final with inheritance, Object class, Packages, Access protection, Importing packages, Interfaces: Define, implement and extend. Default interface methods, Use static method in interface.

UNIT VI: Multithreading, Exception handling & Applets (6L)

Introduction to multithreading: Introduction, Creating thread and extending thread class.

Concept of Exception handling: Introduction, Types of errors, Exception handling syntax, Multiple catch statements.

I/O basics, Reading console inputs, Writing Console output.

Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating a simple applet.

Text Books:

1. E Balagurusamy, Programming with C++, Tata McGraw Hill, 3rd Edition.

2. Herbert Schildt, Java: The complete reference, Tata McGraw Hill, 7th Editon.

Reference Books:

1. Robert Lafore, "Object Oriented Programming in C++", Sams Publishing, 4th Edition.

2. T. Budd, Understanding OOP with Java, Pearson Education.

3. Matt Weisfeld, "The Object-Oriented Thought Process", Pearson

4. Cox Brad, "Object –Oriented Programming: An Evolutionary Approach", Addison –Wesley

5. E Balagurusamy, Programming with Java A Primer, Tata McGraw Hill, 3rd Edition.

List of Practical:

(Perform any 4 from group I and any 12 from group II)

Group I

1. Write a program in C++ to implement database of persons having different profession e,g. engineer, doctor, student, laborer etc. using the concept of multiple inheritance. The objective of this assignment is to learn the concepts of inheritance.
2. Write a program in C++ to sort the numbers in an array using separate functions for read, display, sort and swap. The objective of this assignment is to learn the concepts of input, output, functions, call by reference in C++.
3. Write a program in C++ to perform following operations on complex numbers Add, Subtract, Multiply, Divide, Complex conjugate. Design the class for complex number representation and the operations to be performed. The objective of this assignment is to learn the concepts classes and objects
4. Write a program in C++ to implement Stack. Design the class for stack and the operations to be

performed on stack. Use Constructors and destructors. The objective of this assignment is to learn the concepts classes and objects, constructors and destructors.

5. Write a program in C++ to perform following operations on complex numbers Add, Subtract, Multiply, Divide. Use operator overloading for these operations. The objective of this assignment is to learn the concepts operator overloading.

Group II

6. Write some simple programs in Java such as
   i) To find factorial of number.
   ii) To display first 50 prime numbers.
   iii) To find sum and average of N numbers.
7. 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.
8. 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".
9. 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
10. Write a Program in Java to add two matrices. The objective of this assignment is to learn Arrays in Java
11. 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.
12. Write a Java program which imports user defined package and uses members of the classes contained in the package.
13. Write a Java program which implements interface.
14. 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.

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

16. 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.

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

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

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

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

204191 EMPLOYABILITY SKILL DEVELOPMENT

Credits:Th – 02, Pr -01

Subject Code:

Teaching Scheme		**Examination Scheme**
Theory / Week	**: 2 Hrs**	**Term Work: 50 Marks**
Practical /Week	**: 2Hrs.**	

Course Objectives:

1. To develop analytical abilities
2. To develop communication skills
3. To introduce the students to skills necessary for getting, keeping and being successful in a profession.
4. To expose the students to leadership and team-building skills.

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

1. Have skills and preparedness for aptitude tests.
2. Be equipped with essential communication skills (writing, verbal and non-verbal)
3. Master the presentation skill and be ready for facing interviews.
4. Build team and lead it for problem solving.

Unit I :Soft Skills & Communication basics (4Hrs)

Soft skills Vs hard skills, Skills to master, Interdisciplinary relevance, Global and national perspectives on soft skills. Resume, Curriculum vitae, How to develop an impressive resume, Different formats of resume – Chronological, Functional, Hybrid, Job application or cover letter, Professional presentation- planning, preparing and delivering presentation, Technical writing

Unit II: Arithmetic and Mathematical Reasoning (4 Hours)

Aspects of intelligence, Bloom taxonomy, multiple intelligence theory, Number sequence test, mental arithmetic (square and square root, LCM and HCF, speed calculation, reminder theorem)

Unit III: Analytical Reasoning and Quantitative Ability (4 Hours)

Matching, Selection, Arrangement, Verifications (Exercises on each of these types). Verbal aptitude (Synonym, Antonym, Analogy)

Unit IV: Grammar and Comprehension (4 Hours)

English sentences and phrases, Analysis of complex sentences, Transformation of sentences, Paragraph writing, Story writing, Reproduction of a story, Letter writing, précis writing, Paraphrasing and e-mail writing.

Unit V: Skills for interviews (4Hours)

Interviews- types of interviews, preparatory steps for job interviews, interview skill tips, Group discussion- importance of group discussion, types of group discussion, difference between group discussion, panel discussion and debate, personality traits evaluated in group discussions, tips for successful participation in group discussion, Listening skills- virtues of listening, fundamentals of good listening, Non-verbal communication-body movement, physical appearance, verbal sounds, closeness, time.

Unit VI: Problem Solving Techniques (4 Hours)

Problem solving model: 1. Define the problem, 2. Gather information, 3. Identify various solution, 4. Evaluate alternatives, 5. Take actions, 6. Evaluate the actions.

Problem solving skills: 1. Communicate. 2. Brain storming, 3. Learn from mistakes.

Text Books:

1. R. Gajendra Singh Chauhan, Sangeeta Sharma, “Soft Skills- An integrated approach to maximize personality”, ISBN: 987-81-265-5639-7, First Edition 2016, Wiley.
2. Wren and Martin, "English grammar and Composition", S. Chand publications.
3. R. S. Aggarwal, "A modern approach to verbal reasoning", S. Chand publications.

Reference Books:

1. Philip Carter, "The Complete Book Of Intelligence Test", John Willey & Sons Ltd.
2. Philip Carter, Ken Russell, "Succeed at IQ test", Kogan Page
3. Eugene Ehrlich, Daniel Murphy, "Schaum’s Outline of English Grammar", McGraw Hills.
4. David F. Beer, David A. McMurrey, “A Guide to Writing as an Engineer”, ISBN : 978-1-118-30027-5 4th Edition, 2014, Wiley.

List of Practical:

1. Every student should collect five questions of each type
   a. Number sequence
   b. Mental arithmetic
   c. Square, square roots
   d. LCM, HCF
   e. Speed calculations

   Note: Teacher should distribute the question set randomly amongst the students.

2. Write up on
    a. Blooms taxonomy
    b. Multiple intelligence theory
    c. Every student should identify his/her strength and weaknesses
    d. Action plan to improve the weaknesses
3. Every student should collect five questions of each type
    a. Matching
    b. Selection
    c. Arrangements
    d. Verifications

    Note: Teacher should distribute the question set randomly amongst the students.

4. Every student should collect five questions of each type
    a. Verbal aptitude
    b. Synonym
    c. Antonym
    d. Analogy

Note: Teacher should distribute the question set randomly amongst the students.

5. Solve exercises from book (Wren and Martin, "English grammar and Composition") based on
    a. English sentences and phrases
    b. Paragraph writing
    c. Story writing
    d. Letter writing
6. Formulate suitable assignment to solve a real problem using problem solving techniques
7. Practice tests (aptitude, analytical abilities, logical reasoning)
8. Extempore, group discussions and debate.
9. Technical report writing and Seminar Presentation.
10. Mock interviews.

Audit course-II

204193:Japanese Language module II

About course:

With changing times, the competitiveness has gotten into the nerves and 'Being the Best' at all times is only the proof of it. Nonetheless, 'being the best' differs significantly from 'Communicating the best'! The best can merely be communicated whilst using the best… suited Language!!

Japanese is the new trend of 21st century. Not only youngsters but even the professionals seek value in it. It is the engineer's companion in current times with an assertion of a thriving future. Pune has indisputably grown to become a major center of Japanese Education in India while increasing the precedence for Japanese connoisseurs.

Japanese certainly serves a great platform to unlock a notoriously tough market & find a booming career. While the companies prefer candidates having the knowledge of the language, it can additionally help connect better with the native people thus prospering in their professional journey. Learning Japanese gives an extra edge to the 'resume' since the recruiters consciously make note of the fact it requires real perseverance and self-discipline to tackle one of the most complex languages.

It would be easy for all time to quit the impossible; however it takes immense courage to reiterate the desired outcomes, recognize that improvement is an ongoing process and ultimately soldier on it.

The need of an hour is to introduce Japanese language with utmost professionalism to create awareness about the bright prospects and to enhance the proficiency and commitment. It will then prove to be the ultimate path to the quest for professional excellence!

Course Objectives:

- To meet the needs of ever growing industry with respect to language support.
- To get introduced to Japanese society and culture through language.

Course Outcomes:

On completion of the course student

- will have ability of basic communication.
- will have the knowledge of Japanese script.
- will get introduced to reading , writing and listening skills
- will develop interest to pursue professional Japanese Language course.

Course Contents

Unit 1 : Katakana basic Script, Denoting things (nominal & prenominal demonstratives)

Purchasing at the Market / in a shop / mall (asking & stating price)

Unit 2 : Katakana : Modified kana, double consonant, letters with ya, yu, yo,

Long vowels

Describing time, describing starting & finishing time (kara ~ made)

Point in time (denoting the time when any action or the movement occurs)

Unit 3 : Means of transport (Vehicles), Places, Countries,

Stating Birth date, Indicating movement to a certain place by a vehicle

Text Book:

1.Minna No Nihongo, “Japanese for Everyone”, (Indian Edition), Goyal Publishers & Distributors Pvt. Ltd.

Guidelines for Conduction

(Any one or more of following but not limited to)

- Guest Lectures
- Visiting lectures
- Langauge Lab

Guidelines for Assessment (Any one of following but not limited to)

- Written Test
- Practical Test
- Presentation
- Paper
- Report

Audit course-II

204193:Cyber Crime and law

Introduction to Cyber Crime and law:

Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Computer Language, Network Language, Realms of the Cyber world, A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes,Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000

Introduction to Cyber Crime Investigation

Firewalls and Packet Filters, password Cracking, Keyloggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks

Guidelines for Conduction

(Any one or more of following but not limited to)

- Guest Lectures
- Visiting lectures

Guidelines for Assessment (Any one of following but not limited to)

- Written Test
- Practical Test
- Presentation
- Paper
- Report

FACULTY OF ENGINEERING

Savitribai Phule Pune University

Syllabus for the

T.E (Electronics & Telecommunications Engineering)

(2015 Course)

(w.e.f . June 2017)

Savitribai Phule University of Pune, Pune

Third Year E&TC Engineering (2015 Course)

(With effect from Academic Year 2017-18)

Semester I

Course Code	Course	Teaching Scheme Hours / Week			Semester Examination Scheme of Marks						Credits	
		Theory	Tutorials	Practicals	In-Sem	End-Sem	TW	PR	OR	Total	Th+Tut	PR/OR/TW
304181	Digital Communication	3	--	--	30	70	--	--	--	100	3	--
304182	Digital Signal Processing	3	--	--	30	70	--	--	--	100	3	--
304183	Electromagnetics	3	1	--	30	70	--	--	--	100	4	--
304184	Microcontrollers	3	--	--	30	70	--	--	--	100	3	--
304185	Mechatronics	3	--	--	30	70	--	--	--	100	3	--
304191	Signal Processing and Communications Lab (DC/DSP)	--	--	4	--	--	50	50		100	--	2
304192	Microcontrollers and Mechatronics Lab	--	--	4	--	--	50	50		100	-	2
304193	Electronics System Design	2	--	2	--	--	-	--	50	50	2	1
	Audit Course 3	--	--	--	--	--	--	--	--	--	----	
	Total	17	01	10	150	350	100	100	50	750	18	5
										Total Credits	**23**	

Third Year E&TC Engineering (2015 Course)

(With effect from Academic Year 2017-18)

Semester II

Course Code	Course	Teaching Scheme Hours / Week			Semester Examination Scheme of Marks						Credit	
		Theory	Tutorials	Practicals	In-Sem	End-Sem	TW	PR	OR	Total	Th+Tut	PR/OR/TW
304186	Power Electronics	3	--	--	30	70	--	--	--	100	3	--
304187	Information Theory, Coding and Communication Networks	4	--	--	30	70	--	--	--	100	4	--
304188	Business Management	3	--	--	30	70	--	--	--	100	3	--
306189	Advanced Processors	3	--	--	30	70	--	--	--	100	3	--
304190	System Programming and Operating Systems	3	--	--	30	70		--	--	100	3	--
304194	Power and ITCT Lab	--	--	4	--	--	50	50	--	100	--	2
304195	Advanced Processors and System Programming Lab	--	--	4	--	--	50	50	--	100	--	2
304196	Employability Skills and Mini Project	2	--	2	--	--	--	--	50	50	2	1
	Audit Course 4	--	--	--	--	--	--	--	--	--		
	Total	18	---	10	150	350	100	100	50	750	18	5
										Total Credits	**23**	

304181 Digital Communication

Credits: TH-03

Teaching Scheme:

Lecture : 03 hr/week

Examination Scheme:

In-Sem : 30 Marks

End-Sem: 70 Marks

Course Objectives:

- To understand the building blocks of digital communication system.
- To prepare mathematical background for communication signal analysis.
- To understand and analyze the signal flow in a digital communication system.
- To analyze error performance of a digital communication system in presence of noise and other interferences.
- To understand concept of spread spectrum communication system.

Course Outcomes:

On completion of the course, student will be able to

1) Understand working of waveform coding techniques and analyse their performance.
2) Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
3) Perform the time and frequency domain analysis of the signals in a digital communication system.
4) Design of digital communication system.
5) Understand working of spread spectrum communication system and analyze its performance.

Course Contents

Unit I : Digital Transmission of Analog Signal (8 Hrs)

Introduction to Digital Communication System: Block Diagram and transformations, Basic Digital Communication Nomenclature. Digital Versus Analog Performance Criteria, Sampling Process, PCM Generation and Reconstruction, Quantization Noise, Non-uniform Quantization and Companding, PCM with noise: Decoding noise, Error threshold, Delta Modulation, Adaptive Delta Modulation, Delta Sigma Modulation, Differential Pulse Code Modulation, LPC speech synthesis.

Unit II :Baseband Digital Transmission (7Hrs)

Digital Multiplexing: Multiplexers and hierarchies, Data Multiplexers. Data formats and their spectra, synchronization: Bit Synchronization, Scramblers, Frame Synchronization. Inter-symbol interference, Equalization

Unit III : Random Signal & Noise (8Hrs)

Introduction, Mathematical definition of a random process, Stationary processes, Mean, Correlation &Covariance function, Ergodic processes, Transmission of a random process through a LTI filter, Power spectral density, Gaussian process, noise, Narrow band noise, Representation of narrowband noise in terms of in phase & quadrature components.

Unit IV : Baseband Receiver (8Hrs)

Signal space representation : Geometric representation of signal, Conversion of continuous AWGN channel to vector channel, Likelihood functions, Coherent Detection of binary signals in presence of noise, Optimum Filter, Matched Filter, Probability of Error of Matched Filter, Correlation receiver.

Unit V : PassbandDigital Transmission (8Hrs)

Pass band transmission model, Signal space diagram, Generation and detection, Error Probabilityderivationand Power spectra of coherent BPSK, BFSK and QPSK.

Geometric representation, Generation and detection of - M-ary PSK, M-ary QAM and their error probability, Non-coherent BFSK, DPSK.

Unit VI : Spread Spectrum Modulation (7Hrs)

Introduction, Pseudo noise sequences, A notion of spread spectrum, Direct sequence spread spectrum with coherent BPSK, Signal space dimensionality & processing gain, Probability of error, Concept of jamming, Frequency hop spread spectrum.

Text Books:

1. A.B Carlson, P B Crully, J C Rutledge, “Communication Systems”, Fourth Edition, McGraw Hill Publication.
2. Simon Haykin, “Digital Communication Systems”, John Wiley & Sons, Fourth Edition.

Reference Books:

1. P Ramkrishna Rao, Digital Communication, McGraw Hill Publication
2. Ha Nguyen, Ed Shwedyk, “A First Course in Digital Communication”, Cambridge University Press.
3. B P Lathi, Zhi Ding “Modern Analog and Digital Communication System”, Oxford University Press, Fourth Edition.
4. Bernard Sklar, Prabitra Kumar Ray, “Digital Communications Fundamentals and Applications” Second Edition, Pearson Education
5. Taub, Schilling, “Principles of Communication System”, Fourth Edition, McGraw Hill.

304182 Digital Signal Processing

Credits: TH-03

Teaching Scheme:

Lecture : 03 hr/week

Examination Scheme:

In-Sem : 30 Marks

End-Sem : 70 Marks

Course Objectives:

- To introduce students with transforms for analysis of Discrete time signals and systems.
- To understand the digital signal processing, sampling and aliasing
- To use and understand implementation of digital filters.

Course Outcomes:

On completion of the course, student will be able to

1) Analyze the discrete time signals and system using different transform domain techniques.

2) Design and implement LTI filters for filtering different real world signals.

3) Develop different signal processing applications using DSP processor.

Course Contents

Unit I :DSP Preliminaries and Applications (6 Hrs)

Sampling, DT signals, sampling theorem in time domain, sampling of analog signals, recovery of analog signals, and analytical treatment with examples, mapping between analog frequencies to digital frequency, representation of signals as vectors, concept of Basis function and orthogonality, Eigen value and eigen vector, Basic elements of DSP and its requirements, advantages of Digital over Analog signal processing.

Unit II :Discrete Fourier Transform (8 Hrs)

DTFT, Definition, Frequency domain sampling , DFT, Properties of DFT, circular convolution, linear convolution, Computation of linear convolution using circular convolution, FFT, decimation in time and decimation in frequency using Radix-2 FFT algorithm, Linear filtering using overlap add and overlap save method, Amplitude spectrum and power spectrum, Introduction to Discrete Cosine Transform.

Unit III : Z transform (6 Hrs)

Need for transform, relation between Laplace transform and Z transform, relation between Fourier transform and Z transform, Properties of ROC, properties of Z transform, Relation between pole locations and time domain behavior, causality and stability considerations for LTI systems, Inverse Z transform, Power series method, partial fraction expansion method, Solution of difference equations using Z transform.

Unit IV : IIR Filter Design (8 Hrs)

Concept of analog filter design, IIR filter design by approximation of derivatives, IIR filter design by impulse invariance method, Bilinear transformation method, warping effect. Butterworth filter design, Characteristics of Butterworth filters, Chebyshev filters and elliptic filters, IIR filter realization using direct form, cascade form and parallel form, Finite word length effect in IIR filter design

Unit V : FIR Filter Design (6 Hrs)

Ideal filter requirements, Gibbs phenomenon, windowing techniques, characteristics and comparison of different window functions, Design of linear phase FIR filter using windows and frequency sampling method. Magnitude and Phase response of Digital filters, Frequency response of Linear phase FIR filters, FIR filters realization using direct form, cascade form , Finite word length effect in FIR filter design.

Unit VI : DSP Applications (6Hrs)

Overview of DSP in real world applications such as Digital crossover audio systems, Interference cancellation in ECG, Speech coding and compression, Compact disc recording system, Vibration signature analysis for defective gear teeth, Speech noise reduction, two band digital crossover.

Text Books:

1. John G. Proakis, Dimitris G. Manolakis, " Digital Signal Processing: Principles, algorithms and applications" Fourth edition, Pearson Prentice Hall.

2. S. Salivahanan, C. Gnanpriya, " Digital Signal processing", McGraw Hill

Reference Books:

1. Ifaeachor E.C,Jervis B. W., " Digital Signal processing : Practical approach", Pearson publication
2. Li Tan, Jean Jiang, " Digital Signal Processing : Fundamentals and applications" Academic press
3. Dr. Shaila Apte, "Digital Signal Processing" Wiley India Publication, second edition
4. K.A. Navas, R. Jayadevan, " Lab Primer through MATLAB", PHI

304183 Electromagnetics

Credits: TH-03+Tut- 01

Teaching Scheme:

Lecture : 03 hr/week

Tut : 01 hr/week

Examination Scheme:

In-Sem : 30 Marks

End-Sem : 70 Marks

Course Objectives:

- To introduce the basic mathematical concepts related to electromagnetic vector fields.
- To impart knowledge on the concepts of electrostatics, electric potential, energy density and their applications.
- To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.
- To impart knowledge on the concepts of Faraday's law, induced emf and Maxwell's equations
- To impart knowledge on the concepts of Concepts of electromagnetic waves and Transmission lines.

Course Outcomes:

On completion of the course, student will be able to

1) Understand the basic mathematical concepts related to electromagnetic vector fields.

2) Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.

3) Apply the principles of magnetostatics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density.

4) Understand the concepts related to Faraday's law, induced emf and Maxwell's equations.

5) Apply Maxwell's equations to solutions of problems relating to transmission lines and uniform plane wave propagation.

Course Contents

Unit I :Electrostatics – I (8 Hrs)

Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields Gradient, Divergence, Curl – theorems and applications – Coulomb's Law – Electric field intensity – Field due to discrete and continuous charges – Gauss's law and applications. Electric potential –Concept of Uniform and Non-Uniform field, Utilization factor.

Unit II :Electrostatics – II (8 Hrs)

Electric field in free space, conductors, dielectrics – Dielectric polarization – Dielectric strength – Electric field in multiple dielectrics – Boundary conditions (dielectric-dielectric, conductor – dielectric), significance of Poisson's and Laplace's equations, Capacitance, Energy density, Applications.

Unit III : Magnetostatics (9 Hrs)

Lorentz force, magnetic field intensity (H) – Biot–Savart's Law – Ampere's Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials, Boundary conditions, scalar and vector potential, Poisson's Equation, Magnetic force, Torque, Inductance, Energy density, Applications.

Unit IV : Electrodynamic Fields (8 Hrs)

Faraday's law, Translational and motional emf, Displacement current, Time varying Maxwell's equations - point form, integral form, Power and Poynting theorem, concept of Retarded magnetic vector potential, Applications.

Unit V : Transmission Lines (8 Hrs)

Line parameters, skin effect, general solution, physical significance of the equations, wavelength, velocity of propagation, the distortion less line, Reflection on a line not terminated in Z0, reflection coefficient, open and short circuited lines, reflection factor and reflection loss, standing waves; nodes; standing wave ratio, Input impedance of dissipation less line, Input impedance of open- and short-circuited lines, Power and impedance measurement on lines, Reflection losses on the unmatched Load, Problems solving using Smith chart.

Unit VI : Uniform Plane Waves (8Hrs)

Maxwell's equation using phasor notations, Electromagnetic wave equations (Helmholtz equation), Relation between **E** and **H**, depth of penetration, concept of polarization, Reflection by perfect conductor-normal incidence, reflection by perfect dielectric- normal incidence, snell's law.

Text Books:

1. Mathew N. O. Sadiku, 'Principles of Electromagnetics', 4th Edition ,Oxford University Press Inc, 2009.
2. William H. Hayt and John A. Buck, 'Engineering Electromagnetics', Tata McGraw Hill, 8th Revised edition, 2011.

Reference Books:

1. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, 5th edition, 2010.
2. Jordan and Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 1964.

304184 Microcontrollers

Credits: TH-03

Teaching Scheme:

Lecture : 03 hr/week

Examination Scheme:

In-Sem : 30 Marks

End-Sem : 70 Marks

Course Objectives:

- To understand architecture and features of typical Microcontroller.
- To understand need of microcontrollers in real life applications.
- To learn interfacing of real world peripheral devices
- To study various hardware and software tools for developing applications.

Course Outcomes:

On completion of the course, student will be able to

1) Learn importance of microcontroller in designing embedded application.
2) Learn use of hardware and software tools.
3) Develop interfacing to real world devices.

Course Contents

Unit I :Introduction to Microcontroller Architecture (6 Hrs)

Overview of MCS-51 architecture, Block diagram and explanation of 8051, Port structure , memory organization, Interrupt structure, timers and its modes, serial communication modes. Overview of Instruction set, Sample programs (assembly): Delay using Timer and interrupt, Programming Timer 0&1, Data transmission and reception using Serial port

Unit II :IO Port Interfacing-I (6 Hrs)

Interfacing of: LEDS, Keypad, 7-segment multiplexed display, LCD, ADC 0809(All programs in assembly).

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

Unit III : Parallel Port Interfacing-II (6 Hrs)

Interfacing of: DAC, Temperature sensors, Stepper motor, Motion detectors, Relay, Buzzer, Optoisolaters, Design of DAS and Frequency counter: All programs in assembly

Unit IV : PIC Microcontroller Architecture (6 Hrs)

Features, comparison & selection of PIC series as per application. PIC18FXX architecture- MCU, Program and Data memory organization, Pin out diagram, Reset operations, Oscillator options (CONFIG), BOD, power down modes & configuration bit settings, timer and its programming, Brief summary of Peripheral support, Overview of instruction set.

Unit V : Real World Interfacing Part I (6 Hrs)

Port structure with programming, Interrupt Structure (Legacy and priority mode) of PIC18FWith SFRS. Interfacing of LED, LCD (4&8 bits), and Key board, use of timers with interrupts, CCP modes: Capture, Compare and PWM generation, DC Motor speed control with CCP: All programs in embedded C

Unit VI : Real World Interfacing Part II (6Hrs)

Basics of Serial Communication Protocol: Study of RS232, RS 485, I2C,SPI, MSSP structure (&I2C),UART, Sensor interfacing using ADC, RTC(DS1306) with I2C and EEPROM with SPI. Desig PIC test Board, Home protection System: All programs in embedded C.

Text Books:

1. Mahumad Ali Mazadi, "The 8051 microcontroller & embedded systems" 2nd Edition ,PHI
2. Mahumad Ali Mazadi,"PIC Microcontroller & Embedded System" 3rd Edition ,Pearson

304185 Mechatronics

Credits: TH-03

Teaching Scheme:
Lecture : 03 hr/week

Examination Scheme:
In-Sem : 30 Marks
End-Sem : 70 Marks

Course Objectives:

- To understand the concept and key elements of Mechatronics system, representation into block diagram
- To understand principles of sensors their characteristics
- To Understand of various data presentation and data logging systems
- To Understand concept of actuator
- To Understand various case studies of Mechatronics systems

Course Outcomes:

On completion of the course, student will be able to

1 Identification of key elements of mechatronics system and its representation in terms of block diagram

2 Understanding basic principal of Sensors and Transducer.

3. Able to prepare case study of the system given.

Course Contents

Unit I :Introduction to Mechatronics (6 Hrs)

Basics of Mechatronics Systems : Definition of Mechatronics, Key elements of Mechatronics Systems, Levels of mechatronics systems,Measurement Characteristics,Examples of Mechatronics systems in daily life as ,WashingMachines, Digital Cameras,CD Players, camcorders, Mechatronics design process,phases of mechatronics design process, integrated design approach. **Mechanical Components and Servo mechanism :**Mechanical System and Motion, Mass Inertia and Dashpot, Gears, types of Gears, Servomechanism(Concepts and Theory, Problems).Case study Mechatronics Design of Coin Counter/Coin Separator

Unit II :Overview of Sensors, Transducers and their Characteristics Specifications (8Hrs)

Specifications related to selection criterion for force, pressure, temperature and motion (Rotary and

Linear).

Classification and selection of transducers:

Force: Load Cell, Cantilever Beam (Design aspect example)

Pressure: Strain Gauge, Piezoelectric

Motion: Rotary and Linear motions, Proximity sensors Inductive, Capacitive and Magnetic, sources detectors in optical proximity sensors.Comparison of Various proximity sensors

Temperature: Optical Fibre and its use in temperature measurement**,** Fibre Optic Temperature sensors,Ultrasonic Transducersfor applications as position, level, flow measurement.

Gas sensors, Wind sensors:Gyroscope, Accelerometer, Magnetometer (As used in smart phones)

Smart Sensors: Concept, Radiation Sensors - Smart Sensors - Film sensor, IR- temperature sensors

Introduction to MEMS& Nano Sensors . Rotary Optical Encoder

Unit III : Hydraulic Systems (6 Hrs)

Introduction to Hydraulic Actuators

Fluid Power systems:Concept of Actuators, Classification of Actuators: Pneumatic, Hydraulic and Electrical Actuators, Fluid Power systems

Hydraulic Systems: Physical Components of a Hydraulic systems, Hydraulic Pumps (e.g. Gear Pumps, Vane Pumps, Piston Pumps and Axial Piston Pumps) , Filters and Pressure Regulation, Relief Valve, Accumulator.

Unit IV : Pneumatic Systems (6 hrs)

Introduction to Pneumatic a Actuators

Physical Components of a Pneumatic Systems, Pneumatic Cylinders, Pneumatic Actuators (e.g. Spring Actuator and Spring Actuator with positioner), Air compressor ,Air Receiver, Air Dryer

Air Service Treatment: Air Filter, air regulator and Gauge, Air Lubricator and Pressure regulation Intake and Air Filter.Case study of Robotic Pick and Place robot

Unit V : Electrical Actuators, Electron-Mechanical Actuators (6 Hrs)

Electrical-Actuation system: Selection criteria and specifications of stepper motors, solenoid valves,relays (Solid State relays and Electromechanical relays).

Selection Criterionofcontrol valve, Single acting and Double acting Cylinders.

Electro-Pneumatic: Pneumatic Motors, Valves: Electro Hydraulic: 3/2 Valves, 4/2 Valves, 5/3 Valves

Cables: Power cable and Signal cables

Unit VI :Mechatronics Systems in Automobile (6Hrs)

(Treatment with Block Diagram Approach)

Boat Autopilot,High Speed tilting trains, Automatic car parking systems, Engine Management

systems, Antilock Brake systems (ABS) ,CNC Machines(Only Black Diagram and explaination)

Text Books:

1) W. Boltan "Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering" 6th Edition, Pearson Education, 2016

2)David Alciatore and MaichaelB Histand, "Introduction to Mechatronics and Measurement Systems",4th Edition, Tata McGraw Hill 2013.

3) K.P.Ramachandran, G.K.Vijayaraghavan and M.S. Balasundaram, "Mechatronics-Integrated Mechanical Electronic Systems", Willey Publication 2008

Reference Books:

1) Nitaigour P. Mahalik ," Mechatronics-Principles, Concepts and Applications", Tata McGraw Hill, Eleventh reprint 2011.

2) DevdasShetty and Richard A.Kolk, "Mechatronics System Design", Thomson India Edition 2007.

3) HMT Limited, " Mechatronics", Tata McGraw-Hill Publishing Hous

304191 Signal Processing and Communications Lab

Credits: PR-02

Teaching Scheme:
Practical : 04 hr/week

Examination Scheme:
Practical : 50 Marks
Termwork : 50 Marks

Digital Communication

Note : Perform any 6 experiments from Group A and any 3 from Group B

Group A

1 Study of PCM and Companded PCM.
2 Study of DM and ADM.
3 Study of Pulse shaping, ISI and eye diagram
4 Study of Generation &detection of BPSK and QPSK.
5 Study of Generation &detection of BFSK.
6 Study of line codes (NRZ, RZ, POLAR RZ, BIPOLAR (AMI), MANCHESTER) & their spectral analysis.
7 Study of Detection of digital base band signal in presence of noise.
8 Study of Generation of PN Sequence and its spectrum.
9 Study of Generation &detection of DS-SS coherent BPSK&its spectrum.

Group B

1 Program for implementation to simulate PCM/ DM/ADM system.
2 Simulation program to study effect of ISI and noise in baseband communication system.
3 Simulation Program to study Random Processes.
4 Simulation program for calculation and plotting the error probability of BPSK, QPSK, QAM. Comparison of theoretical and practical BERs.
5 Simulation of any digital communication system using Simulink or similar software.
6 Simulation program for Constellation diagram of any pass band modulated signal in presence of noise.

Digital Signal processing

- Minimum eight experiments to be performed.
- Experiments can be performed using any appropriate software's such as C/MATLAB/SCILAB etc.

1. Write a program to verify the sampling theorem and aliasing effects with various sampling frequencies.
2. Write a programs to study and verify DFT properties (Minimum two properties).
3. Write a program to find 4 point circular convolution and compare the result with 8 point circular convolution to study aliasing effect in time domain.
    (a) To find Z and inverse Z transform and pole zero plot of Z-transfer function.
    (b) To solve the difference equation and find the system response using Z transform.
4. To plot the poles and zeros of a transfer function when the coefficients of the transfer
    (a) function are given, study stability of different transfer functions.
5. To study the effect of different windows on FIR filter response. Pass the filter coefficient designed in experiment 6 via different windows and see the effect on the filter response.
6. Design Butterworth filter using Bilnear transformation method for LPF and write a
    (a) program to draw the frequency response of the filter.
7. To plot the mapping function used in bilinear transformation method of IIR filter design.(assignment may be given)
8. Effect of coefficient quantization on the impulse response of the filter using direct form I
    (a) and II realization and cascade realization.(theory assignment)
9. Design and implement two stage sampling rate converter.
10. Computation of DCT and IDCT of a discrete time signal and comment on energy compaction density
11. Write a program for speech signal enhancement using pre-emphasis filter and speech filtering using bandpass filter. Any biomedical signal e.g. ECG can also be used for signal enhancement

304192 Microcontrollers and Mechatronics Lab

Credits: PR-02

Teaching Scheme: **Examination Scheme:**

Practical : 04 hr/week **Practical : 50 Marks**

Termwork : 50 Marks

Microcontrollers

List of Practical's: Minimum 10 experiments

(Experiment number 2,3, 5,6, 7, 9,10, 12 are compulsory; Any one from 1and4 , 8, 11 and 13)

1. Simple programmes on Memory transfer.
2. Parallel port interacting of LEDS—Different programs(flashing, Counter, BCD, HEX, Display of Characteristic)
3. Waveform Generation using DAC
4. Interfacing of Multiplexed 7-segment display (counting application)
5. Interfacing of LCD to 8051 (4 and 8 bit modes)
6. Interfacing of Stepper motor to 8051- software delay using Timer
7. Write a program for interfacing button, LED, relay & buzzer as follows

   A. On pressing button1 relay and buzzer is turned ON and LED's start chasing from left to right

   B. On pressing button2 relay and buzzer is turned OFF and LED start chasing from right to left .
8. Interfacing 4X4 keypad and displaying key pressed on LCD.
9. Generate square wave using timer with interrupt
10. Interfacing serial port with PC both side communication.
11. Interfacing EEPROM 24C128 using SPI to store and retrieve data
12. Interface analog voltage 0-5V to internal ADC and display value on LCD
13. Generation of PWM signal for DC Motor control.

Mechatronics

List of Practical's

1. Servomotor position control using photo electric pickup
2. Position and velocity measurement using encoders
3. Study of liquid flow measurement.

4. Study on the application of data acquisition systems for industrial purposes.

5 . Interfacing of any 2- sensors with data acquisition systems.

6. Study of Hydraulic Trainer.

7. Study of Pneumatic Trainer.

8. Study of Electro-Pneumatic Trainer.

9. Study of Electro-Hydraulic Trainer.

10. Demonstration of any one case study.

304193 Electronic System Design

Credits: TH-02 PR-01

Teaching Scheme: **Examination Scheme:**

Lecture : 02 hr/week **Oral : 50 Marks**

Practical : 02 hr/week

Course Objectives:

- Design working, reliable and electronic system to meet specifications.
- Inculcate circuit designing skills and ability and to use modern design tools.
- Enhance employability based on knowledge and understandings of electronic system design.
- To learn basics of database systems used in design / simulation software.
- To create an interest in the field of electronic design as a prospective career option.

Course Outcomes:

On completion of the course, student will be able to

1. Apply the fundamental concepts and working principles of electronics devices to design electronics systems.
2. Shall be able to interpret datasheets and thus select appropriate components and devices
3. Select appropriate transducer and signal conditioning circuit to design prototype of Data Acquisition system.
4. Design an electronic system/sub-system and validate its performance by simulating the same.
5. Shall be able to use an EDA tool for circuit schematic and simulation.
6. Create, manage the database and query handling using suitable tools.

Course Contents

Unit I : Design of SMPS (3 Hrs)

General block diagram of SMPS, Advantages of SMPS, Comparison between SMPS and Linear Power Supply, Basic concept of switching regulator, Basic topologies, Step down converter, Step up converter, Fly back Converter, Forward converter.Performance parameters of SMPS. Selection Criteria of Switching element,Switching diode, Filter capacitor and inductor, PWM circuit, High frequency transformer design (steps only), Protection Circuits for SMPS.

Unit II : Design of Data Acquisition Systems (DAS) (3 Hrs)

Need of DAQ, Block diagram of DAQ, Application Areas of DAQ, Performance parameters of DAQ, Selection of Sensor, Transducers, and Actuator, Interfacing of sensor, Need of signal conditioners, Design of signal conditioning circuits, Selection criteria for ADC and DAC, Selection Criteria of Microcontrollers, PC Interfacing using serial communication like RS-232, USB, Overview of storage interface (like SD-Card, Serial EEPROM), Display interfaces (like 7-segment

and LCD), GUI Development.

Unit III :Introduction to DBMS and SQL (4 Hrs)

RDBMS: Need and Overview, hierarchy, classification, creating a data base table and basics of normalization. Data integrity. Current trends (Intro to Non-SQL databases). Basics of SQL.Insert, Update and Deleteoperations,Retrieving Data based on query.Sorting and Filtering Data, Advanced Filtering, Summarizing Data, Grouping Data, Using Sub-queries, Nested queries, Joining Tables, Managing Tables. Using viewsand generating reports.

Unit IV : Design of Communication System(3Hrs)

Gathering requirements for designing a basic block diagram and detailing of **any one section out of following (One only)**

1. Modulator – Demodulator Design(AM / FM / FSK)
2. Design of Mixer
3. Audio / Power Amplifier
4. HF Oscillator, Cascode Amplifier

Unit V :PCB Design (2 Hrs)

Types of PCB, PCB artwork components (pads, vias, tracks, footprints) and their metrics, Netlists, Power planes, High frequency considerations, Power considerations, Design Artwork (double sided PTH), Carry out signal integrity analysis.

Text Books:

1. "Switching Power Supply Design,"3E, Abraham I. Pressman et. al, The McGraw-Hill Companies, 2009
2. "Measurement, Instrumentation, and Sensors Handbook", John G. Webster, CRC Press, 1999
3. Reference Manual for MySQL / SQL Server / Oracle for Relational Databases
4. Roger L. Freeman," Fundamentals of Telecommunications", John Wiley & Sons

Reference Books:

1. Practical design of power supplies" , Ron Lenk, John Wiley & Sons, 2005
2. The Circuit Designer's Companion", Peter Wilson, Elsevier Ltd, 2012
3. Printed Circuits Handbook, 7th Edition, Clyde Coombs, Happy Holden, McGraw-Hill ,2016
4. Printed Circuit Boards: Design, Fabrication, and Assembly", R. Khandpur, McGraw-Hill ,05
5. Mazidi, PIC microcontroller & embedded system, 3rd Edition ,Pearson
6. Henry Korth, "Data base system Concepts", 6th Edition, Mc-Graw Hill Education

7. http://www.ti.com/lit/an/slua143/slua143.pdf
8. https://www.onsemi.com/pub/Collateral/SMPSRM-D.PDF

http://download.ni.com/evaluation/daq/Measurement_System_Build_Guide.pdf

Guidelines:

a) Students are expected to Design and simulate all assignments during the semester in a group.Group shall consist of **maximum of three** students.

b) Institutions are requested to provide components required for implementation and required software.

c) **For hardware based assignments:** Paper design should be functionally verified with an appropriate EDA tool (NI Multisim/Orcad/Pspice / Altium Designer suite etc.) and prepare the document which consist of :

1. Problem statement (Different for each group)
2. Specifications 3.Block Diagram
4. Component Selection 5. Design Calculations
6. Simulation results 7. Bill of Material (generated from SQL)
8. Conclusion **9.** Datasheets
10. Detailed circuit diagram (separate sheet: Imperial /Half Imperial size)

d) **For software based assignments (Assignment 3):** Implement the database using MySQL software and prepare the user manual for the implemented system.

List of Practicals:

Assignment 1: Design and Implementation of SMPS

a) Design and simulate buck converter using ICslike LM3842 / LM 3524 and measure performance parameters like load regulation, line regulation, ripple rejection, output impedance, dropout voltage.

b) Design and Implement buck converter using ICs like LM3842 / LM 3524 and measure performance parameters like load regulation, line regulation, ripple rejection, output impedance and dropout voltage.

Assignment 2: Design, simulate and implement multi-channel data acquisition system

a) Minimum two sensors must be interfaced to microcontroller and design signal conditioning circuit for the same.

b) Interface display device such as LED, 7-segment and LCD
c) Interface the actuators such as Relay, DC Motor, Solenoid
d) Serial interface such as RS-232, USB to transmit the data to PC
e) Optional: GUI development using Lab-View, MATLAB, C#, .net, python etc.

Assignment 3: Create Database tables to store the relevant information of various electronic components. Define Keys for the tables and join those using relational keys.

a) Database for Electronic components shall be created with specification details.
b) Manipulate data using DML commands.
c) Use SQL queries for following
    I. Add and delete particular component.
    II. Display all the components with given criteria.
    III. Retrieve particular component as per the specification. This shall involve join of minimum two tables.
    IV. To sort / filter component according their values / tolerances
d) Generate Report s like consumption, inventory, Purchases during specified period.
e) Generate Bill of Materials for SMPS or DAQ design by entering all related components to database and using queries and report tool.

Assignment 4: Design of Building block in communication System

a) Design of block level system used for communication (Choose any one system for design)
b) Design any one building block in detail with selection of components, specifications and calculations. Specifications related to frequency and Power must be mentioned. Termination matching with preceding and next block.

Audit Course 3

Japanese Language Audit Course

With changing times, the competitiveness has gotten into the nerves and 'Being the Best' at all times is only the proof of it. Nonetheless, 'being the best' differs significantly from 'Communicating the best'! The best can merely be communicated whilst using the best… suited Language!!

Japanese is the new trend of 21st century. Not only youngsters but even the professionals seek value in it. It is the engineer's companion in current times with an assertion of a thriving future. Pune has indisputably grown to become a major center of Japanese Education in India while increasing the precedence for Japanese connoisseurs.

Japanese certainly serves a great platform to unlock a notoriously tough market & find a booming career. While the companies prefer candidates having the knowledge of the language, it can additionally help connect better with the native people thus prospering in their professional journey. Learning Japanese gives an extra edge to the 'resume' since the recruiters consciously make note of the fact it requires real perseverance and self-discipline to tackle one of the most complex languages.

It would be easy for all time to quit the impossible; however it takes immense courage to reiterate the desired outcomes, recognize that improvement is an ongoing process and ultimately soldier on it.

The need of an hour is to introduce Japanese language with utmost professionalism to create awareness about the bright prospects and to enhance the proficiency and commitment. It will then prove to be the ultimate path to the quest for professional excellence!

Course Objectives:

- To meet the needs of ever growing industry with respect to language support.
- To get introduced to Japanese society and culture through language.

Course Outcomes:

On completion of the course

- One will have ability of basic communication.
- One will have the knowledge of Japanese script.
- One will get introduced to reading , writing and listening skills
- One will develop interest to pursue professional Japanese Language course.

Course Duration: 4 semesters (3 units / semester)

TE-Semester 1

Unit 1 : Introduction to Kanji Script,
Describing one's daily routine. To ask what someone does.
Expressions of Giving & Receiving.

Unit 2 : Adjectives (Types of adjectives)
Asking impression or an opinion about a thing / person / place that the listener
Has experienced, visited, or met
Describing things / person / places with the help of the adjectives.

Unit 3 : Expressions of Like & Dislikes. Expressing one's ability, hobby
Comparison between objects, persons & cities

Audit Course 3

Cyber and Information Security

Basic Concepts of Technology and Law

Basics of Information Technology, Basics of Indian Legal System, Information Technology Act 2000 (Amended), Relevant Amendments in all other laws. E-Contract The essence of digital contracts, Law of Contract, Construction of E-contracts, Issues of security, Employment contracts, Consultant Agreements and Digital signature

Intelligent Property Issues in Cyber space: Doman names and related issues, Copyright in digital media, Patents in cyber world. Rights of Neitzens and E- Governance: Privacy and freedom issues in cyber world, E-Governance, Cyber crimes and Cyber laws.

Information Security Fundamentals: Background, Importance, Statistics, National and International Scenario, Goals of security, Confidentiality, Privacy, Integrity, Non-repudiation, Availability.
Essentials of computer security - Sources of security threats – Intruders, Viruses, Worms and related threats - Threat identification - Threat analysis -Vulnerability identification and Assessment.

Security Investigation: Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues Access Control, Intrusion Detection and Server Management, Firewalls: Overview of Identification and Authorization, Overview of IDS, Intrusion, Detection Systems and Intrusion

Prevention Systems, User Management, Overview of Firewalls, Types of Firewalls, DMZ and firewall features

Security Policies and Management: Security Policy Design, Designing Security Procedures, Risk Management and Assessment Techniques, Security stan

dards, Security Models. Security Management Practices, Security Laws, Information Classification Process, Risk Management, Security Procedures and Guidelines, Business Continuity and Disaster Recovery, Ethics and Best Practices, Security Assurance

SEMESTER II

304186 Power Electronics

Credits: TH-03

Teaching Scheme: **Examination Scheme:**

Lecture : 03 hr/week **In-Sem : 30 Marks**

End-Sem : 70 Marks

Course Objectives:

- To introduce students to different power devices to study their construction, characteristics and turning on circuits.
- To give an exposure to students of working & analysis of controlled rectifiers for different loads, inverters, DC choppers, AC voltage controllers and resonant converters.
- To study the different motor drives, various power electronics applications like UPS, SMPS, etc. and some protection circuits.

Course Outcomes:

On completion of the course, student will be able to

1) Design & implement a triggering / gate drive circuit for a power device
2) Understand, perform & analyze different controlled converters.
3) Evaluate battery backup time & design a battery charger.
4) Design & implement over voltage / over current protection circuit.

Course Contents

Unit I : Power Devices (8 Hrs)

Construction, Steady state characteristics & Switching characteristics of SCR, Construction, Steady state characteristics of Power MOSFET & IGBT. SCR ratings: IL, IH, VBO, VBR, dv/dt, di/dt, surge current & rated current. Gate characteristics, Gate drive requirements, Gate drive circuits for Power MOSFET & IGBT,opto isolator driving circuits for SCR. Series and parallel operations of SCR's. Applications of above power devices as a switch .

Unit II :AC-DC Power Converters (8 Hrs)

Concept of line & forced commutation, Single phase Semi & Full converters for R, R-L loads, Performance parameters, Effect of freewheeling diode, Three phase Semi & Full converters for R load, effect of source inductance, Power factor improvement techniques, Diode based boost converter. Single Phase dual converter with inductive load.

Unit III : DC-AC Converters (8 Hrs)

Single phase bridge inverter for R and R -L load using MOSFET / IGBT, performance Parameters, single phase PWM inverters. Three Phase voltage source inverter for balanced star R load with 120° and 180 mode of operation, Device utilization factor, Harmonics Elimination/Modulation Techniques**.**

Unit IV : DC-DC converters & AC Voltage Controller (8 Hrs)

Working Principle of step down chopper for R-L load (highly inductive), control strategies. Performance parameters, Step up chopper, 2-quadrant & 4-quadrant choppers, SMPS: Fly back/ Half Bridge/ LM3524 based or equivalent Circuit. Single-Phase full wave AC voltage controller by using IGBT with R load**.**

Unit V : Resonant Converters & Protection of Power Devices & Circuits (8 Hrs)

Need for Resonant converters, Concept of Zero current switching (ZCS) and Zero voltage switching (ZVS) resonant converters. Cooling & heat sinks, over voltage conditions, over voltage protection circuits, metal oxide varistors**,** over current fault conditions, Over current protection. Electromagnetic interference, sources, minimizing techniques, shielding techniques for EMI.

Unit VI : Power Electronics Applications (8 Hrs)

ON-line and OFF line UPS with battery AH, back up time, battery charger rating. Electronic Ballast, LED Lamp with Driver Circuit, fan Regulator. Single phase separately excited DC motor drive, stepper motor drive, BLDC motor drive. Variable voltage & variable frequency three phase induction motor drive.

Text Books:

1) M. H. Rashid, “Power Electronics circuits devices and applications”, PHI 3rd edition, 2004 edition, New Delhi.

2) M. S. Jamil Asghar, "Power Electronics", PHI, 2004, New Delhi

Reference Books:

1) Ned Mohan, T. Undeland & W. Robbins, “Power Electronics Converters Applications and Design” 2nd edition, John Willey & sons, Singapore, Oxford University Press, New Delhi, 2005

2) P.C. Sen, “Modern Power Electronics”, S Chand & Co New Delhi

3) "GE SCR MANUAL" 6th edition, General Electric, New York, USA

4) Dr. P. S. Bimbhra, “Power Electronics”, Khanna Publishers, Delhi.

5) M D Singh, K B Khanchandani “Power Electronics” TMH

304187 Information Theory Coding Techniques and Communication Networks

Credits: TH-04

Teaching Scheme:

Lecture : 04 hr/week

Examination Scheme:

In-Sem : 30 Marks

End-Sem : 70 Marks

Course Objectives:

- To understand information theoretic behavior of a communication system.
- To understand various source coding techniques for data compression
- To understand various channel coding techniques and their capability.
- To Build and understanding of fundamental concepts of data communication and networking.

Course Outcomes:

On completion of the course, student will be able to

1) Perform information theoretic analysis of communication system.

2) Design a data compression scheme using suitable source coding technique.

3) Design a channel coding scheme for a communication system.

4) Understand and apply fundamental principles of data communication and networking.

5) Apply flow and error control techniques in communication networks.

Course Contents

Unit I :Information Theory & Source Coding (6 Hrs)

Introduction to information theory, Entropy and its properties, Source coding theorem, Huffman coding, Shannon-Fano coding, The Lempel Ziv algorithm, Run Length Encoding, Discrete memory less channel, Mutual information, Examples of Source coding-Audio and Video Compression.

Unit II :Information Capacity & Channel Coding (6 Hrs)

Channel capacity, Channel coding theorem, Differential entropy and mutual Information for continuous ensembles, Information Capacity theorem, Linear Block Codes: Syndrome and error detection, Error detection and correction capability, Standard array and syndrome decoding, Encoding and decoding circuit, Single parity check codes, Repetition codes and dual codes, Hamming code, Golay Code, Interleaved code.

Unit III : Cyclic Codes (6 Hrs)

Galois field, Primitive element & Primitive polynomial, Minimal polynomial and generator polynomial, Description of Cyclic Codes, Generator matrix for systematic cyclic code, Encoding for cyclic code, Syndrome decoding of cyclic codes, Circuit implementation of cyclic code.

Unit IV : BCH and Convolutional Codes (6Hrs)

Binary BCH code, Generator polynomial for BCH code, Decoding of BCH code, RS codes, generator polynomial for RS code, Decoding of RS codes, Cyclic Hamming code and Golay code. Introduction of convolution code, State diagram, Tree diagram, Trellis diagram, Sequential decoding and Viterbi decoding

Unit V : Data Communication & Physical Layer(6 Hrs)

Data Communications – Networks - Network models – OSI model – Layers in OSI model – TCP / IP protocol suite – Addressing – Guided and Unguided Transmission media.

Unit VI : Data Link Layer (4Hrs)

Data link control: Framing – Flow and error control –Protocols for Noiseless and Noisy Channels – HDLC.

Text Books:

1) Bernad Sklar, "Digital Communication Fundamentals & applications", Pearson Education. Second Edition.

2) Behrouz A. Foruzan, "Data communication and Networking", Tata McGraw-Hill

Reference Books:

1) Ranjan Bose, "Information Theory coding and Cryptography", McGraw-Hill, 2nd Ed

2) Murlidhar Kulkarni, K.S.Shivaprakasha, "Information Theory & Coding", Wiley Publications

3) Simon Haykin, "Communication Systems", John Wiley & Sons, Fourth Edition.

4) Shu lin and Daniel j, Cistello jr., "Error control Coding" Pearson, 2nd Edition.

5) Todd Moon, "Error Correction Coding : Mathematical Methods and Algorithms", Wiley Publication

6) Khalid Sayood, "Introduction to Data compression", Morgan Kaufmann Publishers

304188 Business Management

Credits: TH-03

Teaching Scheme:

Lecture : 03 hr/week

Tutorial:

Examination Scheme:

In-Sem : 30 Marks

End-Sem : 70 Marks

Term Work :

Course Objectives:

- To get awareness about various domains in Business Management.
- To understand concept of Quality Management, Financial Management and Project Management.
- To learn Human Resource Management, marketing management are the major tasks in Business
- To promote Entrepreneurship.

Course Outcomes:

On completion of the course, student will be able to

1) Get overview of Management Science aspects useful in business.
2) Get motivation for Entrepreneurship
3) Get Quality Aspects for Systematically Running the Business
4) To Develop Project Management aspect and Entrepreneurship Skills.

Course Contents

Unit I :Basics of Business Management (8 Hrs)

Introduction, Definition of management, characteristics of management, functions of management - Planning, Organizing, Staffing, Directing, Co-ordination, Controlling, Motivating, Communication, Decision Making, Principles of management – F.W.Taylor, Henry Fayol, Elton Mayo, Administration and management, Nature of management, levels of management, scientific management, managerial roles, Forms of Organization- Line , Line –staff,committee etc, Dist Business sectors & forms of business organizations- private sector,Cooperative sectors, public sector, joint sector, Services sector, Various forms of business organizations – Sole Proprietorship, Partnership firms, Joint stock companies -their features, relative merits, demerits & suitability. Concept of globalization

Unit II :Quality Management (6 Hrs)

Definition of quality, goalpost view of quality, continuous improvement definition of quality, types

of quality – quality of design, conformance and performance, phases of quality management, Juran's and Demings view of quality, Quality Management Assistance Tools: Ishikawa diagram – Pareto Analysis – Pokka Yoke (Mi stake Proofing).quality circles, TQM, Kaizen, Five S (5S), Six sigma Quality Management Standards Application of six sigma a CASE study - The ISO 9001:2015 Quality Management System Standard. Software quality management with respect to CMM level and ISO standard.

Unit III : Financial Management and Project Management (6 Hrs)

Capital Structure, Fixed & working capital, Cash flow, Financial accounting concepts and application, Scope of business, Macro analysis, micro analysis, Demand and supply analysis. Function of money market and capital Market, sources of finance. Introduction to capital budgeting, Techniques of capital budgeting. Break even analysis - assumptions, importance, Cost-Benefit analysis,. Introduction to Project Management process (Project Life cycle Management),Project selection criteria, project scope, Project planning, scheduling , Resources and constrains. Project estimates and costing .Project qualitative and quantitative Risk analysis and Mitigation, project quality planning and deliverables. Case study of a project Mnagement.

Unit IV : Human Resource Development (6 Hrs)

Strategic importance HRM; objectives of HRM; challenges to HR professionals; role, Responsibilities and competencies of HR professionals; HR department operations; Human Resource Planning - objectives and process; human resource information system.. Talent acquisition; recruitment and selection strategies, career planning and management, training and development, investment in training program; executive development, Case study on Recent trends in Human Resource Development. Case study of a HR of an organization.

Unit V : Entrepreneurship Development (6 Hrs)

Concept of entrepreneurship, Identification of business opportunities, Generation of business idea, Business plan, Preparation of business proposal, Sources of finance – government and nongovernment agencies, , Policies and incentives for small business development, Government policies and incentives, Woman entrepreneurship, Industrial relations, Case study on Small scale industries in India.

Unit VI : Marketing (6 Hrs)

Introduction to marketing, marketing environment, segmentation. Consumer behavior and Marketing management. Marketing research, pricing, advertising, branding and packaging. Personal selling and sales force Management .Modern marketing system (digital Mastering□marketing) Email Marketing, Social Media Marketing, Web Marketing, Google (Google Analytics, Advertising and

Applications), Facebook, LinkedIn, Twitter, Guides & Directories, Online Publications etc for sales, customer services, staff recruitment etc, Blogging and Micro Blogging Event Management, Online Payments, Disability Web Access, Surveys & Forms, Affiliate & Voucher Marketing, Crowd sourcing, Mobile Social Media (Geotagging etc) and Mobile Marketing, Mobile Applications (Apps and Mobile Web), Audio , Video podcasting.

Introduction to supply chain management and customer relationship management

Text Books:

1) O. P. Khanna, "Industrial Engineering and Management", Dhanpatrai publications Ltd, NewDelhi.

2) L.C.Jhamb , Savitri Jhamb , Industrial Management – I , Everest Publishing House .

3) Jenniffer Greene, Andrew Stellman,Head First PMP 3rd Edition OREILLY Publication

4) Marketing Management-Phillip Kotlar, The Millennium Edition, PHI EEE Edition

Reference Books:

1) G. S. Batra , "Development of entrepreneurship " , deep and deep publications, new delhi

2) Ashwathappa, "human resource management", mc-gra w-hill education (india) pvt. Ltd.

3) M.Y. Khan and P. K. Jain, "financial management" , mc-graw-hill education (india) pvt. Ltd.

4) Ravi M. Kishore, "project management", mc-graw-h ill education (india) pvt.

5) Pravin kumar, " fundamentals of engineering economics", wiley india

6) Monga..i.r..Financial Accounting:conceptsand Applications,maytirpaperbacks

7) Business organization and management by dr. C. B. Gupta, publisher sultan chand & co. Delhi

8) Fundamentals of accounting & financial analysis: by Anil Chowdhry (Pearson education)

9) Textbook of economic theory - Stonier and Hague; LongmanGreen and co., london.

10) managerial economics - theory and application - D. M. Mithani

304189 Advanced Processors

Credits: TH-03

Teaching Scheme:

Lecture : 03 hr/week

Examination Scheme:

In-Sem : 30 Marks

End-Sem : 70 Marks

Course Objectives:

- To understand need and application of ARM Microprocessors in embedded system.
- To study the architecture of ARM series microprocessor
- To understand architecture and features of typical ARM7& DSP Processors.
- To learn interfacing of real world input and output devices
- To learn embedded communication systems.

Course Outcomes:

On completion of the course, student will be able to

1) Describe the ARM microprocessor architectures and its feature.

2) Interface the advanced peripherals to ARM based microcontroller

3) Design embedded system with available resources.

4) Use of DSP Processors and resources for signal processing applications.

Course Contents

Unit I :ARM7, ARM9, ARM11 Processors (6 Hrs)

Introduction to ARM processors and its versions, ARM7, ARM9 & ARM11 features, advantages & suitability in embedded application, registers, CPSR, SPSR, ARM and RISC design philosophy, ARM7 data flow model, programmers model, modes of operations. Introduction to Tiva TM4C123G Series Overview, Programming model, Tivaware Library

Unit II :ARM7 Based Microcontroller (6 Hrs)

ARM7 Based Microcontroller LPC2148: Features, Architecture (Block Diagram and Its Description), System Control Block (PLL and VPB divider) , Memory Map, GPIO, Pin Connect Block, timer, Instruction set, programming in assembly language.

Unit III : Real World Interfacing with ARM7 Based Microcontroller -1 (6 Hrs)

Interrupt structure of LPC2148, Interfacing with LED, LCD, GLCD, KEYPAD, simple LPC2148 GPIO Programming examples Using timers of LPC2148 to generate delay, serial communication programming for transmission and reception from computer, programming for UART.

Unit IV : Real World Interfacing with ARM7 Based Microcontroller -2 (6 Hrs)

GSM and GPS module interfacing, on-chip ADC using interrupt (VIC) and without using interrupt (VIC), EEPROM using I2C, SDCARD using SPI, on-chip DAC for waveform generation.

Unit V : Digital signal Processors –I (6 Hrs)

Introduction, Computer Architectures for signal processing, General purpose Digital signal Processors, selecting digital signal processors, Special purpose DSP Hardware, Architecture of TMS320C67X, Features of C67X processors, CPU, General purpose register files, Functional units and operation, Data paths, Control register file.

Unit VI : Digital signal Processors-II (6Hrs)

TMS320C67X Functional units,Internal memory, External memory, on chip peripherals, Interrupts, Instruction set and addressing modes, Fixed point instructions, Floating point instructions, Conditional operations, Parallel operations, Pipeline operations, Code Composer studio, Application programs in C67X.

Text Books:

1) Andrew Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide – Designing and Optimizing System Software", ELSEVIER

2) Digital Signal Processors: Architecture, Programming and Applications By B. Venkatramani, M Bhaskar McGraw Hill Second Edition

Reference Books:

i. LPC 214x User manual (UM10139) :- www.nxp.com
ii. ARM architecture reference manual : - www.arm.com
ii. Trevor Martin,"An Engineer's Introduction to the LPC2100 series", Hitex (UK)
iv. TMS320C67XX User manual: www.ti.com
v. Digital Signal Processing A Practical Approach by Emmanuel Ifeachor, Barrie W. Jervis Pearson Second edition
vi. Joseph Yiu, "The Definitive Guide to the ARM Cortex-M", Newness, ELSEVIER.

304190 System Programming and Operating System

Credits: TH-03

Teaching Scheme:

Lecture : 03 hr/week

Examination Scheme:

In-Sem : 30 Marks

End-Sem : 70 Marks

Course Objectives:

- To understand system software concepts, like the use and implementation of assembler, macros, linker, loaders and compiler.
- To get acquainted with software tools for program development.
- To explore memory allocation methods, input output devices and file system w. r. t. various operating system.
- To study and implement various processes scheduling techniques and dead lock avoidance schemes in operating system.

Course Outcomes:

On completion of the course, student will be able to

1) Demonstrate the knowledge of Systems Programming and Operating Systems
2) Formulate the Problem and develop the solution for same.
3) Compare and analyse the different implementation approach of system programming operating system abstractions.
4) Interpret various OS functions used in Linux / Ubuntu

Course Contents

Unit I: Introduction to Systems Programming (8 Hrs)

Introduction:
Components of System Software, Language Processing Activities, Fundamentals of Language Processing.

Assemblers:
Elements of Assembly language programming. Simple assembler scheme, Structure of an assembler, Design of single and two pass assembler.

Macro Processors:
Macro Definition and call, Macro expansion, Nested Macro Calls, Advanced Macro Facilities, Design of a two-pass macro-processor.

Unit II : Compiler, Loaders and Linkers(8Hrs)

Compilers:
Basic compilers function, Phases of compilation, memory allocation, compilation of expression, Compilation of expressions, compilation of control structures, Code of optimization.
Loaders:

Loader Schemes: Compile and go, General Loader Scheme, Absolute loaders, subroutine linkages, relocating loaders, direct linking loaders, Design of an absolute loader.

Linkers:

Relocation and linking concepts, Design of linker, self relocating programs, Static and dynamic linker.

Unit III : Introduction to OS and Process management(6 Hrs)

Introduction to OS :
Architecture, Goals & Structures of O.S, Basic functions, Interaction of O. S. & hardware architecture, System calls, Batch, multiprogramming. Multitasking, time sharing, parallel, distributed & real -time O.S.
Process Management:
Process Concept, Process states, Process control, Threads, Scheduling: Types of scheduling: Preemptive, Non preemptive, Scheduling algorithms: FCFS, SJF, RR.

Unit IV : Concurrency control(6Hrs)

Concurrency:
Interprocess communication, Mutual Exclusion, Semaphores, Classical Problems of Synchronization: Readers-Writers, Producer Consumer, and Dining Philosopher problem.
Deadlock:
Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection.

Unit V : Memory Management (8 Hrs)

Basics of memory management, Swapping, Memory Allocation, Paging, Segmentation ,Virtual memory, Demand Paging, Page replacement, Page replacement algorithms – Optimal FIFO, LRU, LRU approximation, Allocation of frames

Unit VI : Input and Output, File System (8Hrs)

I/O management & Disk scheduling:
I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS), RAID, Disk Cache.
File Management:
Concepts, File Organization, File Directories, File Sharing, Record Blocking, Allocation methods, Free Space management

Text Books:

1. 1 Dhamdhere D., "Systems Programming and Operating Systems", 2nd Edition, 'TMH

2. Siberschatz A; Galvin P.B; Gagne G, “Operating System Concepts”, John Wiley.
3. J. J. Donovan, “Systems Programming”, McGraw Hill

Reference Books:

1. Stalling William, "Operating Systems" , Pearson Education, fifth edition.
2. Adam Hoover, “System Programming with C and UNIX”, Pearson Education
3. Leland L. Beck, “System Software,” Pearson Editions.
4. Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, PHI.
5. A. V. Aho, R. Sethi, J. D. Ullman. Compilers: Principles, Techniques, and Tools. Addison-Wesley

304194 Power Electronics and Information Theory Laboratory

Credits: PR-02

Teaching Scheme:
Practical : 04 hr/week

Examination Scheme:
Practical : 50 Marks
Term work : 50 Marks

Power Electronics

List of Experiments (Any 8)

1) Characteristics of SCR
   i) Plot V-I characteristics , ii) Observe the effect of gate current
   iii) Measure I_H & I_L
2) V-I Characteristics of MOSFET / IGBT
   i) Plot output characteristics ii) Plot transfer characteristics
3) Single phase Semi / Full Converter with R & R-L load
   i) Observe load voltage waveform,
   ii) Measurement of firing angle, average o/p voltage across loads,
   iii) Verification of theoretical values with practically measured values.
4) Single-Phase PWM bridge inverter for R load
   i) Observe output rms voltage waveforms,
5) Step down dc chopper using power MOSFET / IGBT
   i) Measure duty cycle and observer effect on average load voltage for DC chopper
6) Find load & line regulation of given SMPS
7) Single phase AC voltage controller using SCRs for R load
   i) Observe output rms voltage waveforms,
   ii) Measurement of firing angle, o/p voltage across load,
   iii) Verification of theoretical values with practically measured values.
8) Speed control of DC motor / Stepper motor / AC motor
   i) Speed control of DC motor using armature voltage control / field control method.
   Measure RPM and plot graph of speed versus armature voltage and field current OR
   ii) Study drive circuit for stepper motor- phase sequencing and micro stepping. OR
   iii) Plot speed-torque characteristic of three phase induction motor.
9) To study over voltage / over current protection circuit.
10) i) Study of Power Factor improvement techniques. OR

ii) Simulation of circuits by using Powers software

Information Theory, Coding Techniques and Communication Networks

Note: Perform any 8 practical Assignments (1-6 and 11 are compulsory)

1 Write a program for determination of various entropies and mutual information of a given channel. Test various types of channel such as

a) Noise free channel. b) Error free channel

c) Binary symmetric channel d) Noisy channel

Compare channel capacity of above channels.

2 Write a program for generation and evaluation of variable length source coding using (C/MATLAB or any relevant software) (Any 2)

a) Shannon – Fano coding and decoding

b) Huffman Coding and decoding

c) Lempel Ziv Coding and decoding

3 Write a Program for coding & decoding of Linear block codes.

4 Write a Program for coding & decoding of Cyclic codes.

5 Write a program for coding and decoding of convolutional codes

6 Write a program for coding and decoding of BCH and RS codes.

7 Write a program to study performance of a coded and uncoded communication system (Calculate coding gain, error probability, Bit energy Vs error performance)

8 Write a simulation program to implement source coding and channel coding for transmitting a text file.

9 Implementation of any compression algorithm by using various toolboxes in MATLAB or any other platform for either audio, image or video data.

10 Study of Networking Components and LAN.

11 Write a simulation program to implement ARQ techniques

304195 Advanced Microprocessors and System Programming Lab

Credits: PR-02

Teaching Scheme: **Examination Scheme:**

Practical : 04 hr/week **Practical : 50 Marks**

Term work : 50 Marks

Advanced Microprocessors

List of Practical's

Group A: LPC2148 Based Experiments (Any 6)

1 Interfacing LPC2148 with GLCD to display image on it

OR

GPIO configuration and control with simple LED example on TIVA TM4C123G Platform

2. Using UART of LPC2148 for serial reception and transmission from/to computer
3. Interfacing GSM with LPC2148 for sending and receiving message and voice call
4. Interfacing GPS with LPC2148 for finding current location latitude and longitude values
5. Using built-in ADC of LPC2148 for displaying its values (Programming built-in ADC with interrupt and without interrupt) OR

   Programming of on chip ADC and displaying converted digital values on HyperTerminal on TIVA Platform
6. Interfacing SD card to LPC2148 using SPI
7. Interfacing EEPROM to LPC2148 using I2C protocol
8. Introduction to Programming environment with CCS and Tiva library

Group B: DSP Based Experiments (Any 2)

The programs may be written in assembly language, C language and combination of both

1. Convolution
2. Discrete Fourier Transform Using FFT Algorithm
3. Discrete Fourier Transform Using DFT FFT Radix 2 Algorithm
4. FIR filter
5. Real time audio signal capture

TMS320C6748 DSP Development kit(LCDK) with XDS100 V2 JTAG Emulator may found useful.

System Programming and Operating Systems Lab

List of Practical's:

List of Assignments:

1. a. Study of Basic Linux Commands
   b. Write an shell scripting on LINUX OS
2. Write C Program to implement Lexical Analyzer for simple arithmetic operation which creates output tables (Uniform Symbol Table or a. Identifier Table b. Literal Table c. Symbol Table)
3. Design of PASS I of two pass assembler for pseudo machine code.
4. Design of a MACRO PASS-I
5. Implement Job scheduling algorithms: FCFS, SJF
6. Implement Bankers Algorithm for deadlock detection and avoidance
7. Implementation of page replacement algorithm: FIFO / LRU
8. Case Study
   a. Android mobile operating system
   b. Study of System calls to list files, directories
   c. Study of System calls to handles process

304196 Employability Skills and Mini Project

Credits: TH-02 PR-01

Teaching Scheme: **Examination Scheme:**

Lecture : 02 hr/week **Oral : 50 Marks**

Practical : 02 hr/week

Course Objectives:

- To understand the "Product Development Process" including budgeting through Mini Project.
- To plan for various activities of the project and distribute the work amongst team members.
- To inculcate electronic hardware implementation skills by -
- Learning PCB artwork design using an appropriate EDA tool.
- Imbibing good soldering and effective trouble-shooting practices.
- Following correct grounding and shielding practices.
- To develop student's abilities to transmit technical information clearly and test the same by delivery of Seminar based on the Mini Project.
- To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

Course Outcomes:

On completion of the course, student will be able to

1. Understand, plan and execute a Mini Project with team.
2. Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.
3. Prepare a technical report based on the Mini project.
4. Deliver technical seminar based on the Mini Project work carried out.

Course Contents

Execution of Mini Project

- Project group shall consist of **not more than 3** students per group.
- Mini Project Work should be carried out in the Design / Projects Laboratory.
- Project designs ideas can be necessarily adapted from recent issues of electronic design magazines Application notes from well known device manufacturers may also be referred.

- Use of Hardware devices/components is mandatory.
- Layout versus schematic verification is mandatory.
- Bare board test report shall be generated.
- Assembly of components and enclosure design is mandatory.

B: Selection: Domains for projects may be from the following, but not limited to:

- Instrumentation and Control Systems
- Electronic Communication Systems
- Biomedical Electronics
- Power Electronics
- Audio , Video Systems
- Embedded Systems
- Mechatronic Systems

- Microcontroller based projects should preferably use Microchip PIC controllers/ATmega controller/AVR microcontrollers.

C. Monitoring: (for students and teachers both)

Suggested Plan for various activities to be monitored by the teacher.

Week 1 & 2: Formation of groups, Finalization of Mini project & Distribution of work.

Week 3 & 4: PCB artwork design using an appropriate EDA tool, Simulation.

Week 5 to8:PCB manufacturing through vendor/at lab, Hardware assembly, programming (if required) Testing, Enclosure Design, Fabrication etc

Week 9 & 10: Testing of final product, Preparation, Checking & Correcting of the Draft Copy of Report

Week 11 & 12: Demonstration and Group presentations.

Log book for all these activities shall be maintained and shall be produced at the time of examination.

D. Report writing

- A project report with following contents shall be prepared:
    - Title
    - Specifications
    - Block diagram
    - Circuit diagram
    - Selection of components, calculations

- Simulation results
- PCB artwork
- Layout versus schematic verification report
- Testing procedures
- Enclosure design
- Test results

  Conclusion
- References

Text Books:

1. Thomas C Hayes, Paul Horowitz,, "The Art of Electronics",Newens Publication

2. Analog Circuit Design: Art, Science and Personalities, by Jim Williams (Editor) , EDN series for Design Engineers,

3. M Ashraf Rizvi,‟ Effective Technical Communication‟, Tata McGraw Hill Education Pvt. Ltd.

Reference Books:

1. . Robert Boylested, " Essentials of Circuit Analysis", PHI Puublications
2. Meenakshi Raman, Sangeeta Sharma,‟ Technical Communication, Principles and Practice‟, Oxford University Press
3. A.E. Ward, Angus, " Electronic Product Design", Stanley thornes Publishers, UK.
4. C Muralikrishna, Sunita Mishra,‟ Communication Skills for Engineers‟, Pearson

Audit Course 4

Japanese Language Audit Course

With changing times, the competitiveness has gotten into the nerves and 'Being the Best' at all times is only the proof of it. Nonetheless, 'being the best' differs significantly from 'Communicating the best'! The best can merely be communicated whilst using the best… suited Language!!

Japanese is the new trend of 21st century. Not only youngsters but even the professionals seek value in it. It is the engineer's companion in current times with an assertion of a thriving future. Pune has indisputably grown to become a major center of Japanese Education in India while increasing the precedence for Japanese connoisseurs.

Japanese certainly serves a great platform to unlock a notoriously tough market & find a booming career. While the companies prefer candidates having the knowledge of the language, it can additionally help connect better with the native people thus prospering in their professional journey. Learning Japanese gives an extra edge to the 'resume' since the recruiters consciously make note of the fact it requires real perseverance and self-discipline to tackle one of the most complex languages.

It would be easy for all time to quit the impossible; however it takes immense courage to reiterate the desired outcomes, recognize that improvement is an ongoing process and ultimately soldier on it.

The need of an hour is to introduce Japanese language with utmost professionalism to create awareness about the bright prospects and to enhance the proficiency and commitment. It will then prove to be the ultimate path to the quest for professional excellence!

Course Objectives:

- To meet the needs of ever growing industry with respect to language support.
- To get introduced to Japanese society and culture through language.

Course Outcomes:

On completion of the course

- One will have ability of basic communication.
- One will have the knowledge of Japanese script.
- One will get introduced to reading , writing and listening skills

- One will develop interest to pursue professional Japanese Language course.

Course Duration: 4 semesters (3 units / semester)

Course Content for TE-Semester 2

Unit 1 : Stating existence or a presence of thing (s), person (s)
Relative positions, Counters

Unit 2 : Expressing one's Desire & wants

Verb groups,
Asking, Instructing a person to do something

Unit 3 : Indicating an action or motion is in progress. Describing habitual action
Describing a certain continuing state which resulted from a certain action in the past. Express permission & prohibition.

Audit Course 4

Embedded System Design using MSP430

Embedded applications like automation and control, consumer electronics, test and measurement equipment's, HVAC and building control, remote monitoring and other embedded applications require Low power CPU's with more GPIO's, in-build ADC and dedicated Embedded protocols. MCU workshop is based upon Low power 16-bit MSP430 series platforms. Participants will be exposed to complete application-building concept using 16-bit MSP430 series MCUs. The workshop will be designed to give hands-on experience so that every participant will get expertise in using MSP430 platform. From Standalone applications to Embedded Networking applications (Embedded Wi-Fi) will be covered with exposure to real world interfacing techniques.

Learning outcomes:

At the end of the workshop participant will be able to learn/understand

- Embedded C programming techniques for 16-bit platform
- Embedded protocols and its interfacing techniques
- Embedded Wireless networking concepts and its implementation with application oriented projects and case studies.

Prerequisite:

Must have exposure to building embedded applications for 8-bit platforms

Basic knowledge of C language programming

Digital Electronics fundamentals

Introduction to Embedded Curriculum: framework, concept map and role of faculty mentors.

Embedded Systems and role of TI platforms

Introduction to MSP430 series platforms: scope, application and tools in Embedded ecosystem

Programming MSP430 using CCS

MSP430's Internal Architecture and Programmer's model

Various Configuration registers of in-build modules and their programming (GPIO, PWM, ADC)

Clock tree structure and its role

Interfacing Analog sensors

Enabling Low power modes and understanding Interrupt based programming techniques

Various Serial Communication Interfaces : UART / I2C / SPI

UART programming and data logging applications

Programming SPI Interface, Programming I2C Interface

Embedded Wi-Fi and Internet of things

Real-time data gathering (humidity, temperature, pressure etc.) and remote monitoring for Wireless Sensor Network applications and related use cases.

Savitribai Phule Pune University

Faculty of Science &Technology

B.E. (Electronics & Telecommunication)
(2015 Pattern) Syllabus
(With effect from Academic Year 2018-19)

Savitribai PhulePune University
Final Year E&TC Engineering (2015 Course)
(With effect from Academic Year 2018-19)

Semester I												
Course Code	**Course**	**Teaching Scheme Hours / Week**			**Semester Examination Scheme of Marks**						**Credits**	
		Theory	**Tut**	**Pract**	**In-Sem**	**End-Sem**	**TW**	**PR**	**OR**	**Total**	**TH/TW**	**PR+OR**
404181	VLSI Design& Technology	3	--	--	30	70	--	--	--	100	3	--
404182	Computer Networks & Security	4	--	--	30	70	--	--	--	100	4	--
404183	Radiation & Microwave Techniques	3	--	--	30	70	--	--	--	100	3	--
404184	Elective I	3	--	--	30	70	--	--	--	100	3	--
404185	Elective II	3			30	70	--	--	--	100	3	--
404186	Lab Practice -I (CNS+ RMT)	--	--	4	--	--	50	--	50	100	--	2
404187	Lab Practice -II (VLSI + Elective I)	--	--	4	--	--	50	50		100	--	2
404188	Project Stage I	-	2	--	--	--	-	--	50	50	--	2
	Audit Course 5	--	--	--	--	--	--	--	--	--	----	
	Total	16	2	8	150	350	100	50	100	750	16	6
Total Credits											**22**	

Elective I	**Elective II**	**Audit Course 5**
1 Digital Image and Video Processing	1. Wavelets	1. Green Energy
2. Industrial Drives and Control	2. Electronics Product Design	2. Human Behaviour
3. Embedded Systems & RTOS	3. Optimization Techniques	
4. Internet of Things	4. Artificial Intelligence	
	5. Electronics in agriculture	

Final Year E&TC Engineering (2015 Course)

(With effect from Academic Year 2018-19)

Semester II

Course Code	Course	Teaching Scheme Hours / Week			Semester Examination Scheme of Marks						Credit	
		Theory	Tut	Pract	In-Sem	End-Sem	TW	PR	OR	Total	TH/TW	PR+OR
404189	Mobile Communication	3	--	--	30	70	--	--	--	100	3	--
404190	Broadband Communication Systems	4	--	--	30	70	--	--	--	100	4	--
404191	Elective III	3	--	--	30	70	--	--	--	100	3	--
404192	Elective IV	3	--	--	30	70	--	--	--	100	3	--
404193	Lab Practice –III (MC+BCS)	--	--	4	--	--	50	50	--	100	--	2
404194	Lab Practice –IV (Elective III)	--	--	2	--	--	--	--	50	50	--	1
404195	Project Stage II	--	6	-	--	--	150	--	50	200	--	6
	Audit Course 6	--	--	--	--	--	--	--	--	--		
Total		13	6	6	120	280	200	50	100	750	13	9
										Total Credits	**22**	

Elective III	**Elective-IV**	**Audit Course 6**
1. Machine Learning 2. PLC s and Automation 3. Audio and Speech Processing 4. Software Defined Radio 5. Audio Video Engineering	1. Robotics 2. Biomedical Electronics 3. Wireless Sensor Networks 4. Renewable Energy Systems 5. Open Elective*	1. Team Building, Leadership and Fitness 2. Environmental issues and Disaster Management

*Any one course from the list of Elective IV of computer/IT/Electrical/Instrumentation or Institute can offer elective IV based on any industry need with prior approval from BoS(Electronics & Telecommunication). Repetition of course or topics should be avoided.

404181 VLSI Design & Technology

Credits: 03

Teaching Scheme:			Examination Scheme:	
Lecture : 03 Hr/Week				**In-Sem : 30 Marks** **End-Sem: 70 Marks**

Course Objectives:

- To explore HDL and related design approach.
- To nurture students with CMOS circuit designs.
- To realize importance of testability in logic circuit design.
- To overview ASIC issues and understand PLD architectures with advanced features.

Course Outcomes:

On completion of the course, student will be able to

1. Write effective HDL coding for digital design.
2. Apply knowledge of real time issues in digital design.
3. Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
4. Design CMOS circuits for specified applications.
5. Analyze various issues and constraints in design of an ASIC
6. Apply knowledge of testability in design and build self test circuit.

Unit I : HDL Design **7 Hrs**

Design Flow, Language constructs, Data objects, Data types, Entity, Architecture & types of modeling, Sequential statements, Concurrent statements, Packages, Sub programs, Attributes, HDL modeling of Combinational, Sequential circuits and FSM. Simulations, Synthesis, Efficient coding styles, Hierarchical and flat designs, Partitioning for synthesis, Pipelining, Resource sharing.

Unit II : Digital design and Issues **6 Hrs**

Sequential synchronous machine design, Moore and Mealy machines, HDL code for Machines, FIFO. Metastability and solutions, Noise margin, Fan-out, Skew, Timing considerations, Hazards, Clock distribution, Clock jitter, Supply and ground bounce, Power distribution techniques, Power optimization, Interconnect routing techniques; Wire parasitic, Signal integrity issues. I/O architecture.

Unit III : PLD Architectures and applications **6 Hrs**

Design Flow. CPLD Architecture, Features, Specifications, Applications. FPGA Architecture, Features, Specifications, Applications. The Simulation and Synthesis Tools, FPGA synthesis and implementation.

Unit IV:Digital CMOS circuits **7 Hrs**

N-MOS, P-MOS and CMOS, MOSFET parasitic, Technology scaling, Channel length modulation, Hot electron effect, Velocity saturation, CMOS Inverter, Device sizing, CMOS combinational logic design, Power dissipations, Power delay product, Body Effect, Rise and fall times, Latch Up effect, transmission gates.

Unit V : Application Specific Integrated Circuit **7 Hrs**

Design Flow, Cell design specifications, Spice simulation, AC and DC analysis, Transfer Characteristics, Transient responses, Noise analysis, Lambda rules, Design rule check, Fabrication methods of circuit elements, Layout of cell, Library cell designing for NAND & NOR, Circuit Extraction, Electrical rule check, Layout Vs. Schematic, Post-layout Simulation and Parasitic extraction, Design Issues like Antenna effect, Electro migration effect, Cross talk and Drain punch through, Timing analysis.

Unit VI : VLSI Testing and Analysis 6 Hrs

Types of fault, Need of Design for Testability (DFT), DFT Guideline, Testability, Fault models, Path sensitizing, Test pattern generation,Sequential circuit test, Built-in Self Test, JTAG & Boundary scan, TAP Controller.

Text Books:

1. Charles H. Roth, "Digital systems design using VHDL", PWS.
2. Wyane Wolf, "Modern VLSI Design (IP-Based Design)", 4E,Prentice Hall.
3. Steve Kilts "Advanced FPGA Design Architecture, Implementation and Optimization", Wiley.

Reference Books:

1. E. Weste, David Money Harris, "CMOS VLSI Design: A Circuit &System Perspective", Pearson Publication.
2. R. Jacob Baker, "CMOS Circuit Design, Layout, and Simulation", 3E, Wiley-IEEE Press
3. John F. Wakerly, "Digital Design Principles and Practices" , 3E, Prentice Hall
4. M. Morris Mano , "Digital Design", 3E , Pearson
5. CemUnsalan, Bora Tar, "Digital System Design with FPGA: Implementation Using Verilog and VHDL", McGraw-Hill

404182Computer Networks & Security

Credits: 04

Teaching Scheme:			**Examination Scheme:**	
Lecture : 04 Hrs/Week				**In-Sem: 30 Marks** **End-Sem: 70 Marks**

Course Objectives:

- To understand state-of-the-art in network protocols, architectures, and applications
- To provide students with a theoretical and practical base in computer networks issues
- To outline the basic network configurations
- To understand the transmission methods underlying LAN and WAN technologies.
- To understand security issues involved in LAN and Internet.

Course Outcomes:

On completion of the course, student will be able to

1. Understand fundamental underlying principles of computer networking
2. Describe and analyze the hardware, software, components of a network and their interrelations.
3. Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
4. Have a basic knowledge of installing and configuring networking applications.
5. Specify and identify deficiencies in existing protocols, and then go onto select new and better protocols.
6. Have a basic knowledge of the use of cryptography and network security.
7.

Unit I : Introduction to Local Area Networks **6Hrs**

TCP/IP Protocol Suit, Media Access Control: Random Access, Controlled Access- Reservation, Channelization. Wired LAN: Ethernet Protocol, Standard Ethernet, Fast Ethernet (100 MBPS), Gigabit Ethernet, 10 Gigabit Ethernet. Wireless LAN : Introduction, IEEE 802.11 Project, Bluetooth

Unit II :Network Layer Part I **7Hrs**

Introduction to Network Layer: Network-Layer Services, Packet Switching, Network-Layer Performance, IPv4 Addresses, Forwarding Of IPPackets,Network Layer Protocols: Internet Protocol (IP), ICMPv4, Mobile IP

Unit III : Network Layer Part II **6 Hrs**

Unicast and Multicast Routing: Introduction, Routing Algorithms, Unicast Routing Protocols, Introduction, Multicasting Basics, Intra-domain Multicast Protocols, Inter-domain Multicast Protocols, IGMP. Next Generation IP:IPv6 Addressing, The Ipv6 Protocol, TheICMPv6 Protocol, Transition From IPv4 toIPv6.

Unit IV : Transport Layer **6 Hrs**

Introduction to Transport Layer:Introduction, Transport-Layer Protocols,Transport Layer Protocols:Introduction, User Datagram Protocol, Transmission Control Protocol, SCTP.

Unit V : Application Layer 7 Hrs

Introduction to Application Layer, Standard Client Server Protocols:World Wide Web and HTTP , FTP, Electronic Mail, Telenet, SSH, DNS.Network Management: Introduction, SNMP.

Unit VI : Network Security **7Hrs**

Cryptography & Network Security: Introduction Confidentiality, Other Aspects Of Security.
Internet Security:N etwork-Layer Security, Transport-Layer Security, Application-Layer Security, Firewalls.

Text Books:

1. Behrouz A. Forouzan, "Data Communications and Networking" MacGraw Hill, 5th edition
2. James F. Kurouse& W. Rouse, "Computer Networking: A Top down Approach", 6thEdition, Pearson Education.

Reference Books:

1. Andrew S. Tannenbaum, "Computer Networks", Pearson Education, Fourth Edition,2003
2. Wayne Tomasi, "Introduction to Data Communication and Networking", 1/e, Pearson Education
3. Natalia Olifer, Victor Olifer, "Computer Networks" Wiley Student Edition

404183 Radiation and Microwave Techniques

Credits: 03

Teaching Scheme:			**Examination Scheme:**	
Lecture : 03 Hr/Week				**In-Sem : 30 Marks** **End-Sem : 70 Marks**

Course Objectives:

- To introduce fundamental theory of radiation and microwaves.
- To understand design principles of various radiating elements.
- To understand theory of passive and active components of microwave systems.
- To learn microwave measurement techniques.

Course Outcomes:

On completion of the course, student will be able to

1. Differentiate various performance parameters of radiating elements.
2. Analyze various radiating elements and arrays.
3. Apply the knowledge of waveguide fundamentals in design of transmission lines.
4. Design and set up a system consisting of various passive microwave components.
5. Analyze tube based and solid state active devices along with their applications.
6. Measure various performance parameters of microwave components.

Unit I : Fundamental Theory of Radiation and Radiating Elements 8Hrs

Fundamental equations for free space propagation, Friis transmission equation, Definition of antenna, radiation mechanism and types of antenna, performance parameters such as radiation pattern, directivity, gain, efficiency, half power beam width, bandwidth, polarization, input impedance, radiation efficiency, effective length, effective area, radiation sphere.

Unit II : Radiating elements and arrays7 Hrs

Comparison of various radiating elements such as infinitesimal dipole, small dipole, finite length dipole and half wave length dipole, analytical treatment of these elements. Planar, log periodic and YagiUda antenna. Types of arrays, two element array, N-element array, uniform amplitude uniformly spaced linear broad side and end-fire array.

Unit III : Transmission lines and Waveguides 6Hrs

General solution for TEM, TE and TM waves.Analysis of coaxial line and rectangular waveguides. Analysis of rectangular cavity resonators and their applications, Striplines: Structural details, types and applications.

Unit IV : Passive Microwave Components 6Hrs

Construction, working principle and scattering analysis of passive microwave components such as E-plane, H-plane and magic tee. Ferrite composition, characteristics and Faraday rotation principle. Construction, working principle and scattering analysis of isolator, circulator and directional coupler. Construction and operation of gyrator.

Unit V: Active Microwave Components 6Hrs

Limitations of conventional tubes, O and M type classification of microwave tubes, re-entrant cavity, velocity modulation.Construction, operation, performance analysis and applications of -Single cavity and two cavity klystron,Cylindrical wave magnetronandHelix traveling wave. Construction, working principle and applications of two terminal microwave devices such as tunnel diode, Gunn Diode, PIN Diode, Schottky Barrier Diode and Varactor.

Unit VI : Microwave Systems and Microwave Measurement Techniques 6Hrs

Microwave terrestrial and satellite communication system and industrial applications of microwaves such as microwave heating, thickness and moisture measurement, medical application such as microwave diathermy.Microwave measurement devices such as slotted line, tunable detector, VSWR meter, power meter, and their working principles. Microwave measurement techniques to measure S-parameters, frequency, power, attenuation, phase shift, VSWR, impedance.
Radiation hazards and protection.

Text Books:

1. C.A. Balanis, “Antenna Theory - Analysis and Design", John Wiley.
2. Samuel Y. Liao, “Microwave Devices and Circuits”, 3rd edition, Pearson
3. Annapurna Das and Sisir K. Das, “Microwave Engineering", Second edition, Tata McGraw Hill.

Reference Books:

1. David M. Pozar, “Microwave Engineering", Fourth edition, Wiley.
2. Ahmad Shahid Khan, “Microwave Engineering : Concepts and Fundamentals
3. K. D. Prasad, “Antenna &Wave Propagation”, SatyaPrakashan, New Delhi.
4. M. Kulkarni, “Microwave and Radar engineering”, 3rd edition, Umesh Publication
5. E.C. Jordon and E.G. Balman, “Electromagnetic Waves and Radiation Systems”, Prentice Hall India.

404184 Digital Image and Video Processing (Elective-I)

Credits: 03

Teaching Scheme:			**Examination Scheme:**	
Lecture : 03 Hr/Week				**In-Sem: 30 Marks** **End-Sem: 70 Marks**

Course Objectives:

- Understand the fundamental concepts of Digital Image Processing with basic relationship of pixels and mathematical operations on 2-D data.
- Learn design and integrate image enhancement and image restoration techniques
- Understand object segmentation and image analysis techniques
- Learn the need for effective use of resources such as storage and bandwidth and ways to provide effective use of them by data compression techniques
- Learn basic concepts of video processing

Course Outcomes:

On completion of the course, student will be able to

1. Develop and implement basic mathematical operations on digital images.
2. Analyze and solve image enhancement and image restoration problems.
3. Identify and design image processing techniques for object segmentation and recognition.
4. Represent objects and region of the image with appropriate method.
5. Apply 2-D data compression techniques for digital images.
6. Explore video signal representation and different algorithm for video processing.

Unit I : Fundamentals of Image Processing **5 Hrs**

Steps in Image processing, Human visual system, Sampling & quantization, Representing digital images, spatial and gray level resolution, Image file formats, Basic relationships between pixels, Distance Measures, Basic operations on images – image addition, subtraction, logical operations, scaling translation, rotation. Color fundamentals and models – RGB, HIS, YIQ

Unit II : Image Enhancement and Restoration **8 Hrs**

Point – Log transformation, Power law transformation, Piecewise linear transformation, Image histogram, histogram equalization, Mask processing of images, filtering operations- Image smoothing, image sharpening, frequency domains image enhancement: 2D DFT, smoothing and sharpening in frequency domein, Pseudo coloring. Image Restoration: Noise models, restoration using Inverse filtering and Wiener filtering

Unit III : Image Compression **6 Hrs**

Types of redundancy, Fidelity criteria, Compression models - Information theoretic perspective – Fundamental coding theorem, Lossless Compression: Huffman Coding- Arithmetic coding. Introduction to DCT, Lossy compression: DCT based compression, Wavelet based compression, Image compression standards JPEG and JPEG 2000.

Unit III : Image Segmentation **8 Hrs**

Pixel classification, Bi-level thresholding, Multi-level thresholding, Adaptive thresholding, Otsu's method, Edge detection – First order derivative Prewitt and Sobel, Second order derivative – LoG, DoG, Canny. Edge linking, Hough transform, Region growing and region merging. Morphological operators: Dilation, Erosion, Opening, Closing, Hit or Miss transform, Boundary detection, Thinning, Thicking, Skelton.

Unit V : Representation and Description 5 Hrs

Representation – Chain codes, Polygonal approximation, Signatures, Boundary descriptors, Shape numbers, Fourier descriptors, Stastical moments, Regional descriptors – Topological, texture, Principal components for description

Unit VI : Video Processing 6 Hrs

Fundamental Concepts in Video – Types of video signals, Analog video, Digital video, Color models in video, Motion Estimation; Video Filtering; Video Compression, Video coding standards MPEG.

Text Books:

1. Gonzalez and Woods, "Digital Image Processing", Pearson Education, 3rd edition
2. Iain E. G. Richardson, "H.264 and MPEG
3. Video Compression: Video Coding for Next Generation Multimedia", John Wiley and Son's Publication, 3rd Edition.

Reference Books:

1. A. K. Jain, Fundamentals of digital image processing, Prentice Hall of India, 1989.
2. Pratt William K. "Digital Image Processing", John Wiley & sons
3. A. Bovik, Handbook of Image & Video Processing, Academic Press, 2000

404184 Industrial Drives and Control (Elective-I)

Credits: 03

Teaching Scheme:			**Examination Scheme:**	
Lecture : 3Hours / Week				**In-Sem : 30 Marks** **End-Sem: 70 Marks**

Course Objectives:

- Describe the structure of Electric Drive systems and their role in various applications such as flexible production systems, energy conservation, renewable energy, transportation etc., making Electric Drives an enabling technology
- Study and understand the operation of electric motor drives controlled from a power electronic converter and to introduce the design concepts of controllers for closed loop operation
- Study DC, AC, special machines like stepper motor, servo motor and brushless motor and their control.

Course Outcomes:

On completion of the course, student will be able to

1. Understand the basic principles of power electronics in drives and its control, types of drives and basic requirements placed by mechanical systems on electric drives for various applications
2. Understand the operation of 1ϕ & 3ϕ converter drives for separately excited & series DC motors, dual converter drives, 2 quadrant and 4 quadrant DC chopper drives, Open-loop & closed-loop control of DC drives with transfer function, Dynamic and regenerative braking. Protection circuits for DC drives.
3. Learn speed control of induction motor drives in an energy efficient manner using power electronics. To study and understand the operation of both classical and modern induction motor drives like FOC or Vector control.
4. Learn and understand working of various types of synchronous motors and their drive systems
5. Learn stepper motors & drives, BLDC and SRM motors and drives
6. Understand modern control techniques of Fuzzy logic and ANN in motor drive application

Unit I :Motor Drive as system **5 Hrs**

Electrical drive as system, Parts of Electrical drives AC / DC drives, Components, nature and classification of load torques. Four quadrant operation of a motor drive. Control of Electrical drives, steady state stability Closed loop control, Selection of motor power rating

Unit II : DC Motors and drives6Hrs

Basic characteristics of DC motors, Operating modes, Motor performance parameters, 1ϕ & 3ϕ converter drives for separately excited & series DC motors for continuous & discontinuous operations. Chopper fed DC drives, Comparison of converter fed drive & chopper fed drive. Open loop & closed loop control of dc drives with transfer function PLL control, Microprocessor based control of dc drives, Dynamic and regenerative braking of DC motors

Unit III :Induction Motors and Drives 8Hrs

Induction motor characteristics, Control strategies like stator voltage control, v/f control, rotor resistance control, Variable frequency Square wave VSI Drives, Variable frequency PWM VSI Drives, Variable frequency CSI Drives, Closed loop control of Induction motors, v/f control of three phase IM using PWM inverter, Vector Control (Field oriented Control): Basic principle of vector control, Direct vector control & indirect vector control, DQ Transformation, Braking of induction motor, soft acceleration and deceleration, various protections.

Unit IV :AC and DC synchronous Motors and drives6Hrs

Cylindrical rotor motor Drive, Salient pole motor Drive, Switched reluctance motor (SRM) drive, Synchronous Reluctance motor drive, self-controlled synchronous motor drives Permanent magnet Brushless DC motor drive, Permanent magnet AC synchronous motor drive, Variable reluctance & permanent magnet stepper motor and drive. Servo motor Drives.

Unit V :Power Electronics applications inRenewable Energy 6Hrs

Wind power system: System component, Turbine rating, Electrical load matching, fixed speed and variable speed operation, System design features, Maximum power operations and System control requirement WECS: Principle of WECS, role of power electronics in WECS, Drive selection criteria for fixed speed and variable speed WECS, Stand-alone PV systems, Grid connected PV systems. Power Electronics for Photovoltaic Power Systems Basics of Photovoltaic: The PV cell, Module and array, I-V and P-V curves, PV system component, Stand-alone PV systems, Grid connected PV systems.

Unit VI :Artificial Intelligence in Motor Drives5Hrs

Fuzzy logic principle and applications: Introduction, Fuzzy sets, Fuzzy system, Fuzzy control, Fuzzy logic based induction motor speed control. Neural network principle and applications: Introduction, Neural network in identification and control, AI Applications in electrical machines and drives, Neural network based PWM controller.

Text Books:

1. Fundamental of Electrical Drives, Gopal K. Dubey, Narosa Publishing House .
2. Power Electronics, circuits, devises and applications by Muhammad Rashid, Pearson
3. Modern Power Electronics and AC Drives, Bimal K. Bose, Pearson

Reference Books:

1. Wind & Solar Power system, Mukund Patel , CRC Press
2. Thyristor DC drives, P. C Sen, John Wiley.
3. Power Electronics, Converters, Applications and Design, N. Mohan, T. M. Undeland &W. P. Robbins, John Wiley and Sons, 3rd Edition

404184 Embedded Systems and RTOS(Elective-I)

Credits: 03

Teaching Scheme:			Examination Scheme:	
Lecture : 03Hr/Week				In-Sem : 30 Marks End-Sem: 70 Marks

Course Objectives:

- To understand and able to design an application specific systems.
- To develop implementation skill for application specific systems.
- To understand design and implementation of real time system using RTOS.
- To understand open source platform for embedded system

Course Outcomes:

On completion of the course, student will be able to

1. Understand design of embedded system
2. Use RTOS in embedded application
3. Use modern architecture for embedded system
4. Use Linux for embedded system development
5. Use open platform for embedded system development

Unit I : Embedded System Overview 6 Hrs

Embedded System Introduction, Hardware and software architectures of ES, Design metrics(technical and techno- economical), Prototyping models, Development tool chain insights(GNU), guidelines for Selection of hardware and memory architecture, embedded C programming, embedded system design challenges, standard programming practices in embedded system.

Unit II :Real time system and RTOS 7 Hrs

Real time system, types, design approaches and considerations, Usage ofSharedresourcesand related issues**,** Concept of RTOS, Types of RTOS, differences from GPOS (Multitasking, Inter-process communication, Timers, Device drivers, protection mechanism etc.), real time scheduling algorithms, commercial RTOS , survey of RTOS.

Unit III :µcos-II –RTOS8 Hrs

µcos-II features, kernel structure, data structure, µcos-II services as task management, time management, inter-process communication (mailbox, queue,events,pipesetc.), memory management.µcos-II porting on ARM7/Cortex (M3/M4) architecture.

Unit IV : Advanced embedded architectures (Cortex-M3/M4)8 Hrs

Introduction to ARM CORTEX series, Design Philosophy, processors series, versions, features and applications. CMSIS standard for ARM Cortex. Survey of CORTEX M3/M4 based controllers. ARM-CM3 Based Microcontroller LPC1768: Features, Architecture (Block Diagram &itsDescription), System Control, Clock & Power Control, GPIO, Pin Connect Block, interfacing with RGB LED, Seven Segment, TFT Display, MOTOR control using PWM.

Unit V : Embedded Linux 8 Hrs

Linux for embedded systems, embedded Linux development system, kernel architecture and configuration, file systems, porting Linux on ARM architecture, boot loaders, tool utilities such as Minicomp, Busybox, Redboot, Libc, Device drivers- concept, architecture, types, sample character device driver.

Unit VI :Open hardware /development systems and Case study7 Hrs

Arduino open platform (IDE), development using ATMega328p based Uno board, structure of Arduino programs, introduction to Arduino library, sample GPIO program.

Case study of implementation with control, compute and communication modules using Arduino platform.

Text Books:

1. Jean J.Labrosse, "MicroC OS II, The Real-Time Kernel", 2nd edition, CMP Books.
2. Christopher Hallinan, "Embedded Linux Primer -A Practical, Real-World Approach "2nd edition, Prentice Hall.
3. Parag H Dave, Himanshu .H.Dave," Embedded systems" Concepts, design and programming, Pearson India

Reference Books:

1. Frank Vahid and Tony Givargis, " Embedded System Design – A Unified hardware/ Software introduction " 3rd edition, Wiley
2. David Simon, "Embedded system primer"
3. Raj Kamal, "Embedded Systems – Architecture, Programming and Design" 2nd edition,
4. http://www.ti.com/lit/an/slaa207/slaa207.pdf
5. MSP430x5xx: http://www.ti.com/product/msp430f5529
6. MSP430x4xx : http://www.ti.com/product/msp430f438
7. MSP430x2xx: http://www.ti.com/product/msp430g2302-ep

404184 Internet of Things (Elective-I)

Credits: 03

Teaching Scheme:			**Examination Scheme:**	
Lecture : 03 Hr/Week				**In-Sem: 30 Marks** **End-Sem: 70 Marks**

Course Objectives:

- To study fundamental concepts of IoT
- To understand roles of sensors in IoT
- To Learn different protocols used for IoT design
- To be familiar with data handling and analytics tools in IoT

Course Outcomes:

1. On completion of the course, student will be able to
2. Understand the various concepts, terminologies and architecture of IoT systems.
3. Use sensors and actuators for design of IoT.
4. Understand and apply various protocols for design of IoT systems
5. Use various techniques of data storage and analytics in IoT
6. Understand various applications of IoT

Unit I : Fundamentals of IoT **6Hrs**

Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M.

Unit II :Sensors Networks **7Hrs**

Definition, Types of Sensors, Types of Actuators, Examples and Working, RFID Principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT.

Unit III :Wireless Technologies for IoT **6 Hrs**

WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, Modbus.

Unit IV :IP Based Protocols for IoT **6 Hrs**

IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT.

Unit V :Data Handling& Analytics6Hrs

Introduction, Bigdata, Types of data, Characteristics of Big data, Data handling Technologies, Flow of data, Data acquisition, Data Storage, Introduction to Hadoop. Introduction to data Analytics, Types of Data analytics, Statistical Models, Analysis of Variance, Data Dispersion, Contingence and Correlation, Regression Analysis, Precision and Error limits.

Unit VI :Applications of IoT **7Hrs**

Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, IoT design Ethics, IoT in Environmental Protection.

Text Books:

1.Hakima Chaouchi, " The Internet of Things Connecting Objects to the Web" ISBN : 978-1-84821-140-7, Wiley Publications

2. Olivier Hersent, David Boswarthick, and Omar Elloumi, "The Internet of Things: Key Applications and Protocols", WileyPublications

3. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.

References

1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications

2. by Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press

3. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

4. https://onlinecourses.nptel.ac.in/noc17_cs22/course

404185 Wavelets (Elective-II)

Credits: 03

Teaching Scheme:			**Examination Scheme:**	
Lecture : 03 Hr/Week				**In-Sem: 30 Marks** **End-Sem: 70 Marks**

Course Objectives:

- Learn and understand basic linear algebra
- Understand the need of time frequency resolution
- Understand the basics of Discrete Wavelet transform and various wavelets available
- Learn the signal analysis using multi-resolution analysis
- Study the applications of Wavelets in compression, enhancement, noise removal etc.

Course Outcomes:

1. On completion of the course, student will be able to
2. Explore and learn the basics of linear algebra.
3. Identify the need of Wavelet transform and its properties.
4. Analyze the 1-D and 2-D signal using discrete wavelet transform.
5. Analyze the signal using Multi resolution analysis
6. Use wavelet transform in different applications like data compression, denoising, enhancement etc.

Unit I : Fundamentals of Linear Algebra6 Hrs

Vector spaces, Orthogonality, Ortho-normality, Projection, Functions and function spaces. Orthogonal basis functions. Fourier series orthogonality of complex exponential bases, mathematical preliminaries for continuous and discrete Fourier transformer. Limitations of Fourier domain signal processing, Towards wavelet signal processing, signal representation with continuous and discrete Short Time Fourier Transform.

Unit II : Introduction to Wavelet 6 Hrs

Concept of time-frequency resolution, Resolution problem associated with STFT, Heisenberg's uncertainty principle and time frequency tiling, why wavelet transform? The origin of wavelets, Properties of Wavelet Transform, Wavelet and other wavelet like transformer, different communities and family of wavelets, different families of wavelets within wavelet communities, Continuous and discrete wavelet transform

Unit III : Discrete Wavelet Transform 8 Hrs

Haar scaling function and function spaces, translation and scaling of $\varphi(t)$, function spaces V0 Finer Haar Scaling Functions, concept of nested vectopr spaces, Haar wavelet function, scaled and translated Haar wavelet functions, orthogonality of $\varphi(t)$ and $\gamma(t)$. Normalization of Haar bases at different scales, daubechies wavelets, plotting of Daubechies wavelets. 1-D and 2-D decomposition (analysis) of signals using Wavelet.

Unit IV : Multi-resolution Analysis 6 Hrs

Signal decomposition and its relation with filter banks, frequencies response, signal reconstruction course to fine scale, upsampling and filtering, QMF conditions, concepts of multi-Resolution analysis and multi-rate signal processing, Perfect matching filters, Vanishing moments of wavelet function and filter properties, introduction to wavelet lifting.

Unit V : Wavelet Transform in Data Compression 6 Hrs

Transform coding, image compression using DWT, Embedded tree image coding, comparison of JPEG and JPEG 2000, Audio masking, MPEG Coding for audio, Wavelet based audio coding, video coding using Multi-resolution technique (introduction).

Unit VI : Applications of Wavelet Transform 4 Hrs

Waveletdenoising, speckle removal, Edge detection and object isolation Image fusion, wavelet watermark, image enhancement. Communication application scaling functions as signaling pulses, Discrete Wavelet Multitone modulation.

Text Books:

1. K.P Soman, K I Ramchandran, N G Resmi, "Insights into Wavelets from theory to Practice", Third edition, PHI publication.
2. Raghuveer M Rao, Ajit S. Bopardikar, "Wavelet Transforms, Introduction to Theory and Applications", Seventh Indian Reprint 2005, Pearson Education.

Reference Books:

1. Jaideva C. Goswami, Andrew K. Chan, "Fundamentals of Wavelets", Wiley Student Edition
2. V. M. Gadre, A. S. Abhyankar, "Multiresolution and Multirate Signal Processing, Introduction, Principles and Applications", MGH Publication

404185 Electronic Product Design (Elective-II)

Teaching Scheme:		Examination Scheme:
Lectures: 3 Hrs./ Week		In Sem: 30 Marks End Sem: 70Marks

Course Objectives:

- To understand the stages of product (hardware/ software) design anddevelopment.
- To learn the different considerations of analog, digital and mixed circuitdesign.
- To be acquainted with methods of PCB design and different tools used for PCBDesign.
- To understand the importance of testing in product design cycle.`
- To understand the processes and importance ofdocumentation.

Course Outcomes:

After Successfully completing the course students will be able to

- Understand various stages of hardware, software and PCBdesign.
- Importance of product test &testspecifications.
- Special design considerations and importance ofdocumentation.

Unit I: Introduction to Electronic Product Design 6 Hrs

Man machine dialog and Industrial design, user-centered design, five element of successful design, cognition, ergonomics. Packaging and factors, design for manufacture, assembly and disassembly, wiring, temperature, vibration and shock. Safety, noise, energy coupling, grounding, filtering and shielding.

Unit II: Hardware Design & testing methods 6 Hrs

Design process. Identifying the requirements, formulating specifications, design specifications, Specifications verses requirements, System partitioning, Functional design, architectural design, Functional model verses architectural model. Prototyping. Performance and Efficiency measures. Formulating a test plan, writing specifications, Test procedure and test cases, Egoless design, design reviews. Module debug and test: black box test, white box test, grey box test.

Unit III: Software Design and Testing methods 6 Hrs

Types of Software. Waterfall model of software development. Models, metrics andsoftware limitations. Risk abatement and failure preventions. Software bugs and testing. Good programming practice. User interface .Embedded, Real time software.

Unit IV: PCB design 6 Hrs

Fundamental Definitions, Standards. Routing Topology Configurations, Layer Stack up assignment, Grounding Methodologies, Aspect Ratio, Image Planes, Functional Partitioning, Critical frequencies, Bypassing and decoupling. Design techniques for ESD Protection,Guard Band implementation.

Unit V: Product Debugging and Testing 6 Hrs

Steps of Debugging, Techniques for troubleshooting, characterization, Electromechanical components, passive components, active components, active devices, operational amplifier, Analog-Digital Conversion, Digital Components, Inspection and test of components, Simulation, Prototyping and testing, Integration, validation and verification. EMI & EMC issues.

Unit VI : Documentation 6 Hrs

Definition, need, and types of documentation. Records, Accountability, and Liability. Audience. Preparation, Presentation, and Preservation of documents. Methods of documentation, Visual techniques, Layout of documentation, Bill of material.

Text Books:

1. Kim Fowler," Electronic Instrument Design" Oxford universitypress.
2. Robert J. Herrick, "Printed Circuit board design Techniques for EMC Compliance", Second edition, IEEE press.

Reference Books:

1. James K. Peckol, "Embedded Systems – A Contemporary Design Tool", Wiley publication
2. J C Whitakar," The Electronics Handbook", CRCpress.

404185 Artificial Intelligence (Elective II)

Credits: 03

Teaching Scheme:			**Examination Scheme:**	
Lecture : 03 hr/week				**In-Sem : 30 Marks** **End-Sem: 70 Marks**

Course Objectives:

- To learn various types of algorithms useful in Artificial Intelligence (AI).
- To convey the ideas in AI research and programming language related to emergingtechnology.
- To understand the concepts of machine learning, pattern recognition, and natural language processing.
- To understand the numerous applications and huge possibilities in the field of AI that gobeyond the normal human imagination.

Course Outcomes:

On completion of the course, student will be able to

1. Design and implement key components of intelligent agents and expert systems.
2. To apply knowledge representation techniques and problem solving strategies to common AI applications.
3. Applyand integrate various artificial intelligence techniques in intelligent system development as well as understand the importance of maintaining intelligent systems.
4. Build rule-based and other knowledge-intensive problem solvers.

Unit I :Foundation 6Hrs

Intelligent Agents, Agents and environments, Good behavior, The nature of environments, structure of agents, Problem Solving, problem solving agents, example problems, Searching for solutions, uniformed search strategies, avoiding repeated states, searching with partial information.

Unit II :Searching 6Hrs

Search and exploration, Informed search strategies, heuristic function, local search algorithms and optimistic problems, local search in continuous spaces, online search agents and unknown environments, Constraint satisfaction problems (CSP), Backtracking search and Local search for CSP, Structure of problems, Games: Optimal decisions in games, Alpha- Beta Pruning, imperfect real-time decision, games that include an element of chance.

Unit III :Knowledge Representation 6Hrs

First order logic, representation revisited, Syntax and semantics for first order logic, Using first order logic, Knowledge engineering in first order logic, Inference in First order logic, prepositional versus first order logic, unification and lifting, forward chaining, backward chaining, Resolution, Knowledge representation, Uncertainty and methods,Bayesian Probability and Belief network, probabilistic Reasoning,Bayesian networks, inferences in Bayesian networks,Temporalmodels,Hidden Markov models.

Unit IV :Learning 6Hrs

Learning from observations: forms of learning, Inductive learning, Learning decision trees, Ensemble learning, Knowledge in learning, Logical formulation of learning, Explanation based learning, Learning using relevant information, Inductive logic programming, Statistical learning methods, Learning with complete data, Learning with hidden variable, EM algorithm, Instance based learning, Neural networks - Reinforcement learning, Passive reinforcement learning, Active reinforcement learning, Generalization in reinforcement learning.

Unit V :Pattern Recognition and Expert System6 Hrs

Basic steps of pattern recognition system, Feature Extraction- Principal Component Analysis,Linear Discriminant Analysis, Classification, Object Recognition- Template Matching theory, Prototype Matching Theory, Speech Recognition, Pattern Mining- Apriori Algorithm,

Unit VI :Natural Language Understanding6Hrs

Why NL, Formal grammar for a fragment of English, Syntactic analysis, Augmented grammars, Semantic interpretation, Ambiguity and disambiguation, Discourse understanding, Grammar induction, Probabilistic language processing, Probabilistic language models

Text Books:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence”, A Modern Approach, Pearson Education/Prentice Hall of India.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw-Hill.

Reference Books

404185 Optimization Techniques (Elective II)

Credits: 03

Teaching Scheme:			**Examination Scheme:**	
Lecture : 03hr/week				**In-Sem : 30 Marks** **End-Sem: 70 Marks**

Course Objectives:

- To understand the need and origin of the optimization methods.
- To get a broad picture of thevarious applications of optimization methods used in engineering
- To define an optimizationproblem and its various components.

Course Outcomes:

Upon completion of the course, students will be able to:

1. Describe clearly a problem, identify its parts and analyze the individual functions.
2. Perform mathematical translation of the verbal formulation of an optimizationproblem.
3. Design algorithms, the repetitive use of which will lead reliably to finding an approximate solution
4. Discover, study and solve optimization problems.
5. Investigate, study, develop, organize and promote innovative solutions for various applications.

Unit I : Introduction to Optimization **6Hrs**

Introduction: Historical Development, Engineering Applications of Optimization, Statement of an Optimization Problem, Classification of Optimization Problems, Optimization Techniques, Engineering Optimization Literature, Mathematical Background.

Unit II :Classical Optimization Techniques **7Hrs**

Single-Variable Optimization, Multivariable Optimization with No Constraints, Multivariable Optimization with Equality Constraints, Multivariable Optimization with Inequality Constraints, Convex Programming Problem.

Unit III : Linear Programming **6 Hrs**

Introduction, Applications of Linear Programming, Standard Form of a Linear Programming Problem, Geometry of Linear Programming Problems, Definitions and Theorems, Solution of a System of Linear Simultaneous Equations, Pivotal Reduction of a General System of Equations, Motivation of the Simplex Method, Simplex Method,Revised Simplex Method, Duality in Linear Programming, Decomposition Principle, Sensitivity or Post optimality Analysis,Transportation Problem.

Unit IV : Nonlinear Programming -I **7Hrs**

Unimodal Function, Elimination Methods:Unrestricted Search, Unrestricted Search, Dichotomous Search, Interval Halving Method, Fibonacci Method

Interpolation Methods:Quadratic Interpolation Method, Cubic Interpolation Method, Direct Root Methods, Practical Considerations,

Unit V :Nonlinear Programming-II7Hrs

Introduction to Unconstrained Optimization techniques, Direct Search Methods: Random Search Methods,Grid Search Method, Univariate Method, Pattern Directions, Powell's Method, Simplex Method. Indirect Search Methods: Gradient of a Function, Steepest Descent (Cauchy) Method, Conjugate Gradient (Fletcher–Reeves) Method, Newton's Method, Davidon–Fletcher–Powell Method, Test Functions.

Unit VI : Modern Methods of Optimization6 Hrs

Genetic algorithms, Simulated annealing, Particle Swarm Optimization, Ant Colony Optimization, Optimization of Fuzzy systems, Neural Network based optimization

Text Books:

1.Singiresu S Rao, "Engineering optimization Theory and Practice", New Age International, 2009
2.Kalynamoy Deb, "Optimization for Engineering Design, Algorithms and Examples",PHI

Reference Books:

1. Hadley, G. "Linear programming", Narosa Publishing House, New Delhi.
2.Ashok D Belegundu, Tirupathi R Chandrupatla, "Optimization concepts and Application inEngineering", Pearson Education.
3. KantiSwarup, P.K.Gupta and Man Mohan, Operations Research, Sultan Chand and Sons.
4. J. S. Arora, Introduction to Optimum Design, McGraw-Hill Book Company.
5. David Lay, Steven L Lay, "Linear Algebra and its Applications", Pearson Education.
6. Papalambros& Wilde, Principles of Optimal Design, Cambridge University Press, 2008

404185 Electronics in Agriculture (Elective II)

Credits: 03

Teaching Scheme:			Examination Scheme:	
Lecture : 03 Hr/Week				**In-Sem : 30 Marks** **End-Sem: 70 Marks**

Course Objectives:

- To inculcate the ability to recognize environmental problems and to provide solutions to agricultural sector.
- An over view of technology of advanced topics like DAS, SCADA and Virtual Instrumentation.
- The ability to select the essential elements and practices needed to develop and implement the Engineering Automation for Agricultural sector.

Course Outcomes:

After successfully completing the course students will be able to

1. Understand Role of computers & virtual instrumentation.
2. Provide communication solution for interpreting environmental parameters with Electronics systems.
3. Describe Instrument technology used in agriculture.
4. Apply knowledge of Electronics in Agriculture.
5. Understand Greenhouse Technology & Role of Electronics Governance.

Unit I: Review of computers & Virtual instrumentation **6 Hrs**

Data loggers, Data acquisitions systems (DAS), Supervisory control and data acquisition (SCADA), Basics of PLC, Functional block diagram of computer control system, alarms, interrupts.Virtual Instrumentation: Historical Perspective, advantages, Block diagram and architecture of virtual instrument, data flow techniques, graphical programming in data flow, comparison with conventional programming.

Unit II:Communication Systems **6Hrs**

Use of field buses, functions, international standards, field bus advantages and disadvantages, Instrumentation network: sensor networks, Open networks-advantages and limitations, HART Network, Foundation field bus network.Profibus PA: Basics, architecture, model, network design.Foundation field bus segments: General consideration, network design.

Unit III:Instrument technology for agriculture **6Hrs**

Instrument for measurement of pH, Electrical conductivity, gas analysis, humidity, leaf area, chlorophyll content, and soil moisture & temperature.

Unit IV:Precision Farming **6Hrs**

An introduction to precision farming. GIS/GPS positioning system for precision farming, Yield monitoring and mapping, soil sampling and analysis. Computers and Geographic information systems. Precision farming- Issues and conditions. Role of electronics in farm machinery for precision farming.

Unit V:Electronics in Agriculture **6 Hrs**

Instrument for crop monitoring – moisture measurement – capacitive, infrared reflectance and resistance. Monitoring soil and weather – measurement of soil properties and meteorological parameters – irrigation control systems. Instruments for crop establishment monitoring. Crop spraying – selective crop spraying – flow control. Yield monitoring. Technology for precision farming. Instruments for protected cultivation – green house environment control – transducers and control system. Instruments and systems for crop handling processing and storage. ,

Unit VI:Applications & Electronics Governance **6Hrs**

Greenhouse: History of modeling and control of Greenhouse, Identification of control and manipulation variables for Greenhouse. Crop Preservation : Importance of Preservation of various commodities and parts of plants, Drying process for preservation, Variable identification for drying process, Electronic control system for grape drying process.Agriculture& Electronics Governance: Governance products & services in agriculture sector, Role of Electronics Governance in Agricultural sector.

Text Books:

1. Curtis Johnson, "Process Control Instrumentation Technology"; 8th Edition, Pearson Education
2.Stuart A. Boyer, SCADA supervisory control and data acquisition, ISA Publication

Reference Books:

1. De Mess M. N. Fundamental of Geographic Information System. John Willy & sons, NewYork, Datta S.K.1987.
2. K. Krishna Swamy, "Process Control"; New Age International Publishers
3. Kuhar, John. E. 1977. The precision farming guide for agriculturalist.
4. Lori J. Dhabalt, USManual of Soil & Water conservation Engineering. Oxford & IBH Co. Sigma &Jagmohan, 1976.

404186 Lab Practice I

Credits:02

Teaching Scheme:			Examination Scheme:	
Practical : 04 Hrs/week				**Oral : 50 Marks** **Term-work :50 Marks**

Computer Networks & Security

List of the Experiments(Minimum 8 experiments are to be performed).

1. Implementation of LAN using suitable multiuser Windows operating System anddemonstrating client-server and peer to peer mode of configuration.
2. Installation and configuration of Web server, FTP Server.
3. Study of DNS, SMTP & POP3 Determine the local host address, Ping to a host using its NetBIOS name Add IP addresses/host name mappings to the local host file Configure DNS service on Windows 2000 server Use Domain Name Service to resolve hostnames into IP addresses. Interact with an Email server using SMTP and POP3 protocols commands.
4. Installation and configuration of Telnet server for Telnet communication.
5. Installation and configuration of Proxy server.
6. Installation and configuration of DHCP server.
7. Study of IP Addresses subnetting and CIDR
8. Study of Network Protocol Analyzer tool/software.
9. Study of network monitoring tool/software.
10. Simulating LAN or WAN using suitable network simulator.
11. Write a program to simulate leaky bucket/token bucket.
12. Echo Client and Server Program Using TCP or UDP or both in C/Java
13. Write a program for Encryption and Decryption
14. Study of HTTPS, IPSec and SSH using Wireshark.

Radiation & Microwave Techniques

List of Experiments[Minimum 08]

Group A [Any 2]

1. To measure and compare radiation pattern, return loss, impedance, gain, beam width of dipole antenna and folded dipole antenna at microwave frequency

OR

1. To measure radiation pattern and gain of horn or parabolic antenna at microwave frequency
2. Design, simulate and compare performance of microwave dipole antennas of length 2λ, λ, λ/2 and λ/4.
3. Design, simulate and compare the performance of two element broad side and end fire uniform amplitude and uniformly spaced linear array.

Group B[Any 6]

4. To measure and plot mode characteristics of reflex klystron.
5. To measure VI characteristics of Gunn Diode and study of PIN modulator.
6. To measure and verify port characteristics of microwave tees (E, H, E-H or magic planes).
7. To measure and verify port characteristics of directional coupler and calculate coupling factor, insertion loss and directivity.
8. To measure and verify port characteristics of isolator and circulator and calculate insertion loss and isolation in dB.
9. To measure wavelength of the microwave using microwave test bench and verify with its theoretical calculations.
10. To plot standing wave pattern and measure SWR for open, short and matched termination at microwave frequency using slotted section with probe carriage.
11. Study the network analyzer and carry out the measurements of s-parameters.

404186Laboratory Practice II				
Credits: 02				
Teaching Scheme:			**Examination Scheme:**	
Practical : 04 hr/week				**Practical : 50 Marks** **Termwork : 50 Marks**

VLSI Design& Technology

List of Experiments:

A. To write VHDL code, simulate with test bench, synthesis, implement on PLD. [Any 4].

1. 4 bit ALU for add, subtract, AND, NAND, XOR, XNOR, OR, & ALU pass.
2. Universal shift register with mode selection input for SISO, SIPO, PISO, & PIPO modes.
3. FIFO memory.
4. LCD interface.
5. Keypad interface.

B. To prepare CMOS layout in selected technology, simulate with and without capacitive load, comment on rise, and fall times.

1. Inverter, NAND, NOR gates, Half Adder
2. 2:1 Multiplexer using logic gates and transmission gates.
3. Single bit SRAM cell

Digital Image and Video Processing

List of Practicals
(Perform any 8 practical on appropriate software)
1. Perform basic operations on images.
2. Perform conversion between color spaces.
3. Perform histogram equalization.
4. Perform image filtering in spatial domain.
5. Perform image filtering in frequency domain.
6. Perform image restoration.
7. Perform image compression using DCT / Wavelet transform.
8. Perform edge detection using various masks.
9. Perform global and adaptive thresholding.
10. Apply morphological operators on an image.
11. Obtain boundary / regional descriptors of an image.
12. Extraction of frames from video, improve the quality and convert them back to compressed video.

Industrial Drives and Control

(Minimum 8 experiments are to be performed):

1. DC motor control using semi/full 1-Φ /3-Φ converter. (Open loop and closed loop)
2. 4-Quadrant chopper fed reversible DC drive
3. Dual converter fed DC Drive (Single phase/ Three phase)
4. Induction motor speed control using VFD
5. Speed Control of Universal Motor.
6. Stepper motor drive.
7. BLDC Motor drive.
8. Three phase brushless generator for wind energy applications.
9. Simulation of closed loop controlled DC motor drive using PSIM/Matlab/MathCad/ open source software

10 Simulation of closed loop controlled AC motor drive using PSIM / Matlab/MathCad/ open source software

Embedded Systems & RTOS

Minimum 08 experiments

Any 02 Lab exercise from Sr.No 2,3,4

Any 01 Lab exercise from Sr.No 05,06

List of Practicals:

1. Porting of ucos-II on ARM7/Cortex controller.
2. Implementation/Verification of multitasking (minimum 03 tasks) with ucos-II on ARM7/Cortex controller.
3. Implementation of semaphore with ucos –II service ARM7/Cortex controller for resource management and synchronization.
4. Implementation of interprocess communication with ucos-II mailbox and message queue service on ARM7/Cortex controller.
5. Programming with exploring onchip ADC of Cortex /MSP430 based microcontroller.
6. Programming on motor control with exploring onchip PWM of Cortex based microcontroller.
7. Exercise on Porting of Linux on ARM board (ARM9 preferably)
8. Programming for device driver with Embedded Linux.
9. Programming with Arduino development for GPIO on Arduino Uno board.

Case study of any compute/communication/control application on Arduino Uno board

Internet of Things

A Project based Learning approach will be followed for this course hence the experiments will be small projects to be built by the students.

Suggested List of the Experimental Projects(Minimum 6 are to be performed):

1. Study& Survey of various development boards for IoT.
2. Study & Survey of various IoT platforms.
3. Interfacing sensors and actuatorswithAurdino .
4. Build a cloud-ready temperature sensor with the Arduino Uno and the anyIoT Platform: This project shows the building of a temperature sensor.
5. Interfacing Sensors and actuators with Raspberry Pi 2.
6. IoT based Stepper Motor Control with Raspberry Pi: The combination of Raspberry Pi and IoT is an exciting one. Raspberry Pi has many general purpose I/O pins and has the ability to control different actuators like stepper motors. In this project, an internet control of stepper motor using

Raspberry Pi computer is developed. The connectivity is divided into server side software and client side software.

7.IoT based Web Controlled Home Automation using Raspberry Pi.

8. A Simple IoT Project with the ESP8266 WiFi module: Here is a simple project with ESP8266 wi-fimodule.This project collects the temperature and is displayed on the network.

9. Implement a RFID Based IoT Project

404188 Project Phase-I

Credits: 02

Teaching Scheme:		**Examination Scheme:**
Tutorial: 2 Hrs/week		OR :50Marks

Note:

1. Term work assessment is based on the project topic. It consists of Literature Survey and basic project work. The abstract of the project should be submitted before Term workassessment.
2. The report consists of the Literature Survey, basic project work and the size of the report should be maximum of 40pages.
3. The examination is conducted by two examiners (internal and external) appointed by the university. The examiners appointed must have minimum 5 years of experience with UG qualification or 2 years with PG qualification.
4. The assessment is based on Innovative Idea, Depth of understanding, Applications, Individual contributions, presentation, and the grade given by the internal guide based on the work carried out in a semester.
5. A log book of Work carried out during the semester will be maintained with monthly review remarks by the guide and HoD.
6. A certified copy of report is required to be presented to external examiner at the time of final examination.

Audit Course 5 (1):Green Energy

About the course

This course provides an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternate energy sources and their technology and application. The students will explore society's present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternate, renewable energy sources such as solar, biomass (conversions), wind power, geothermal, and hydro. Energy conservation methods will be emphasized

Course Objectives:

- To understand the conventional and non conventional energy sources
- To understand different renewable energy sources and their generation
- To understand the various applications & benefits of renewable energy sources
- To enable student to understand project management, energy audit and Installation

Course Outcomes:

After the successful completion of this course, the student is expected to have/be able to:

1. List and generally explain the main sources of energy and their primary applications in the India, and the world.
2. Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the environment.
3. Discuss remedies/potential solutions to the supply and environmental issues associated with fossil fuels and other energy resources.
4. List and describe the primary renewable energy resources and technologies.
5. Describe/illustrate basic electrical concepts and system components.
6. Convert units of energy—to quantify energy demands and make comparisons among energy uses, resources, and technologies.
7. Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.

Unit 1: Introduction of conventional & renewable energy sources:

Environment aspects, Energy Efficient materials, Pollution Control techniques, Energy conservation, Energy Audits

Unit II: Details of renewable energy sources & various systems

Solar, Wind, Hydro, Bio-power, Waste to Power

Unit III: Various applications & benefits

Renewable power projects for smart cities & rural electrification, Power conversion techniques, Off-grid/Stand-alone systems, Grid connected systems, Design of Grid-tied & off-grid Solar PV systems, Design of Grid-tied & off-grid Wind systems, Design of Grid-tied & off-grid Hybrid systems, Storage technologies

Unit IV: Project management

Installation & commissioning techniques & standards, Remote monitoring & control techniques, Performance optimization & control, Practical's / Hands-on exposure, Maintenance & Service of plants, Government policies

Guidelines for Conduction (Any one or more of following but not limited to)

- Guest Lectures
- Group Activities
- Assignments
- Taking up small project for short duration

Guidelines for Assessment (Any one or more of following but not limited to)

- Practical Test
- Presentation
- Paper / (Theory assessment test)
- Report

Sources/ References:

1. Boyle, Godfrey. 2004. Renewable Energy (2nd edition). Oxford University Press, 450 pages (ISBN: 0-19- 926178-4).
2. Boyle, Godfrey, Bob Everett, and Janet Ramage (eds.) 2004. Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press, 619 pages (ISBN: 0-19-926179-2)
3. Ashok Desai V, *Non-Conventional Energy*, Wiley Eastern Ltd, 1990.
4. Mittal K.M, *Non-Conventional Energy Systems*, Wheeler Publishing Co. Ltd, 1997.
5. Ramesh R, Kurnar K.U, *Renewable Energy Technologies*, Narosa Publishing House, New Delhi, 1997.
6. Renewable Energy Resources by John Twidell and Tony Weir.

Audit Course 5 (2) :Human Behavior

About the Course:

Human behavior is the responses of individuals or groups of humans to internal and external stimuli. It refers to the array of every physical action and observable emotion associated with individuals, as well as the human race. Social behavior is a subset of human behavior and includes the study of considerable influence of social interaction and culture. Additional influences include ethics, encircling, authority, rapport, hypnosis, persuasion and coercion.

The behavior of humans falls within a range with some behavior being common, some unusual, some acceptable, and some beyond acceptable limits. The acceptability of behavior depends heavily upon social norms and is regulated by various means of social control. Human behavior is experienced throughout an individual's entire lifetime. It includes the way they act based on different factors such as genetics, social norms, core faith, and attitude. An attitude is an expression of favor or disfavor toward a person, place, thing, or event.

Course Objectives:

- To develop understanding of Behavioral Aspects.
- To identify and develop Attitude and Core Faith values
- To expose students to Family Relations, time and career management
- To enable student to understand Creative Thinking and Problem solving
- To enable students to understand Humanistic Education.

Course Outcomes:

On completion of the course, society will observe –

1. Change in awareness levels, knowledge and understanding of student
2. Change in attitudes / behavior of students with regards to their education improved teamwork, institutional leadership and other life skills
3. Improvement in social health and attitude.

Unit 1:

Why Human Relations are so important? Understanding Behavior, Human Relations, and Performance, Personality, Stress, Learning, and Perception, Attitudes, Self-Concept, Natural acceptance of human values, and Ethics, Dealing with Conflict, Leading and Trust.

Unit 2:

Time and Career Management, Interpersonal Communication, Organizational Structure and Communication, Team Dynamics and Leadership, Teams and Creative Problem Solving and Decision Making

Unit 3:

Understanding Harmony in the Family and Society, Harmony in Human Relationship, Understanding the meaning of *Vishwas*; Difference between intention and competence, Understanding the meaning of *Samman*; Difference between respect and differentiation. Understanding the harmony in the society: *Samadhan, Samridhi, Abhay, Sahasttva*as comprehensive Human Goals.

Unit 4:

Justice in Humankind, Nurturing and Exploitation, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics.

Reference Books:

1. "Human Relations in Organizations Applications and Skill Building" RobartLussier, eighth edition, McGraw-Hill (2014).

2. Atkinson and Hilgard's, "Introduction to psychology" Nolen-Hoeksema, S., Fredrickson, B. L., Loftus, G. R., & Lutz, C., Cengage Learning EME.

3. "A Foundation Course in Human Values and Professional Ethics" R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi and Teacher's Manual, R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi

4. A Nagraj, 1998, JeevanVidyaekParichay, Divya Path Sansthan, Amarkantak.

5. A.N. Tripathy, 2003, Human Values, New Age International Publishers.

Semester-II

404189 Mobile Communication

Credits: 03

Teaching Scheme:		Examination Scheme:
Lectures: 3Hrs/ Week		**In-Sem : 30 Marks** **End-Sem : 70 Marks**

Course Objectives

- To understand switching techniques for voice and data traffic.
- To nurture students with knowledge of traffic engineering to design networks.
- To realize importance of cellular concepts and its propagation mechanism.
- To understand architecture of GSM system.
- To overview 4G LTE and 5G technologies.

Course Outcomes

On completion of the course, student will be able to

1. Apply the concepts of switching technique and traffic engineering to design multistage networks.
2. Explore the architecture of GSM.
3. Differentiate thoroughly the generations of mobile technologies.

Unit I - Switching techniques for Voice and Data **8Hrs**

Switching techniques for Voice: Manual Switching System, Electronic Switching System and Time Division Switching. Single Stage networks, Gradings, Two stage and Three stage networks. Synchronization, **Control of switching systems:** Call processing Functions, Common Control, Reliability, Availability and Security.

Switching techniques for Data: Circuit switching, Message Switching and packet Switching in perceptive with mobile communication.

Unit II - Traffic Engineering and Signalling **8Hrs**

Telecommunication Traffic: Unit of Traffic, Traffic measurement, A mathematical model, Lost- call systems: Theory, traffic performance, loss systems in tandem, traffic tables. Queuing systems: Erlang Distribution, probability of delay, Finite queue capacity, Systems with a single server, Queues in tandem, delay tables and application of delay formulae.

Signaling: Customer line signaling. FDM carrier systems, PCM signaling, Inter-register signaling, Common channel signaling, CCITT signaling system and Digital customer line signaling.

Unit III - Cellular Concept **8Hrs**

Introduction to cellular telephone system, Cellular concept : Expansion of mobile system capacity through frequency reuse, Cell geometry, Selection of cluster size, Cell splitting and sectoring, Coverage and capacity in cellular system and Handoff strategies.

Propagation Mechanism: Free space and two ray propagation model, Basic propagation mechanism. Hata outdoor propagation model. **Small Scale Fading and Multipath:** Types of Small scale fading, Small scale multipath propagation, Impulse response model of multipath channel and Small scale multipath measurements.

Unit IV - GSM Fundamentals **8Hrs**

Introduction, Architecture of GSM, characteristics of GSM standards, services, Radio transmission parameters in GSM System, Applications.

Unit V - GSM Channels and Services **8Hrs**

Traffic and Logical Channels in GSM, GSM time hierarchy, GSM burst structure, Description of call setup procedure, Handover mechanism in GSM, Security in GSM.

Data transmission in GSM: Data Services, SMS, HSCSD, GPRS, EDGE.

Multiple Access Techniques-TDMA, CDMA and OFDMA.

Unit VI - Evolution of Mobile Technologies **6Hrs**

Evolution of Mobile Generation and its comparison(GSM & CDMA)

Overview of LTE : LTE basics , LTE frame structure, LTE Design parameters with Standardization and Architecture of LTE.

Overview of 5 G Networks : Comparison of 4G and 5G technology, Opportunities and requirements in 5G network, Open Wireless Architecture of 5G network and Disruptive technologies for 5G.

Text Books

1. Thiagarajan Vishwanathan, "Telecommunication Switching Systems and Networks"; PHIPublications
2. Theodore Rappaport, "Wireless Communications Principles and Practice" Second Edition, Pearson Education

Reference Books

1. Fei Hu, "Opportunities in 5G Networks : A research& development perspective", CRC Press
2. J. E. Flood , "Telecommunications Switching, Traffic and Networks", Pearson Education
3. Krzysztof Wesolowski, "Mobile Communication Systems", Wiley Student Edition
4. John C. Bellamy, "Digital Telephony", Third Edition; Wiley Publications
5. Mischa Schwartz, "Mobile Wireless Communications", Cambridge University Press
6. AdityaJagannatham,"Principles of Modern Wireless Communication Systems"

404190 Broadband Communication Systems

Credits: 04

Teaching Scheme:			**Examination Scheme:**	
Lecture : 04 hr/week				**In-Sem : 30 Marks** **End-Sem : 70 Marks**

Course Objectives:

- To comprehend the three primary components of a fiber optic communication system.
- To understand the system design issues and the role of WDM components in advanced light wave systems.
- To understand the basics of orbital mechanics and the look angles from ground stations to the satellite.
- To apply subject understanding in Link Design.

Course Outcomes:

After successfully completing the course students will be able to:

1. Perform Link power budget and Rise Time Budget by proper selection of components and check its viability.
2. Perform Satellite Link design for Up Link and Down Link.

UNIT I: Light wave System Components **8Hrs**

Key Elements of optical fiber system, Optical fibers as a communication channel: Optical fiber modes and configurations, Mode theory for Circular waveguides, Single mode fibers, Graded index fiber structure, Signal degradation in optical fibers. Optical sources: Basic concepts and characteristics of LEDs and LASERs. Photo detectors: Basic concepts, Common photo detectors.

UNIT II: Light wave Systems **6 Hrs**

System architectures, Point to point links: System considerations, Design guidelines: Optical power budget, Rise time budget, Long - Haul systems.

UNIT III: Multichannel Systems **6 Hrs**

Overview of WDM, WDM Components: 2 x 2 Fiber coupler, Optical isolators and circulators, Multiplexers and De-multiplexers, Fiber Bragg Grating, FBG applications for multiplexing and de-multiplexing function, Diffraction gratings, Overview of optical amplifiers: SOA, EDFA and RFA in brief.

UNIT IV: Orbital Mechanics and Launchers **8 Hrs**

History of Satellite communication, Orbital mechanics, Look angle determination, Orbital perturbations, Orbital determination, Launchers and launch vehicles, Orbital effects in communication system performance.

UNIT V: Satellite sub systems **6 Hrs**

Satellite Subsystems, Attitude and Control Systems (AOCS), Telemetry, Tracking, Command and monitoring, Power systems, Communication subsystems, Satellite antennas, Equipment reliability and space qualification.

UNIT VI: Satellite communication link design **8Hrs**

Introduction, Basic transmission theory, System noise temperature and G/T Ratio, Design of downlinks, SatelHrsite systems using small earth stations, Uplink design, Design of specified C/N: Combining C/N and C/I values in satellite links system design examples.

Text Books:

1. Gerd Keiser, “Optical fiber Communications”, Tata McGraw Hill, 4th edition.
2. Timothy Pratt, Charles Bostian, Jeremy Allnutt, “Satellite Communications”, John Wiley & Sons.

Reference Books:

1. Govind P. Agrawal, “Fiber -Optic Communication Systems”, Wiley, 3rd edition.
2. Dennis Roody, “Satellite Communications”, McGraw Hill

404191 Machine Learning (Elective III)

Credits: 03

Teaching Scheme:			**Examination Scheme:**	
Lecture : 03 Hr/week				**In-Sem : 30 Marks** **End-Sem: 70 Marks**

Course Objectives:

- Explore supervised and unsupervised learning paradigms of machine learning used forregression and classification.
- To design and analyze various machine learning algorithms using neural networks
- To explore Deep learning technique and various feature extraction strategies.

Course Outcomes:

On completion of the course, student will be able to

1. To compare and contrast pros and cons of various machine learning techniques and to get an in sight of when to apply a particular machine learning approach.
2. To mathematically analyze various machine learning approaches and paradigms.
3. To implement convolution neural networks in recognition applications.

Unit I :Introduction to Machine Learning **4Hrs**

Why Machine learning. Types of machine learning, basic concepts in machine learning like parametric and non-parametricmodeling, linear and nonlinear regression, overfitting and dimensionality reduction. Decision trees, Feature reduction.

Unit II : Models for Regression and Classification **8Hrs**

Linear Models for Regression :Least SquaresandNearestNeighbors ,Linear Basis Function Models,The Bias-Variance Decomposition,Bayesian Linear Regression,Bayesian Model ComparisonLinear Models for Classification : Discriminant Functions .Probabilistic Discriminative Models Multivariate Data,ParameterEstimation,MultivariateClassification,Multivariate RegressionKernal Methods : Support Vector machines and Relevance Vector Machines

Unit III :Clustering **6Hrs**

Dimensionality Reduction : Principal Components Analysis,Factor Analysis,Multidimensional Scaling,Linear Discriminant Analysis Clustering : k-Means Clustering,Mixtures of Gaussians.

Unit IV : Artificial Neural Networks I 6Hrs

Biological neuron, Artificial neuron model, concept of bias and threshold, Activation functions, McCulloch-Pits Neuron Model, learning paradigms,concept of error energy, gradient descent algorithm and application of linear neuron for linear regression,: Learning mechanisms: Hebbian, Delta Rule, Perceptron and its limitations.

Unit V : Artificial Neural Networks II **6 Hrs**

Multilayer perceptron (MLP) and back propagation algorithm, Application of MLP for classification, Self-Organizing Feature Maps,Learning vector quantization Radial Basis Function networks.

Unit VI : Deep Learning and Convolution Neural Networks **6Hrs**

Improvement of the Deep Neural Network:Vanishing Gradient, Overfitting, Computational Load,ReLU Function, Dropout Architecture of ConvNet, Convolution Layer, Pooling Layer, Applications of CNN's.

Text Books:

1. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.
2. LaureneFausett ," Fundamentals of Neural Networks: Architectures, Algorithms And Applications, Pearson Education, Inc, 2008.

Reference Books:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elementsof Statistical Learning", Springer 2009.
3. Phil Kim, "MATLAB Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence",a Press 2017.
4. EthemAlpaydın "Introduction to Machine Learning" Second Edition The MIT Press 2010.

5. SimonHaykin," Neural Networks : A comprehensive foundation, Prentice Hall International Inc. 1999.

404191 PLC & Automation (Elective III)

Credits: 03

Teaching Scheme:			Examination Scheme:	
Lecture : 03hr/week				**In-Sem : 30 Marks** **End-Sem: 70 Marks**

Course Objectives:

- Student will get the ability to recognize industrial control problems suitable for PLC control
- The learners will get an over view of technology of advanced topics such as SCADA, DCS Systems, DigitalController, CNC Machines.
- Student will gain the ability to select the essential elements and practices needed to develop and implement the Engineering Automation using PLC approach.

Course Outcomes:

On successful completion of the course, students able to:

1. Understand PLC architecture
2. Develop PLC ladder programs for simple industrial applications
3. Design Automation systems for industrial applications
4. Implement the Engineering Automation using PLC approach.

Unit I: Process Control & Automation **6Hrs**

Process control principles, Servomechanisms, Control System Evaluation, Analog control, Digital control, Types of Automation; Architecture of Industrial Automation Systems, Advantages and limitations of Automation, Effects of modern developments in automation on global competitiveness.

Unit II: Transmitters and Signal Conditioning **6Hrs**

Need of transmitters, Standardization of signals, Current, Voltage and Pneumatic signal standards, 2-Wire & 3-Wire transmitters, Analog and Digital signal conditioning for RTD, Thermocouple, DPT etc , Smart and Intelligent transmitters.

Unit III: Controllers and Actuators **6Hrs**

PID Controller, Cascade PID control, Microprocessor Based control, PAC (Programmable automation controller), Mechanical switches, Solid state switches,Electrical actuators: Solenoids, Relays and Contactors, AC Motor, VFD, energy conservation schemes through VFD, DC Motor, BLDC Motor, Stepper Motor, Servo Motor, Pneumatic and hydraulic actuators.

Unit – IV Introduction to PLC **6Hrs**

PLC: Characteristics, Operation, function, Types of PLC, Architecture Of PLC, Applications of PLC, PC v/s PLC, PLC programming, Ladder diagram: of logic gates, multiplexer, Ladder diagram for different logical conditions or logical equations or truth table. Timers: types of timer, Characteristics, Function of timer in PLC, Classification of a PLC timer, Ladder diagram using timer, PLC counter, Ladder diagram using counter.

Unit – V Industrial Automation **6 Hrs**

Basic Concept, History and Hierarchy of DCS, Functions of each level, Advantages and Disadvantages, Architecture of SCADA , MTU- functions of MTU, RTU- Functions of RTU, Working of SCADA, Comparison, suitability of PLC, DCS and SCADA, Applications: Thermal power plant, Irrigation and Cement factory.

Unit VI: Automation and CNC (Computer Numeric Control) Machines **7 Hrs**

Introduction of CNC Machines: Basics and need of CNC machines, NC, CNC and DNC (Direct NC) systems, Structure of NC systems, Applications of CNC machines in manufacturing, Advantages of CNC machines. Industrial Communication:Devicenet, Interbus , Device network: Foundation Fieldbus -H 1, HART, CAN, PROFIBUS-PA, Control network: ControlNet, FF-HSE, PROFIBUS-DP, Ethernet, TCP/IP. Panel Engineering for Automation

Text Books:

1. Curtis Johnson, "Process Control Instrumentation Technology"; 8th Edition, Pearson Education.
2. MadhuchhandaMitra, SamarjitSen Gupta, "Programmable Logic controllers and Industrial Automation"; Penram International Publishing India Pvt. Ltd.

Reference Books:

1. Stuart A. Boyer, SCADA supervisory control and data acquisition, ISA Publication.
2. John W. Webb, Ronold A Reis, "Programmable Logic Controllers, Principles and Applications"; 5th Edition, Prentice Hall of India Pvt. Ltd.
3. Kilian, "Modern control technology: components & systems, Delmar 2nd edition.
4. Bela G Liptak, Process software and digital networks, 3rd edition, 2002.
5. Pollack. Herman, W & Robinson., T. "Computer Numerical Control", Prentice Hall. NJ. Pabla, B.S. &Adithan, M. "CNC Machines", New Age Publishers, New Delhi

404191Audio and Speech Processing (Elective III)

Credits: 03

Teaching Scheme			**Examination Scheme**	
Lecture : 03 hr/week				**In-Sem: 30 Marks** **End-Sem: 70 Marks**

Course Objectives:

- To understand basics of speech production and perception mechanism.
- To understand classification of speech sounds based on acoustic and articulatory phonetics.
- To understand the motivation of short-term analysis of speech and audio.
- To understand various audio and speech coding techniques.
- To perform the analysis of speech signal using LPC.
- To extract the information of the speech or audio signals in terms of cepstral features.
- To provide a foundation for developing applications in the field of speech and audio processing.

Course Outcomes:

On completion of the course, student will be able to

1. Design and implement algorithms for processing speech and audio signals considering the properties of acoustic signals and human hearing.
2. Analyze speech signal to extract the characteristic of vocal tract (formants) and vocal cords (pitch).
3. Analyze speech signal for extracting LPC and MFCC Parameters of speech signal.
4. Apply the knowledge of speech and audio signal analysis to build speech processing applications like speech coding, speech recognition, speech enhancement and speaker recognition/verification.

Unit I : Fundamentals of speech production 6 Hrs

Anatomy and physiology of speech production, Human speech production mechanism, LTI model for speech production, Nature of speech signal, linear time varying model, articulators, articulatory phonetics, manner of articulation, place of articulation, acoustic phonetics, spectrogram, classification of speech sounds: vowels, semivowels, nasal diphthongs, stops, affricates, fricative, vowel triangle.

Unit II : Human auditory system and speech perception 6 Hrs

Anatomy and physiology of the ear, outer ear, middle ear and inner ear. Human auditory system, simplified model of cochlea. Sound perception, Auditory psychophysics, thresholds, just noticeable differences (JNDs), Sound pressure level and loudness. Sound intensity and Decibel sound levels. Pitch perception, masking, Concept of critical band and introduction to auditory system as a filter bank, Uniform, non-uniform filter bank, mel scale and bark scale. Speech perception: vowel perception. Coarticulation effects. Consonant perception, perception of manner of articulation feature. Perception of place of articulation.

Unit III: Time and frequency domain methods for speech and audio signal analysis. 6Hrs

Time-dependent speech processing. Short-time energy, short time average magnitude, Short time average zero crossing rate. Speech Vs. silence discrimination using energy and zero crossing rate. Short-time autocorrelation function, short-time average magnitude difference function. Pitch period estimation using autocorrelation method. Audio feature extraction, Spectral centroid, spectral spread, spectral entropy, spectral flux, spectral roll-off. Spectrogram: narrow band and wide band spectrogram.

Unit IV : Linear prediction and cepstral analysis 6Hrs

Basic principles of linear predictive analysis. Autocorrelation method, covariance method. Solution of LPC equations: Durbin's recursive solution, lattice formulations and solutions. Frequency domain interpretation of LP analysis. Applications of LPC parameters as pitch detection and formant analysis

Homomorphic processing of speech signal, application of cepstral analysis for vocal tract vocal cord parameter estimation (formants and pitch). Computation of MFCC.

Unit V : Speech and Audio coding 6Hrs

Time domain waveform coding: linear PCM, companded PCM, DPCM, DM, ADM.

Spectral coders: Filter bank analysis, sub-band coders, Adaptive transform coders (ATC), Harmonic coding. Linear predictive coders (LPC), Non-LP source voice coders: phase vocoders, channel vocoders, excitation for vocoders, Homomorphic (Cepstral) vocoders. Speech coding standards and applications.

Unit VI : Digital speech processing for man-machine communication 6Hrs

Automatic speech recognition (isolated word recognition, automatic telephone number dialing system etc. using statistical signal modeling e.g. GMM, GMM-HMM), Linear and dynamic time warping, text to speech synthesis, speaker recognition and verification, speech enhancement, Introduction to Musical instrument classification, Musical Information retrieval.

Text Books:

1. L. R. Rabiner and S.W. Schafer, "Digital processing of speech signals" Pearson Publication.
2. Douglas O'Shaughnessy, "Speech Communications: Human and Machine:, 2nd Edition Universities Press.

Reference Books:

1. Thomas F. Quateri , "Discrete-Time Speech Signal Processing: Principles and Practice" Pearson Publication.
2. ShailaApte, "Speech and audio processing", Wiley India Publication
3. Ben Gold and Nelson Morgan, "Speech and Audio Signal Processing: Processing and Perception of Speech and Music", Wiley India.
4. L. R. Rabiner , B. H. Juang and B. Yegnanarayana "Fundamentals of speech recognition". PearsonPublication

404191 Software Defined Radio (Elective III)

Credits: 03

Teaching Scheme:			**Examination Scheme:**	
Lecture : 03Hr/Week				**In-Sem: 30 Marks** **End-Sem: 70 Marks**

Course Objectives:

- To understand "Modern Radio Communication System " that can be reconfigured
- To understand GNU Radio
- To understand how SDR platform provides easy access to wireless network system
- To understand how unlike simulation in Communication Projects, SDR allows easy
- access to both PHY and MAC layer
- To understand the concept of Cognitive Radio and Spectrum sharing

Course Outcomes:

On completion of the course, student will be able to

1. Compare SDR with traditional Hardware Radio HDR.
2. Implement modern wireless system based on OFDM, MIMO & Smart Antenna.
3. Build experiment with real wireless waveform and applications, accessing both PHY and MAC, Compare SDR versus MATLAB and Hardware Radio
4. Work on open projects and explore their capability to build their own communication System.

Unit I : Introduction to SDR and RF Implementation **6Hrs**

Introduction to SDR, Need of SDR, Principles of SDR , Basic Principle and difference in Analog radio and SDR , SDR characteristics, required hardware specifications, Software/Hardware platform, GNU radio -What is GNU radio, GNU Radio Architecture, Hardware Block of GNU,GNU software , MATLAB in SDR , Radio Frequency Implementation issues, Purpose of RF front End, Dynamic Range ,RF receiver Front End topologies, Flexibility of RF chain with software radio, Duplexer ,Diplexer ,RF filter ,LNA ,Image reject filters , IF filters , RF Mixers Local Oscillator , AGC, Transmitter Architecture and their issues, Sampling theorem in ADC, Noise and distortion in RF chain, Pre-distortion

Unit II :SDR Architecture **7Hrs**

Architecture of SDR-Open Architecture, Software Communication Architecture, Transmitter Receiver Homodyne/heterodyne architecture, RF front End, ADC, DAC, DAC/ADC Noise Budget, ADC and DAC Distortion, Role of FPGA/CPU/GPU in SDR, Applications of FPGA in SDR, Design Principles using FPGA, Trade –offs in using DSP, FPGA and ASIC, Power Management Issues in DSP, ASIC, FPGA

Unit III : Multi Rate Signal Processing **6Hrs**

Sample timing algorithms, Frequency offset estimation and correction, Channel Estimation, Basics of Multi Rate, Multi Rate DSP, Multi Rate Algorithm, DSP techniques in SDR, OFDM in SDR

Unit IV : Smart/MIMO Antennas using Software Radio **6Hrs**

Smart Antenna Architecture, Vector Channel Modeling , Benefits of Smart Antenna Phased Antenna Array Theory, Adaptive Arrays, DOA Arrays, Applying Software Radio Principles to Antenna Systems, Beam forming for systems-Multiple Fixed Beam Antenna Array, Fully Adaptive Array , Relative Benefits and Trade-offs OF Switched Beam and Adaptive Array, Smart Antenna Algorithms , Hardware Implementation of Smart Antennas, MIMO -frequency, time, sample Synchronization, Space time block coding-Space Time Filtering, Space Time Trellis Coding .

Case Study : Principles of MIMO-OFDM

Unit : Cognitive Radio **6Hrs**

Cognitive Radio Architecture, Dynamic Access Spectrum, Spectrum Efficiency, Spectrum Efficiency gain in SDR and CR ,Spectrum Usage, SDR as a platform for CR, OFDM as PHY layer ,OFDM Modulator, OFDM Demodulator, OFDM Bandwidth, Benefits of OFDM in CR, Spectrum Sensing in CR, CR Network

Unit VI : Applications of SDR **7Hrs**

Applicationof SDR in Advance Communication System-Case Study, Challenges and Issues, Implementation, Parameter Estimation –Environment, Location, other factors, Vertical Handoff, Network Interoperability.

Case Study : 1)CR for Public Safety –PSCR , Modes of PSCR, Architecture of PSCR
2)Beagle board based SDR 3)Embedded PCSR using GNU radio

Text Books:

1. Jeffrey. H. Reed ,Software Radio : A Modern Approach to Radio Engineering, Pearson LPE
2. Markus Dillinge, KambizMadani, Nancy Alonistioti, Software Defined Radio :Architectures , Systems and Functions ,Wiley

Reference Books:

1. Tony .J. Rouphael, RF and DSP for SDR, Elsevier Newness Press ,2008
2. Dr.TajStruman,Evaluation of SDR –Main Document
3. SDR –Handbook, 8th Edition , PENTEK
4. Bruce a. Fette, Cognitive Radio Technology, Newness, Elsevier

404191 Audio Video Engineering (Elective III)

Credits: 03

Teaching Scheme:		**Examination Scheme:**	
Lecture : 03Hr/Week			**In-Sem : 30 Marks** **End-Sem : 70 Marks**

Course Objectives:

- After learning AVE course, students will get benefit to learn and understand the working of real life video system and the different elements of video system plus the encoding/decoding techniques.
- The learners will be groomed up to understand different channel allocations, difference between various systems present in this world, their transmission and reception techniques.
- Students will get insight on functioning of individual blocks, different standards of compression techniques and they will be acquainted with different types of analog, digital TV and HDTV systems.
- The students will get overview of fundamentals of Audio systems and basics of Acoustics

Course Outcomes:

On successful completion of the course, students able to:

1. Apply the fundamentals of Analog Television and Colour Television standards.
2. Explainthe fundamentals of Digital Television, DTV standards and parameters.
3. Study and understand various HDTV standards and Digital TV broadcasting systems and acquainted with different types of analog, digital TV and HDTV systems.
4. Understandacoustic fundamentals and various acoustic systems.

Unit I: Fundamentals of Colour Television **8Hrs**

The basic Television system and scanning principles, Composite video signal and television standards, Color TV systems, fundamentals, mixing of colours, colour perception, chromaticity diagram. NTSC, PAL, SECAM systems, colour TV transmitter, (high level, low level), colour TV receivers.

Unit II: Digital TV and Display Devices **6Hrs**

Introduction to Digital TV, Digital TV signals and parameters, Digital TV Transmitters, MAC signals, advanced MAC signal transmission, Digital TV receivers, Basic principles of Digital Video compression techniques, MPEG Standards. Digital TV recording techniques, Display devices: OLED, LCD, TFT, Plasma, Camcoder, Digicam.

Unit III: HDTV **6Hrs**

HDTV standards and systems, HDTV transmitter and receiver/encoder, Digital TV satellite Systems, video on demand, CCTV, CATV, direct to home TV, set top box with recording facility, conditional access system (CAS), 3D TV systems, HD video cameras, Digital broadcasting, case study (Cricket match, Marathon, Football match).

Unit IV: Advanced TV Systems **6Hrs**

IP Audio and Video, IPTV systems, Mobile TV, Video transmission in 3G/4G mobile System, Digital Video Recorders, Wi-Fi Audio / Video Transmitter and Receivers.

Unit V: Fundamentals of Audio-Video Recording **8Hrs**

Methods of sound recording & reproduction, optical recording, CD recording, audio standards. Digital Sound Recording, CD/ DVD player, MP3 player, Blue Ray DVD Players, MP3 Player.

Unit VI: Fundamentals of Acoustics 6Hrs

Studio acoustics & reverberation, P.A. system for auditorium, acoustic chambers, Cordless microphone system, special types of speakers & microphones, Digital Radio Receiver Satellite radio reception.

Text Books

1. Television and video Engineering, A. M. Dhake, TMH Publication.
2. R. R. Gulati, "Monochrome and colour television"

Reference Books

1. Television Engineering -Audio and Video Systems, D. S. Bormane, P.B. Mane& R RItkarkar, Wiley publication.
2. S. P. Bali, "Color TV Theory and Practice".
3. Bernard Grobb, Charles E, "Basic TV and Video Systems".
4. Video Demisified, Kelth jack, Penram International Publication.
5. Audio Video Systems, R.G. Gupta, TMH Publication

404192 ROBOTICS (Elective-IV)

Credits: 03

Teaching Scheme:			**Examination Scheme:**	
Lecture : 03Hr/Week				**In-Sem : 30 Marks** **End-Sem: 70 Marks**

Course Objectives:

- To understand the history, concept development and key components of robotics technologies.
- To understand basic mathematics manipulations of spatial coordinate representation and transformation.
- Able to solve basic robot forward and inverse kinematic problems
- To understand and able to solve basic robotic dynamics, path planning and control problems

Course Outcomes:

On completion of the course, student will be able to

1. Familiar with the history, concept development and key components of robotics technologies.
2. Implement basic mathematics manipulations of spatial coordinate representation and transformation.
3. Solve basic robot forward and inverse kinematic problems
4. Understand and able to solve basic robotic dynamics, path planning and control problems

Unit I :Basic concepts in robotics 6Hrs

Definition ; anatomyof robot, basic structure of robot, Specifications and Classification of robot, Safety Measures in robotics ,Industrial Applications of Robots.

Unit II :Robot drivers,Sensors and Vision 6Hrs

Drives for robots: Electric, hydraulic and pneumatic.

Sensors: Internal-External,Contact-noncontact, position, velocity,force, torque, proximity and range.

Vision: Introduction to techniques, Image acquisition and processing

Unit III : End Effectors and Actuators **6Hrs**

Different types of grippers- Mechanical,Magnetics,vacuum,Adhesive, Gripper force Analysis&Gripper Design , overview of actuators, Power and torque, Acceleration and velocitySpecifications and characteristics of Stepper motors, AC motors, DC motors and servomotors.

Unit IV : Robot Kinematics and Dynamics **8Hrs**

Direct and inverse kinematics for industrial robots for position and orientation, Redundancy, Manipulator, direct and inverse velocity. Lagrangian formulation , Link inertia tensor and manipulator inertia tensor, Newton –Eller formulation for RP and RP manipulators, Trajectory planning, interpolation, static force and moment transformation, solvability, stiffness

Unit V:Programming methods **6Hrs**

Robot language classification, Robot language structure, elements and its functions. Simple programs on Sensing distance and direction., Line Following Algorithms, Feedback Systems Other topics on advance robotic techniques

Unit VI : Developing and building a robot **6Hrs**

Models of flexible links and joints, Robotic arm – Components and structure, Types of joints and workspace, Design models for mechanic arms and lifting systems

Case Study: 1. Robots in material handling and assembly.
2. Human Robot Interaction

Text Books:

1. Introduction to Robotics By S.K.Saha , Tata McGraw Hill
2. Robotics Control ,Sensing ,Vision and Intelligence by K.S. Fu, R.C .Gonzalez, C.S.G.Lee , Tata McGraw Hill

Reference Books:

1. J. Hirchhorn: Kinematics and Dynamics of Machinery, McGraw Hill book co.
2. Robert J. Schilling , Fundamentals of Robotics- Analysis and Control, Prentics Hall india.
3. Robotics Technology and Flexible Automation by S.R.Deb, S. Deb, Tata McGraw Hill
4. Robot Motion and Control (Recent Developments) by M.Thoma& M. Morari

404194 Biomedical Electronics (Elective-IV)

Credits: 03

Teaching Scheme:			**Examination Scheme:**	
Lecture : 03 hr/week				**In-Sem : 30 Marks** **End-Sem : 70 Marks**

Course Objectives:

- To study Human Physiological Systems from Engineering Perspectives
- To understand the basic signals in the field of biomedical.
- To study origins and characteristics of some of the most commonly used biomedical signals, including ECG, EEG, PCG, Pulse.
- To understand Sources and characteristics of noise and artifacts in bio signals.
- To understand use of bio signals in diagnosis, patient monitoring and physiological investigation

Course Outcomes:

After successfully completing the course students will be able to:

1. Model a biomedical system.
2. Understand various methods of acquiring bio signals.Understand various sources of bio

3. signal distortions and its remedial techniques.
4. Get an Overview of major Devices currently used in Medical field
5. The students will have an understanding of analyzing bio-signal and classifying them

Unit I: Introduction to Biomedical System **6Hrs**

Biomedical Instrumentation System, Cell structure, Bio-Cell potential , Concept of Bio-electrodes, Types of Bio-electrodes to measure Bio-signal, Transducers and Sensors to measure Bio signal EEG,ECG,EMG, Respiration, Body temperature, SPO2, and Pulse. Artifacts in Bio signal Acquisition: Noise, Power line, Baseline, Skin Impedance and Motion Artifacts, Techniques to reduce the artifacts.

Unit II: Cardiovascular System 6Hrs

Introduction to Heart**,** Physiology and anatomy of Heart, Lead Configurations to acquire ECG, ECG preamplifiers, ECG recorder, Heart Sounds and Murmurs, Phonocardiography

Unit III:Nervous System 6Hrs

Nerve Cell and nerve potential, Neural Communication, Brain structure, 10-20 electrode placement for EEG , Types of Montage configuration, Types of EEG signals and its significance, EEG machine, EEG applications for Epilepsy and Sleep apnea**.**

Unit IV: Medical Instrumentation **8Hrs**

Design of Instrumentation system for ECG acquisition, Isolation Amplifier, Right Leg drive Mechanism, Noise removal techniques using Active Filters, Wiener Filters, Adaptive Filters: Basic Concept, Principle noise cancellation model, removal of periodic events, using adaptive cancellation, adaptive cancellation of maternal ECG from fetal ECG of Interest. Grounding and shielding Concepts

Unit: Analysis of Electrical Activity of Heart **6Hrs**

ECG Signal Processing: Removal of Base line and Power line Interference, Muscle noise Filtering, Highlight ECG feature points, QRS detection, ECG classification for normal and abnormal state using Multilayer Perceptron. Use of Multiscale analysis for ECG parameter estimation.

Unit VI:Medical Devices **4Hrs**

Introduction To Blood Pressure Measurement (noninvasive), Life saving Devices Pacemakers and Defibrillators, Bedside Monitors, Central Monitoring system, Stress Test System, X Ray, CT scan , Dental instruments

Text Books:

1. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", 4th Edition, Prentice Hall, 2000.
2. R. Rangayan, "Biomedical Signal Analysis", Wiley 2002.
3. R.S.Khandpur, "Handbook of Biomedical Instrumentation", Tata McGraw Hill, New Delhi, 2003, Edition-II.

Reference Books:

1. John L Semmlow, "Bio-signal and Biomedical Image Processing", Marcel Dekker
2. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", 4thEdition, Prentice Hall, 2000.

404194 Wireless Sensor Networks (Elective-IV)

Credits: 03

Teaching Scheme:			**Examination Scheme:**	
Lecture : 03 hr/week				**In-Sem : 30 Marks** **End-Sem: 70 Marks**

Course Objectives:

- To learn basic concepts of Wireless sensor networks
- To be familiar with architecture and protocols used in Wireless sensor networks
- To provide knowledge of deployment and security issued of Wireless sensor networks

Course Outcomes:

On completion of the course, student will be able to

1. Explain various concepts and terminologies used in WSN
2. Describe importance and use of radio communication and link management in WSN
3. Explain various wireless standards and protocols associated with WSN
4. Recognize importance of localization and routing techniques used in WSN
5. Understand techniques of data aggregation and importance of security in WSN
6. Examine the issues involved in design and deployment of WSN

Unit1 : Introduction **6 Hrs**

What are Wireless Sensor Networks, Wireless Sensor Node, Anatomy of a Sensor Node, architecture of WSN , Performance metrics in WSNs, types of WSN

Unit 2: Radio Communication And Link Management **7 Hrs**

Radio Waves and Modulation/Demodulation, Properties of Wireless Communications, Medium Access Protocols, Wireless Links Introduction, Properties of Wireless Links, Error Control, Naming and Addressing, Topology Control

Unit 3: Wireless Standards And Protocol Stack **7 Hrs**

WSN Standards- IEEE802.15.4 Low rate WPAN, Zigbee, WirelessHART, ISA 100.11a, 6LoWPAN,IEEE802.15.3, Wibree,BLE, Zwave, ANT, Insteon, Wavenis, Protocol stack of WSNs, Cross Layer Protocol Stack

Unit 4: Localization And Routing **7 Hrs**

Localization : Localization Challenges and Properties, Deployment Schemes, Proximity Schemes. Ranging Schemes, Range-Based Localization, Range-Free Localization,
Routing Basics, Routing Metrics, Routing Protocols, Full-Network Broadcast, Location-Based Routing, Directed Diffusion, Collection Tree Protocol, Zigbee, Multi-Hop Communications

Unit 5: Data Aggregation And Security **7 Hrs**

Clustering Techniques, In-Network Processing and Data Aggregation, Compressive Sampling, Security Issues in Wireless Sensor Networks, Attacks, Defensive Measures, Securityrequirements and threat model,

Unit 6: Designing And Deploying WSN Applications **6 Hrs**

Designing and Deploying WSN Applications,Early WSN Deployments, General Problems, General Testing and Validation, Requirements Analysis, The Top-Down Design Process, Bottom-Up Implementation Process.

Text Books

1.Kazem Sohraby, Daniel Minoli and TaiebZnati, " Wireless Sensor Networks Technology, Protocols, and Applications", John Wiley & Sons, 2007.

2.Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, Ltd, 2005.

Reference Books

1. HossamFahmy, "Wireless Senor Networks: Concepts, Application, experimentation and analysis", Springer Publication

2. Anna Forster, "Introduction to Wireless Sensor Networks", IEEE Press, Wiley Publication

3.Anna Hac, "Wireless Sensor Network Designs", John Wiley & Sons Ltd,

404194 Renewable Energy Systems (Elective-IV)

Credits: 03

Teaching Scheme:			**Examination Scheme:**	
Lecture : 03hr/week				**In-Sem : 30 Marks** **End-Sem : 70 Marks**

Course Objectives:

- To study energy generation, different energy sources and their utilization and impact on environment
- To gain knowledge of solar radiation and its applications
- To understand the wind energy and its nature
- To analyze the performance of solar collectors and wind turbines
- To learn fuel cell and its efficiency

Course Outcomes:

On successful completion of the course, students able to:

1. Interpret energy reserves of India and potential of different energy sources.
2. Measure the solar radiation parameters and performance of different solar collectors.
3. Calculate different parameters of wind turbine rotor.
4. Implicit the importance and applications of geothermal and ocean energy.
5. Demonstrate knowledge in field of fuel cell and potential for power generation.

Unit I : Energy Resources and Utilization: 6Hrs

Conservation and forms of energy, energy reserves in India, nuclear power, hydroelectric power potential, India's power scene, impact on environment, renewable energy sources, energy parameters, cogeneration, rational energy use of energy, energy efficiency and conservation, new technologies, distributed energy systems and dispersed generation.

Unit II :Solar Energy 8Hrs

Solar constant, spectral distribution of extraterrestrial radiation, terrestrial solar radiation, solar radiation geometry, computation of COSθ, sunrise, sunset, day length, LAT, Empirical equation, solar radiation measurement, Solar Thermal energy collectors, design parameters,laws of thermal radiation, radiation heat transfer between real bodies, radiation optics, transmitivity, heat losses and coefficient, Solar Thermal energy storage.

Unit III : Solar photovoltaic systems& Solar Applications 8Hrs

Solar photovoltaic systems: Photovoltaics, Different types of PV Cells, Mono-poly crystalline and amorphous Silicon solar cells. Design of PV array. Efficiency and cost of PV systems

Solar Applications: Solar water heating, solar distillation, solar ponds, solar pumping system, solar cooker, solar green house.

Unit IV : Wind energy 8Hrs

Classification, types of rotors, terminology, operation of wind turbines, wind energy extraction, wind characteristics, wind speed, energy estimation, power density duration curve, density function, field data analysis, direction and wind speed, variation of wind speed, wind scale, energy pattern factor in wind power studies, land for wind energy, design of wind turbine rotor, regulating system, wind power generation curve, horizontal axis wind turbine generator, modes of wind power generation, advantages and disadvantages, wind energy farms.

Unit V: Ocean and Geothermal Energy **6Hrs**

Ocean Energy: Tidal Energy, Tidal characteristics, Tidal Energy estimation, Development of a tidal power scheme,Wave energy- characteristics-energy and power from the waves.

Geothermal energy: Structure of earth's interior, sites, field, gradient, resources, power generation, geothermal resources in India, utilization, global status of electricity generation from geothermal resources, advantages of geothermal energy

Unit VI : Fuel Cells **6Hrs**

Principle of operation of an acidic Fuel Cell, Technical parameter, Fuel Processor, methanol fuel cell, fuel cell types, Advantages of fuel cell power plants, comparison between acidic and alkaline hydrogen-oxygen fuel cells, state of art fuel cells, energy output of a fuel cell, efficiency and EMF of a fuel cell, Gibbs-Helmholtz equation, operating characteristics of fuel cells.

Text Books:

1. D.P. Kothari, K.C. Singal and RakeshRanjan, "Renewable Energy Sources and Emerging Technologies", Prentice Hall of India, New Delhi, 2009.
2. S.P. Sukhatme, "Solar Energy: Principles of Thermal Collection and Storage", TMH, New Delhi, 2008

Reference Books:

1. Chetan Singh Solanki, "Renewable Energy Technologies", Prentice Hall of India, New Delhi, 2009
2. G. D. Rai, "Non- conventional Energy Sources", Khanna publishers, New Delhi, 2011.
3. MaltiGoel, "Energy Souces and Global Warming", allied publishers Pvt Ltd. New Delhi, 2005.

404193 Laboratory Practice III

Credits: 02

Teaching Scheme:			Examination Scheme:	
Practical : 02 Hr/week				**TW : 50 Marks** **Oral : 50 Marks**

Mobile Communication:

List of Practicals: (Any Eight)

1. Perform an experiment to explain PSTN TST switch.
2. Write a program to elaborate Lost call system/ delay system used in the analysis of voice/data traffic.
3. Write a program to measure bit error rate in presence of AWGN model.
4. Write a program to simulate speech coding and decoding technique used in mobile Communication.
5. Set up and carry out experiment on AT commands for call operation.
6. Write a program to simulate experiment on GMSK modulation.
7. Write a program to measure bit error rate in presence of Hata/ Multipath propagation model.
8. Set up and carry out experiment to explain VoIP call routing process.
9. Visit to Mobile Telephone Switching Office (MTSO).
10. Perform an experiment / Simulate to elaborate the operation of Multiple access techniques such as TDMA/CDMA/OFDMA.

Broadband Communication System:

List of the Experiments:

- **Minimum 8 experiments are to be performed excluding tutorials.**
- **Tutorials are mandatory. (Expt. 5 and 12)**

1. Estimation of Numerical aperture of fiber.
2. Plot the characteristics of various sources and detectors.
3. Measure attenuation of MMSI and SMSI fiber and comment on the result based on attenuation due to increase in length as well as loss due to bend.
4. Set up a digital link and analyze.
5. Tutorial on Power budget and time budget analysis of optical fiber system.
6. Establishing a direct communication link between Uplink Transmitter and Downlink Receiver using tone signal.
7. To set up an Active Satellite link and demonstrate Link Fail Operation.
8. To establish an AUDIO-VIDEO satellite link between Transmitter and Receiver.
9. To communicate VOICE signal through satellite link.
10. To transmit and receive three separate signals (Audio, Video, Tone) simultaneously through satellite Link.
11. To transmit and receive PC data through satellite link.
12. Tutorial on satellite link design
13. Students, as a part of their term work, should visit satellite earth station and submit a report of visit. (Optional).

404194 Laboratory Practice IV (Elective III)

Credits: 01

Teaching Scheme:			Examination Scheme:	
Practical : 02 Hr/week				Oral : 50 Marks

Machine Learning

List of Practical's:

(Use appropriate Software available in the Institute)

1. Implement simple logic network using MP neuron model
2. Implement a simple linear regressor with a single neuron model
3. Implement and test MLP trained with back-propagation algorithm
4. Implement and test RBF network
5. Implement SOFM for character recognition.
6. Implement SVM classifier for classification of data into two classes. Student can use datasets such as flower classification etc.
7. Implement and test Multiclass SVM classifier.
8. Implement and test CNN for object recognition.

PLC & Automation

List of Experiments (Minimum 8 experiments are to be performed).

1. Control the speed of servo motor using analog voltage 0-10V.
2. Rotate the servo motor according to X, Y co-ordinates.
3. Temperature detection using RTD & control the temperature of water at desired set point.
4. Control the flow of water using analog control valve.
5. Control the speed of AC 3ϕ motor using VFD.
6. Design simulation of 3 cylinder piston pump using pneumatic kit & PLC.
7. Detect the angle of shaft using Encoder & PLC.
8. Control the speed of 3ϕ AC motor from Mobile/HMI with PLC.
9. Interfacing of RFID with PLC & show the corresponding user data on SCADA to access the control.
10. Interface PLC with RTU & SCADA at remote location.
11. Exchange the data between two PLC's using Ethernet.
12. Interfacing of PLC to VFD over profibus& exchange the data

Audio and Speech Processing

List of Experiments (Minimum 8 experiments are to be performed):

NOTE: To perform the experiments software like MATLAB, SCILAB or any appropriate open source software can be used. For analysis of speech signals tools like PRAAT, Audacity can be used. Open source software is encouraged.

1. Record speech signal (isolated words, continuous speech) and analyze the speech signal using speech analysis tool (e.g. PRAAT). Observe spectrogram, pitch, formants, intensity etc.
2. Write a program to compute short time Energy and ZCR for different frame rates and comment on the result.
3. Write a program to classify voiced, unvoiced and silence frames using frame level energy and zero crossing rate
4. Write a program to compute narrow band and wide band spectrogram. Comment on the time and frequency resolution of wide band and narrow band spectrogram.
5. Write a program for extracting pitch period for a voiced part of the speech signal using autocorrelation method and average magnitude difference function (AMDF).
6. Write a program to design a Mel filter bank and using this filter bank write a program to extract MFCC features.
7. Write a program to perform the cepstral analysis of speech signal and detect the pitch from the voiced part using cepstrum analysis.
8. Write a program to find LPC coefficients using Levinson Durbin algorithm.
9. Write a program to enhance the noisy speech signal using spectral subtraction method.
10. Write a program to extract frequency domain audio features like SC, SF and Spectral roll off.

Software Defined Radio

List of the Experiments(Minimum 8 experiments are to be performed):

1. Introduction to GNU Radio
2. Introduction to Software Defined Radio Systems
3. Implementation of AM using SDR
4. Implementation of FM using SDR with application such as transfer of files
5. Implementation of M-PSK transmitter using SDR
6. Implementation of M-PSK receiver using SDR
7. Implementation of M-QAM transmitter using SDR
8. Implementation of M-QAM receiver using SDR
9. Implementation of Transmission of files on Wireless media using SDR
10. Implementation of OFDM using SDR
11. Implementation of Cognitive radio using SDR

Audio Video Engineering

List of Experiments (Minimum 8 experiments are to be performed).

1. Voltage and waveform analysis for color TV.
2. Study of direct to home TV and set top box.
3. Study Wi-Fi TV system
4. Study of Digital TV pattern generator.
5. Study of HDTV
6. Study of Digital TV.
7. Simulation of Video, Audio and Image compressing techniques (Software Assignments)
8. Study of Audio system: CD players and MP3 player.
9. Study of PA system with chord less microphone
10. Directivity pattern of Microphones / Loud speakers
11. Visit to TV transmitter/ Digital TV Studio/ All India Radio / TV Manufacturing factory

404195 Project Phase-II

Credits:06

Teaching Scheme:		Examination Scheme:
Tutorial: 6 Hrs/Week		TW: 150 Mark OR: 50 Marks

1. GroupSize

The student will carry the project work individually or by a group of students. Optimum group size is in 3 students. However, if project complexity demands a maximum group size of 4 students, the committee should be convinced about such complexity and scope of thework.

2. Selection and approval of topic

Topic should be related to real life application in the field of Electronics and Telecommunication

OR

Investigation of the latest development in a specific field of Electronics or Communication or Signal Processing

OR

The investigation of practical problem in manufacture and / or testing of electronics or communication equipment

OR

The Microprocessor / Microcontroller based applications project ispreferable.

OR

Software development project related to VHDL, Communication, Instrumentation, Signal Processing and Agriculture Engineering with the justification for techniques used / implemented is accepted.

OR

Interdisciplinary projects should be encouraged. The examination will be conducted independently in respective departments.

3. Note:

The group should maintain a logbook of activities. It should have entries related to the work done,problems faced, solution evolved etc., duly signed by internal and external guides.

Project report must be submitted in the prescribed format only. No variation in the format will be accepted. One guide will be assigned at the most 3 project groups.

Audit Course 6 (1)
Team Building, Leadership and Fitness

About the course

Team building allows students to work together in social situations just as they would in the classroom, their daily lives, or down the road in the workplace. Team building challenges students to solve problems and execute working with others. It shows them how to be accountable. It allows team members to stay motivated and energized to work on the project together. They work on jobs and tasks cohesively, rather than working alone without interaction. By working together, members of the team can "work together, stay together, and achieve together" .Trust and communication issues can also be noticed from team building exercises. Team building is known to improve performance in teams; members will remain motivated and can easily overcome indifferences to see the strengths in all team members.

Leadership is about the art of motivating, influencing and directing people so that they work together to achieve the goals of a team or broader organization. It's important for students to experience leadership opportunities during their schooling, to learn the art of building relationships within teams, defining identities and achieving tasks effectively. It also provides an opportunity to learn to identify and display effective communication and interpersonal skills. Leadership begins with identifying and understanding our values. Our values are our fundamental beliefs – those principles we consider to be worthwhile and desirable. Fitness does not only refer to being physically fit, but also refers to a person's mental state as well. If a person is physically fit, but mentally unwell or troubled, he or she will not be able to function optimally. Mental fitness can only be achieved if your body is functioning well. You can help relax your own mind and eliminate stresses by exercising regularly and eating right. People who are physically fit are also healthier, are able to maintain their most optimum weight and are least prone to cardiac and other health problems. In order to maintain a relaxed state of mind, a person should be physically active. A person who is fit both physically and mentally strong enough to face the ups and downs of life, and is not affected by drastic changes if they take place.

Course Objectives:

- To develop understanding of team skills and dynamics
- To identify and develop personal skills to become a more effective team member
- To introduce to the students the social change model of leadership
- To expose students to the leadership skills and imbibe within them that the fact that Leadership is a process, not a characteristic associated with an individual or role.
- To enable student to understand principles of fitness training and exercise
- To enable students to understand human posture, nutritional values and mental fitness

Course Outcomes:

On completion of the course, society will observe –

1. Change in awareness levels, knowledge and understanding of today's youth
2. Change in attitudes / behavior of students with regards to their improved teamwork, institutional leadership and other life skills
3. Increase in the body's fitness levels and also reduced health problems
4. Improvement in social health and attitude.

Unit 1: Team Building

Types of Teams, Characteristics of a Team, Stages of Team Development (Forming ,Storming, Norming, Adjourning) , Systematic Approach to Team Work , High Performing Team (Characteristics , Maintenance , Causes of low performance Why Teams Fail , People,Communication , Resources , Objectives)

Unit II: Leadership

Defining Leadership , Personal Leadership Profile, Leadership in the Context of Community, Leadership Theory, Leadership Concepts, Foundations of Group Behavior: The Meaning of Group, Group behavior & Group Dynamics, Types of Groups, The Five -Stage Model of Group Development Managing Organizational Change, Leadership Styles leading to Authenticity, Learning and Development, Positive Responses to Aggressive Behavior, Professionalism, Team Building

Unit III: Educational Leadership

Key challenges for educational leaders, Characteristics, Capabilities of authentic leader, values and ethics in decision making, Continuous professional Development suitable for 21st century pedagogy, Emotional intelligence for educational leaders. Need of Educational research for educational leadership

Unit IV: Fitness for Engineers

Fundamentals of Exercise Science: Skeletal, muscular, cardiovascular, nervous system, nutrition, flexibility, special population and injuries, Basics of fitness, Weight management and supplementation

Guidelines for Conduction (Any one or more of following but not limited to)

• Guest Lectures
• Group Activities
• Assignment
• Taking up assisted Health challenge for short duration (ex. Yoga and Pranayam, Weight management , stability in mental health)

Guidelines for Assessment (Any one or more of following but not limited to)

• Practical Test
• Presentation
• Paper / (Theory assessment test)
•• Report

Sources/ References:

1. Organizational Behavior by Fred Luthans
2. Organizational Behavior by M N Mishra
3. Leadership Development Activities, John Adair, 2nd Edition Jaico Publication
4. Leadership Games, Stephen S Kogan,
5. Mastering Leadership, 2nd Edition, Michael Williams, Viva Books
6. Sculpt and Shape: The Pilates Way by YasminKarachiwala
7. Total Fitness: The LeenaMogre Way by LeenaMogre
8. Don’t Lose Your Mind, Lose Your Weight: RutujaDiwekar
9. Yog Its Philosophy and Practice English by Swami Ramdevji

Audit Course 6 (2)
Environmental Issues And Disaster Management

About the Course:

The importance of environmental science and environmental studies cannot be disputed. The need for sustainable development is a key to the future of mankind. Continuing problems of pollution, loss of forget, solid waste disposal, degradation of environment, issues like economic productivity and national security, Global warming, the depletion of ozone layer and loss of biodiversity have made everyone aware of environmental issues.

It is clear that no citizen of the earth can afford to be ignorant of environment issues. Environmental management has captured the attention of health care managers. Managing environmental hazards has become very important. In spite of the deteriorating status of the environment, study of environment has so far not received adequate attention in our academic programmes.

Course objective :

- To develop understanding of Environment Issues and Biodiversity
- To introduce to the students the environment, Disaster Management
- To enable students to understand ecosystem and preservation of environment
- To understand Disaster Management and handling them

Course Outcomes :

On completion of course students will be able:

1. To learn the different environmental issues and disasters.
2. To deal with problems associated with environment and effectively handle the disasters.

Unit 1: Environmental Pollution

A) Definition, Cause, effects and control measures of :-

Air pollution,Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management, urban and industrial wastes.

Role of an individual in prevention of pollution. Pollution case studies.

B) Social Issues and the Environment:

Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns.

Unit 2 : Ecosystems, Biodiversity and its conservation

A) Concept of an ecosystem.

Structure and function of an ecosystem, Producers, consumers and decomposers, • Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids.

Structure and function of the following ecosystem :

a. Forest ecosystem

b. Grassland ecosystem

c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity at global, National and local levels, India as a mega-diversity nation

Hot-sports of biodiversity, Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Unit 3 : Disaster Management

a) Causes – Natural disaster and Manmade disaster
b) Speed of onset – Sudden and Slow

Natural Disasters

These types of disaster naturally occur in proximity to, and pose a threat to, people, structures or economic assets.
Examples are Storm, Flood, Earthquake, Tsunamis

Manmade Disasters

Accidents: Road, Rail, Air, Sea, Building collapse.
Industrial Mishaps: Gas leak, Explosion, Safety.
Fire: Building, Coal, Oil.
Forest Fire (In tropical counters, forest fires are often manmade)
Speed of onset
1 Sudden onset: little or no warning, minimal time to prepare. For example, an earthquake, tsunami, cyclone, volcano, etc.
2 Slow onset: adverse event slow to develop; first the situation develops; the second level is an emergency; the third level is a disaster.
For example, drought, civil strife, etc.

Unit 4: Case Studies

- Environmental ethics: Awareness, Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air and Water (Prevention and Control of Pollution) Act
- Wildlife Protection Act and Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Role of an individual in prevention of pollution and case studies.

References:

1. Disaster Management: Disaster Manager's Handbook by W. Nick Carter, Asian Development Bank.
2. An Introduction To Disaster Management EBook By S. Vidyanathan - Publisher: IKON
3. Textbook for environmental studies ,ErachBharucha For UGC.