SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
TEACHING AND EXAMINATION SCHEME
Third Year (Electronics /Electronics and TelecommunicationEngineering)

(With effect from A.Y. 2016-17)CGPA PATTERN

Semester – V									
Subject Code	**Subject**	**Teaching Scheme**	**Credits**		**Examination Scheme (Marks)**				
		Hrs/Week	**TH**	**PR**	**ESE**	**MSE**	**CE**	**ESE**	**Total**
ECT301	Data Structures and Algorithms	4	3	---	80	20	---	---	100
ECT302	Digital Signal Processing	4	3	---	80	20	---	---	100
ECT303	Control Systems	4	3	---	80	20	---	---	100
ECT304	Stochastic Processes	4	3	---	80	20	---	---	100
ECT305	Embedded System Design	4	3	---	80	20	---	---	100
ECT306	Professional Ethics	2	---	1	---	---	30	70	100
ECT307	Embedded System Design Lab	2		1	---	---	30	70	100
ECT308	Data Structures and Algorithms Lab	2		1			30	70	100
ECT309	Digital Signal Processing and Lab	2		1			30	70	100
ECT310	Control System Lab	2		1			30	70	100
ECT311	Mini Project - I	4	---	2			100	--	100
	Total	34	15	7	400	100	250	350	1100

Semester – VI									
Subject Code	**Subject**	**Teaching Scheme**	**Credits**		**Examination Scheme (Marks)**				
		Hrs/Week	**TH**	**PR**	**ESE**	**MSE**	**CE**	**ESE**	**Total**
ECT312	Digital Communication Systems	4	3	--	80	20	--	--	100
ECT313	Digital System Design using HDL	4	3	--	80	20	--	--	100
ECT314	Electromagnetic Engineering	4	3	--	80	20	--	--	100
ECT315	Power Electronics	4	3	--	80	20	--	--	100
ECT316	Electronic Instruments and Measurements	4	3	--	80	20	--	--	100
ECT317	Professional Aptitude and Logical Reasoning.	2	--	1	--	--	30	70	100
ECT318	Power Electronics Lab	2	--	1	--	--	30	70	100
ECT319	Digital Communication Systems Lab	2	--	1	--	--	30	70	100
ECT320	Digital System Design using HDL Lab	2	--	1	--	--	30	70	100
ECT321	Electronic Instruments and Measurements Lab	2	--	1	--	--	30	70	100
ECT322	Mini Project - II	4	--	2	--	--	100	--	100
	Total	34	15	7	400	100	250	350	1100

Note:-There should be Minor-I and Minor-II .Minor-I should be conducted on unit:-1,2,3 and Minor-II should be conducted on Unit No:-4,5,6.Finally Average of Two should be consider.

Dr. Y. V. Joshi	**Dr.S.S. Gajre**	**Dr.S.K.Chidrawar**	**Dr.B.M.Patre**
Invitee	BOS Member	BOS Member	BOS Chairman

DATA STRUCTURES AND COMPUTER ALGORITHMS

Structure of the Course:

Lecture	: 4 hrs. / Week
Credits: 3	
Mid Semester Examination	: 20 Marks
End Semester Examination	: 80 Marks
Theory Examination: 3 Hours	
Subject Code	: ECT301

COURSE OBJECTIVES

Students who complete this course will be able to:

1. Write programs that use data structures such as: arrays, linked lists, stacks, queues, trees, hash tables, and graphs.
2. Compare and contrast the cost and benefits of dynamic and static structure implementations.
3. Choose the appropriate data structure for modeling a given problem.
4. Describe the concept of recursion and give examples of its use, identifying the base case and the general case of a recursively defined problem.
5. Compare iterative and recursive solutions for elementary problems.
6. Determine when a recursive solution is appropriate for a problem.
7. Determine the time and space complexity of simple algorithms and recursively defined algorithms.
8. Implement both a greedy and a divide-and-conquer algorithm to solve problems.
9. Implement the most common sorting algorithms.
10. Solve problems using the fundamental graph algorithms, including depth-first and breadth-first search, topological sort, minimum spanning tree algorithm, and single-source shortest path.

COURSE OUTCOMES

1. Able to understand the concepts of data structure, data type and array data structure.
2. Able to analyze algorithms and determine their time complexity.
3. Able to implement linked list data structure to solve various problems.
4. Able to understand and apply various data structure such as stacks, queues, trees and graphs to solve various computing problems using C-programming language.
5. Able to implement and know when to apply standard algorithms for searching and sorting.
6. Able to effectively choose the data structure that efficiently model the information in a problem

UNIT-I] INTRODUCTION TO DATA STRUCTURES [6 Hours]

Definition , types of data structure, overview of C++, detailed model of computer , simplified model of computer, introduction space complexity, time complexity.

UNIT-II] FUNDAMENTALS OF DATA STRUCTURES [7 Hours]

Array, multidimensional arrays, abstract data types, stack, applications of stack-conversion of expressions, parenthesis matching, tower of Hanoi, switch box routing. Queue, dequeue, circular
queue, priority queue, applications of queue- railroad car rearmament, wire routing, image

component labeling, machine shop simulations, linked list, circular linked list, list, sorting list,
ordered list.

UNIT-III] TREES AND SEARCHING [8 Hours]

Trees, basic Trees, n-ary tree, m-way search tree, complete binary tree, tree traversal, expression tree, applications of tree. Searching- basic Searching techniques, sequential searching, indexed searching tables, binary searching, hashing, dynamic and extendible hashing, and AVL tree.

UNIT-IV] GRAPH AND ALGORITHMS [7 Hours]

Definition, basics, representations of graph- linked ,Adjacency matrix, Adjacency list, set representation, spanning forests, DFT, BFT, Topological sort, Application of DFT, efficiency of DFT, Kruskal's and prim's algorithm, minimum cost spanning tree, round robin algorithm. Dijkstra's and Floyd's algorithm.

UNIT-V] ALGORITHMIC DESIGN TECHNIQUES [8 Hours]

Brute force, dynamic programming- assemble line scheduling, matrix chain multiplication, longest common subsequences, greedy algorithms- Huffman code, task scheduling problem, mortised analysis, incrementing a binary counter. Divide and conquer, backtracking algorithms

UNIT-VI] ADVANCED DATA STRUCTURES AND SORTERS [6 Hours]

Heaps, basics of heap, binary heap, Fibonacci search, B-tree, B+ tree., basics, insertion sorting,
exchange sorting- bubble sorting, quick sorting. Selection sort, merge sort, distribution sort- radix and bucket sort.

TEXT BOOKS:

1. B.R.Preiss, "Data Structures & Algorithms with Object Oriented Design Patterns in C++", John Wiely & Sons.
2. Yedidyah Langsam, Moshe J Augenstein, Aaron M. Tenenbaum, "Data Structures using C &
C++", Prentice Hall, Second Edition.
3. Thomas H Cormen, Charles E Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", PHI Publication, Second Edition

REFERENCE BOOKS:

1. Satraj Sahani, "Data Structures Alogorithms & Applications in C++", Mc Graw Hill.
2. A. Drozdek, "Data Structure in C++", Vikas Publication, Second Edition.
3. G. Heileman, "Data Structures & Algorithms with Object Oriented Programming", Tata Mc
Graw Hill, 2002.
4. Varlaxmi, "Programming in C++".
5. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3rd Edition, Pearson Education, 2007. (ISBN-10: 032144146X, ISBN-13: 9780321441461)

DATA STRUCTURES AND COMPUTER ALGORITHMS LABORATORY

Teaching Scheme :	Examination Scheme:
Practical – 2 hrs / week	CE: 30 Marks
Credit : 1	ESE: 70 Marks

COURSE OBJECTIVES

1. Familiarize the student with good programming design methods, particularly TopDown design, bottom up design.
2. Develop algorithms for manipulating stacks, queues, linked lists, trees, graphs.
3. Develop the data structures for implementing the above algorithms.
4. Develop recursive algorithms as they apply to trees and graphs.
5. Demonstrate understanding of various sorting algorithms, including bubble sort, selection sort, quick sort, merge sort, heap sort, distribution sort.
6. Familiarize the student with the issues of Time complexity and examine various algorithms from this perspective.

LABORATORY OUTCOMES

1. Able to understand the importance of structure and abstract data type, and their basic usability in different applications through different programming languages.
2. Able to analyze and differentiate different algorithms based on their time complexity.
3. Able to understand the linked implementation, and its uses both in linear and non-linear data structure.
4. Able to understand various data structure such as stacks, queues, trees, graphs, etc. to solve various computing problems.
5. Able to implement various kinds of searching and sorting techniques, and know when to choose which technique.
6. Able to decide a suitable data structure and algorithm to solve a real world problem.

LIST OF EXPERIMENTS

Note: Faculty should conduct any 10 experiments in the semester out of 15 experiments using C++ Language

1. Implement the Polynomial representation using a Array
2. Implement the Stack operation Push and Pop
3. Implement the Application of Stack Infix to Postfix
4. Make the basic operations of circular Queue
5. Implement the Circular Doubly Link-List.
6. Implement the Binary Search Tree (BST) Traversal for Inorder, Preorder and Postorder.
7. Find the Shortest Path using Diskstra’s Algorithm.
8. Find the Shortest Path using Prim’s Algorithm.
9. Implement Longest Common Subsequence(LCS)
10. Implement the Shorting using Quick Short method
11. Implement the Shorting using Merge Short method
12. Implement the Static Hashing using any one method
13. Arrange words in dictionary order using Binary Search Tree In order Traversal
14. Implement generalizes representation of Link List for polynomial, matrix- …etc type of application
15. Implement Matrix Chain Multiplication.

DIGITAL SIGNAL PROCESSING

Structure of the Course:

Lecture	: 4 hrs. / Week
Credits: 3	
Mid Semester Examination	: 20 Marks
End Semester Examination	: 80 Marks
Theory Examination	: 3 Hours
Subject Code	: ECT302

COURSE OBJECTIVES

1. Understand fundamentals of Digital Signal Processing.
2. Analyze & compare different signal processing strategies.
3. Become aware of some applications of DSP.

COURSE OUTCOMES

1. Understand the Discrete Time Signals Analytically & Visualize them in the time and frequency domain.
2. Able to Understand the Transform domain & it's significance & problems related to computational complexity.
3. Be able to specify & design any digital filters.

UNIT-I] Signals & Systems: [06 Hours]

Motivation, Advantages of DSP over ASP, Applications of DSP, Review of Discrete time signals & systems, Definition of Z-Transform, Rational Z-transform, ROC, Inverse Z-transform, Properties of Z-transform, Transfer function.

UNIT-II] Finite-Length Discrete Transforms: [06 Hours]

Discrete Fourier transform, Inverse DFT, Relation between DTFT & DFT, Properties of DFT, Circular convolution, Linear convolution using DFT, Discrete Cosine transform,The Harr transform.

UNIT-III] Frequency-Domain Analysis of LTI Systems: [06 Hours]

Frequency-Domain characteristics of LTI systems, Frequency response of LTI systems, LTI systems as frequency selective filters, All pass systems, Inverse systems, Minimum-phase & Maximum-phase systems, System identification & deconvolution.

UNIT-IV] Digital Filter Structures: [06 Hours]

Block diagram representation, Equivalent structures, Basic FIR structures, Basic IIR structures, All pass structures, IIR tapped cascaded lattice structures, FIR cascaded lattice structures.

UNIT-V] Digital Filter Design: [10 Hours]

IIR filter design- Bilinear transformation, Impulse invariant transformation,

Low pass IIR digital filters, Spectral transformations, FIR filter design using windowing technique, and Frequency sampling technique.

UNIT-VI] DSP Algorithm Implementation: [06 Hours]

Fast Fourier Transform, FFT algorithms, Radix-n algorithms, Decimation in time& Decimation in frequency FFT algorithms.

Text Books:

1. S.K.Mitra, Digital Signal Processing A Computer-Based Approach, TMH (ISBN 0-07-232105-9).
2. J. G. Proakis, Digital Signal Processing Principles, Algorithms & Applications, PHI.

References Books:

1. A.V.Oppenheim, Discrete Time Signal Processing, PHI.
2. E.C.Ifeachor, Digital Signal Processing A Practcal Approch, Pearson Education Asia.

DIGITAL SIGNAL PROCESSING LAB

Teaching Scheme :	**Examination Scheme:**
Practical – 2 hrs / week	**CE: 30 Marks**
Credit : 1	**ESE: 70 Marks**

List Of Experiment:-

Note:-Any five practical from the below list should be perform.

Sr.No.	Name of the Experiment
1.	Study of the Different commands used in MATLAB for signal and system
2.	MATLAB Program for calculating 1-D linear convolution and circular convolution
3.	MATLAB program to find N-Point Discrete Fourier Transform (DFT) & Inverse Discrete Fourier Transform (IDFT)
4.	To implement DIT - FFT algorithm using matlab.
5.	To implement DIF - FFT algorithm using matlab.
6.	MATLAB program to find poles and zeros of transfer function
7.	MATLAB program to design Butterworth IIR low pass filter
8.	MATLAB program to design Chebyshev-I low pass filter
9.	Design and implementation of FIR filter using Windowing
10	Design and Implementation of IIR filter using bilinear transform

CONTROL SYSTEMS

Structure of the Course:

Lecture	: 4 hrs. / Week
Credits: 3	
Mid Semester Examination	: 20 Marks
End Semester Examination	: 80 Marks
Theory Examination	: 3 Hours
Subject Code	: ECT303

COURSE OBJECTIVES

1) To teach the fundamental concepts of Control systems and mathematical modeling of the system

2) To study the concept of time response and frequency response of the system

3) To teach the basics of stability analysis of the system

COURSE OUTCOMES

1) Represent the mathematical model of a system

2) Determine the response of different order systems for various step inputs

3) Analyse the stability of the system

Chapter 1. Introduction to Control Systems **[10Hours]**

Definition, elements of control systems, examples of control systems, open loop and closed loop control systems, effect of feedback on overall gain, parameter variations, external disturbances or noise and control over system dynamics, regenerative feedback. Laplace Transform and its properties **Mathematical Modeling of Systems -** canonical form of feedback control systems, transfer function and impulse response function, block diagram representation of control system, rules and reduction techniques, signal flow graph: elements, definition, properties, Masons gain formula, application of gain formula to block diagrams.

2. Time Response of feedback control systems **[6Hours]**

Standard test signals, transient response, Unit step response of First and second order systems, Transient response specifications, classification of systems according to type's and, steady– state errors Steady – state analysis of different types of systems using step, ramp and parabolic input signals, effect of adding poles and zeros to transfer functions, effects of integral and derivative control action on system

3 State Variable Analyses and Design **[4Hours]**

Concept of state, state variable, and state model, state model for linear continuous time system, diagonalisation, solution of state equation, concept of controllability and observability.

4 Stability analysis of linear control system **[6 Hours]**

Concepts of stability, Necessary conditions for Stability, Routh- stability criterion, Relative stability analysis; More on the Routh stability criterion. Root–Locus Techniques: Introduction, The root locus concepts, Construction of root loci.

5 Frequency domain analyses: ,. **[9Hours]**

Correlation between time and frequency response, frequency response specifications, stability analysis with Bode plots, gain margin, phase margin, Introduction to lead, lag and lead-lag compensating networks (excluding design). Stability in the frequency domain: Introduction to Polar Plots, (Inverse Polar Plots excluded) Mathematical preliminaries, Nyquist Stability criterion, Assessment of relative stability using Nyquist criterion

6. CONTROL SYSTEM COMPONENTS

AC and DC servo motors, synchro transmitters and receivers, stepper motors, architecture of PLC and SCADA, Potentiometers.
5Hours

Reference Books:

1. K. Ogata, Modern Control Engineering, Fourth edition, Pearson Education India, 2002.
2. I.J. Nagrath and M. Gopal, Control Systems Engineering, Third Edition, New age International Publishers, India, 2001.

3. B.C. Kuo, Automatic Control Systems, Seventh Edition, Prentice–Hall of India, 2000.
4. "Feedback and Control System", Joseph J Distefano III et al.,Schaum's Outlines, TMH, 2nd Edition 2

CONTROL SYSTEM LAB

Teaching Scheme : **Examination Scheme:**

Practical – 2 hrs / week **CE: 30 Marks**

Credit : 1 **ESE: 70 Marks**

Control system lab: Hardware (**any four**)

Control system lab: **Hardware** (**any four**)

1) Study the performance of an open and closed loop control system using Op-Amp based electronic amplifiers.
2) Study of ac and dc positional control system
3) Study of potentiometric error detector
4) Study and measurement of basic step angle using stepper motor controller.
5) Study the performance of synchro transmitter and receiver as a transducer and error detector.
6) Temperature controller using PID controllers

Software (any four):

1) Compare and plot the unit step response of unity feedback system with the given forward path transfer function.
2) Write a program that will compute transient response specifications of second order system. Generalize it for accepting different values of natural frequency and damping factor.
3) Program for compensator design using bode plot.
4) Program for root locus analysis.
5) Study and plot step response of addition of a pole and zero to the forward path of unity feedback system

STOCHASTIC PROCESSES

Structure of the Course:

Lecture	: 4 hrs. / Week
Credits: 3	
Mid Semester Examination	: 20 Marks
End Semester Examination	: 80 Marks
Theory Examination	: 3 Hours
Subject Code	: ECT304

COURSE OBJECTIVES

• To provide necessary basic concepts in statistical signal analysis.
• To study about random processes and its properties
• Apply the basic concepts to various elementary applications.

COURSE OUTCOMES

• Have a fundamental knowledge of the basic probability concepts
• Have a good knowledge of standard distributions which can describe real life phenomena.
• Acquire skills in handling situations involving several random variable and functions of random variables.
• Understand and characterize phenomena which evolve with respect to time in probabilistic Manner

UNIT – I [08 Hours]

Overview of Probability Theory: Sets, Fields and Events, Axiomatic Definition of Probability, Joint, Conditional, and Total Probability, Bayes' Theorem and Applications.
Random Variables: Definition, Probability Distribution Function, Probability Density Function, Common Density Functions, Continuous, Discrete and Mixed Random Variables, Conditional and Joint Distributions and Densities, Independence of Random Variables.

UNIT – II [05 Hours]

Functions of Random Variables: One Function of One Random Variable, One Function of Two Random Variables, Two Functions of Two Random Variables.

UNIT – III [07 Hours]

Expectation: Fundamental Theorem of Expectation, Conditional Expectations Moments, Joint Moments, Jointly Gaussian Random Variables, Chebyshev and Schwarz Inequalities, Moment Generating Functions, Chernoff Bound, Characteristic Functions, Joint Characteristic Functions, Central Limit Theorem.

UNIT - IV [05 Hours]

Random Vector: Joint Distribution and Densities, Multiple Transformation of Random Variables, Expectation Vectors and Covariance Matrices, Properties of Covariance Matrices

UNIT - V **[07 Hours]**

Random Sequences: Basic Concepts, Random Sequences and Linear Systems, WSS Random Sequences, Power Spectral Density, Interpretation of PSD, Markov Random sequences, ARMA Models, Markov Chains,
Convergence of Random Sequences: Definitions, Laws of large numbers.

UNIT – VI **[08 Hours]**

Random Processes: Basic Definitions, Poisson Counting Process, Wiener Process, Markov Random Processes, Birth-Death Markov Chains, Chapman-Kolmogorov Equations, Stationarity, Wide Sense Stationarity, WSS Processes and LSI Systems, Power Spectral Density, White Noise, Periodic and Cyclostationary Processes.

Text Book:

1. Henry Stark and John W. Woods "Probability and Random Processes with Applications to Signal Processing", Pearson Education, Third edition.

References:

1. Athanasios Papoulis and S. Unnikrishna Pillai. Probability, Random Variables and Stochastic Processes, TMH
2. Gray, R. M. and Davisson L. D. An Introduction to Statistical Signal Processing. Cambridge University Press, 2004
(Available at: http://www.ee.stanford.edu/~gray/sp.html)

EMBEDDED SYSTEM DESIGN

Structure of the Course:

Lecture	: 4 hrs. / Week
Credits: 3	
Mid Semester Examination	: 20 Marks
End Semester Examination	: 80 Marks
Theory Examination	: 3 Hours
Subject Code	: ECT305

COURSE OBJECTIVES

- To understand the need and applications of Microcontrollers and ARM Processors in embedded system.
- To understand architecture and features of typical Microcontroller.
- To understand architecture and features of ARM7 Processor.
- To learn interfacing of real world input and output devices
- To study various hardware and software tools for developing applications

COURSE OUTCOMES

- After successfully completing the course students will be able to describe the microcontroller and ARM Processor Architecture and its Features.
- Learn importance of microcontroller and ARM Processor in designing embedded applications.
- Learn use of hardware and software tools.
- Develop interfacing to real world devices.

UNIT-I: INTRODUCTION TO EMBEDDED SYSTEM [06 Hours]

Embedded System, Processor embedded into system, Classification of embedded system.
Harvard and Von Neumann architecture, 89C51 Microcontroller Architecture (Block diagram),Family devices and its derivatives, Pin Diagram and port structure, Memory and Register organization.

UNIT-II: 89C51 PROGRAMMING (Assembly and C) [07 Hours]

Addressing modes, Instruction Set, Programming; Arithmetic, Logical, Code conversion (BCD to Binary etc.), I/O Port Programming, Timer/Counter and Serial port programming, Interrupt Programming.

UNIT-III: REAL WORD INTERFACING WITH 89C51 [07 Hours]

Interfacing External memory and I/O, Matrix Key pad, 16x2 LCD display 4-bit and 8-bit mode, ADC0809 and DAC 0808.

UNIT-IV: ARM PROCESSOR FUNDAMENTALS [06 Hours]

The RISC and ARM design philosophy, Embedded system hardware and software, Registers, CPSR, 3stage and 5-stage pipeline, Interrupts and Vector table, Core extension, ARM processor family.

UNIT-V: ARM ASSEMBLY LANGUAGE PROGRAMMING [07 Hours]

Introduction to ARM, Thumb Instruction Set, Loads and Stores: The Instructions,
Operand Addressing, Pre-Indexed Addressing, Post-Indexed Addressing ,Endianness, Changing Endianness, Arithmetic, logical and bit manipulation, Branches and loops, Subroutine and Stack.

UNIT-VI: ARM7 BASED MICROCONTROLLER **[07 Hours]**

LPC2148 features, Architecture (Block diagram and its description), System control block, Memory map, GPIO, On chip ADC and DAC, Parallel and serial port accessing.

Text Books:

1. Muhammad Ali Mazidi,Janice Gillispie, Rolin D.McKinlay,"The 8051 Microcontroller and Embedded Systems Using Assembly and C" Pearson Education

2. Andrew N.Sloss,Dominic Symes,Chris Wright,"ARM System Developer's Guide Design and Optimizing System Software", Elsevier.

Reference Books:

1. Willam Hohi, Christopher Hinds," ARM Assembly Language Fundamentals and Techniques"
Second Edition, CRC Press.

2. David Seal," ARM Architecture Reference Manual", Adison Wesley.

Web: www.Keil.com
www.nxp.com

EMBEDDED SYSTEM LAB

Teaching Scheme : Examination Scheme:

Practical – 2 hrs / week CE 30 Marks

Credit : 1 ESE: 70 Marks

Any Four experiments on 89c51 and four on ARM:

List of Experiments (89C51):

1. Write a program to add two 8-bit numbers.
2. Write a program to multiply and Divide two 8-bit numbers stored in memory locations.
3. Write a program to multiply two 16-bit numbers.
4. Write a program to transfer block of data from code memory to data memory.
5. I/O Port programming.
6. 8051 UART programming
7. Interfacing ADC and DAC.
8. Interfacing Matrix Keyboard.

List of Experiments (ARM LPC2148):

1. Introduction to ARM Assembly Language Programming with KEIL and Assembler
   Directives: Write assembly language program to convert BCD to HEX and HEX to BCD.
2. Write an Assembly language program to ON and OFF the LED.
3. Write a C program to generate 1 Hz signal from port 0.
4. Write a C Program to Verify SPI Interface with Variable Clock Frequency and Data Transfer.
5. Write a C program to verify UART serial communication and verify that same on Hyper Terminal of a computer.
6. Interfacing LPC2148 to LCD.
7. Interfacing LPC2148 for internal ADC and DAC.
8. Interfacing EEPROM to LPC2148 using I2C protocol.

PROFESSIONAL ETHICS

Structure of the Course:

Lecture	: 2 hrs. / Week
Credits: 1	
Subject Code	: ECT306
CE 30 Marks	: ESE: 70 Marks

COURSE OBJECTIVES

- To create awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.
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COURSE OUTCOMES

At the end of the course, students should:

- Be able to distinguish among morals, values, ethics, and the law and to explore how they impact professional practice;
- Have an increased personal understanding of issues related to ethics and the law;
- Have examined one's own ethical decision-making processes and develop guidelines for enhancing one's ability to generate ethical behavior and solutions to conflicts arising in the practice.

1. HUMAN VALUES **[03 Hours]**

Concept of Human values, Moral Values and Ethics, Integrity, Work Ethic, Honesty, Courage, Empathy, Self-Confidence, Character.

2. ENGINEERING ETHICS **[05 Hours]**

Senses of 'Engineering Ethics', variety of moral issues, types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, Gilligan's theory, consensus and controversy, Models of Professional Roles theories about right action, Self-interest, customs and religion, uses of ethical theories. Valuing Time, Co-operation, Commitment.

3. ENGINEERING AS SOCIAL EXPERIMENTATION **[04 Hours]**

Engineering as experimentation, engineers as responsible experimenters, codes of ethics, a balanced outlook on law, the challenger case study.

4. SAFETY, RESPONSIBILITIES AND RIGHTS **[04 Hours]**

Safety and risk, assessment of safety and risk, risk benefit analysis and reducing risk, the three mile island and Chernobyl case studies.

5. GLOBAL ISSUES **[04 Hours]**

Multinational corporations, Environmental ethics, computer ethics, weapons development, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership-

TEXT BOOKS

1. R. S. Naagrazan, “Professional Ethics and Human Values”, New Age International Publishers 2006
2. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw-Hill, New York 1996.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCES

1. Charles D. Fleddermann, “Engineering Ethics”, Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint now available).
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.

Mini Project-I

Structure of the Course:
Practical : 4 hrs. / Week Credits: 2
Continuous Evaluation : 100 Marks

Course Objectives:
1)To be able to apply some of the techniques/principles you have been taught
2) To carry out budget and time planning for the project.
3) To inculcate electronic hardware implementation skills by learning PCB artwork design using an appropriate EDA tool.
4) To follow correct grounding and shielding practices
5) To do effective trouble-shooting of the mini project.
6) To develop effective communication skill by delivering a seminar based on mini project

Course Outcome:
Upon completion of miniproject the students will be able to
1) Demonstrate a through and systematic understanding of project contents.
2) Understand methodologies and professional way of documentation and communication.
3) Know the key stages in development of the project.
4) **Extend or use the idea in mini project for major project.**

Guidelines for miniproject:
1) Each mini project group should consist of two students.
2) Mini Project work should be carried out in the department laboratories only.
3) Project design ideas should be discussed with respective guide.
4) Hardware component is mandatory.
5) Layout versus schematic verification is mandatory and must be completed in department laboratory only.
6) Domains for projects may be from the following, but not limited to:
Electronic Communication Systems, Analog or Digital Electronics, Biomedical Electronics, Power Electronics, Audio , Video Systems, Embedded Systems, Instrumentation and Control Systems , etc.Microcontroller based projects should preferably use Microchip PIC Controllers.
7) After completion of mini project at the end of the semester, each group should show the demonstration and deliver seminar based on mini project.
8) A spiral bound project report should be prepared in MS-LATEX using the following guidelines

Guidelines for structuring and formatting of the project report:
Front Pages
Page 1 Title Page
Page 2 Certificate
Page 3 Acknowledgement
Page 4 Contents
Page 5 Abstract
Page 6 List of Figures/ tables/ screens

Digital Communication Systems

Structure of the Course:

Lecture	: 4 hrs. / Week
Credits: 3	
Mid Semester Examination	: 20 Marks
End Semester Examination	: 80 Marks
Theory Examination	: 3 Hours
Subject Code	: ECT312

COURSE OBJECTIVES

- To understand the building blocks of digital commutation system.
- To analyze error performance of a digital communication system in presence of noise and other interferences.
- To understand information theoretic behavior of a communication system.
- To understand various source coding and channel coding techniques.
- To understand Multiple Access and Spread Spectrum Techniques.

COURSE OUTCOMES

After successfully completing the course students will be able to

- Perform the time and frequency domain analysis of the signals in a digital communication systems.
- Design a suitable source and channel coding scheme for a communication system.
- Analyze Performance of Multiple Access and Spread Spectrum Techniques.

UNIT: 1 – Introduction to Digital communication : [7 Hours]

Pulse communication - PAM, PWM, PPM – Generation and detection, Applications Elements of a Digital communication system, Advantages and disadvantages of digital communication Pulse code modulation - Generation and reconstruction Quantization noise, non-uniform quantization, Companding, applications , DPCM, DM, ADM.

UNIT: 2 - Digital Modulation Techniques : [7 Hours]

ASK, FSK, PSK, QPSK,MSK, QAM,M-ary modulation techniques, Coherent and Non coherent detection of ASK, FSK, PSK Probability of error calculations for ASK, FSK, PSK, Matched filter receivers, Bandwidth consideration

UNIT: 3 – Information Theory and Source Coding : [6 Hours]

concept of Information, Entropy, Information Rate, Mutual information, channel capacity, Bandwidth – SNR Tradeoff source coding theorem, Huffman coding, Shannon Fano coding

UNIT: 4 – Channel Coding: [7 Hours]

Parity coding, Linear block codes, Hamming code, error detection and correction capability of Hamming code, syndrome decoding, cyclic codes

UNIT: 5 – Convolution codes : [6 Hours]

Code rate, constraint length and dimension of the code, code tree, trellis and state diagram for a convolution encoder, Viterbi algorithm for decoding of convolution code, sequential decoding

UNIT: 6 – Multiple Access and Spread Spectrums Techniques [7 Hours]

Multiple Access Techniques - FDMA, TDMA, CDMA, Necessity, Definition and classification of spread spectrum modulation techniques Direct sequence spread spectrum (DSSS)with coherent PSK, Jamming, Processing gain, Applications, Frequency Hop spread spectrum (FHSS)

TEXT BOOK

- Communication Systems – Simon Haykin, Jon Wiley
- Digital Communication – Simon Haykin, Jon Wiley
- Digital Communication – Bernard Sklar, Parson education

Reference Books

- Digital communication – John Proakis, Mcgraw-Hill
- Information theory, Coding and cryptography – Ranjan Bose, Mcgraw-Hill
- Essentials of Error-Control Coding- J C Moreira P G Farrell, Wiley Student Edition

DIGITAL COMMUNICATION SYSTEMS LAB.

Teaching Scheme : Examination Scheme:

Practical – 2 hrs / week CA: 30 Marks

Credit : 1 ESA : 70 Marks

Note:

1. **Perform any five experiments from group – A and any 5 from group – B.**
2. **Group – A experiments will be hardware based.**
3. **Group – B experiments should be performed using software like Matlab.**

Name of the experiment

Group – A

1. Generation & Detection of PCM and Companded PCM
2. Generation & Detection of DM and ADM
3. Generation & Detection of BPSK and QPSK
4. Generation & Detection of BFSK
5. Generation & Detection of ASK
6. Generation of PN Sequence and its spectrum.
7. Generation & Detection of DS-SS.

Group – B

1. Write a program for determination of various entropies and mutual information of a given channel. Test Noise free and Noisy channel. Compare channel capacity of mentioned channels.
2. Write a program for Shannon – Fano coding and decoding.
3. Write a program for Huffman Coding and decoding.
4. Write a program for coding & decoding of Linear block codes.
5. Write a program for coding & decoding of Cyclic codes.
6. Write a program for coding & decoding of convolution codes.
7. Write a program to study performance of a coded & Uncoded communication system (Calculate the error probability

DIGITAL SYSTEM DESIGN USING HDL

Structure of the Course:

Lecture	: 4 hrs. / Week
Credits: 3	
Mid Semester Examination	: 20 Marks
End Semester Examination	: 80 Marks
Theory Examination	: 3 Hours
Subject Code	: ECT313

UNIT I: [5 HOURS]

Introduction to VHDL, design units, data objects, signal drivers, inertial and transport delays, delta delay, VHDL data types, concurrent and sequential statements.

UNIT II: [5 HOURS]

Subprograms – Functions, Procedures, attributes, generio, generate, package, IEEE standard logic library, file I/O, test bench, component declaration, instantiation, configuration.

UNIT III: [8 HOURS]

Combinational logic circuit design and VHDL implementation of following circuits – first adder, Subtractor, decoder, encoder, multiplexer, ALU, barrel shifter, 4X4 key board encoder, multiplier, divider, Hamming code encoder and correction circuits.

UNIT IV: [8 HOURS]

Synchronous sequential circuits design – finite state machines, Mealy and Moore, state assignments, design and VHDL implementation of FSMs, Linear feedback shift register (Pseudorandom and CRC)

UNIT V: [8 HOURS]

Asynchronous sequential circuit design – primitive flow table, concept of race, critical race and hazards, design issues like metastability, synchronizers, clock skew and timing considerations.

UNIT VI: [6 HOURS]

Introduction to place & route process, Introduction to ROM, PLA, PAL, Architecture of CPLD (Xilinx / Altera).

TEXT BOOKS:

1. VHDL – 3 rd Edition – Douglas Perry – TMH
2. Fundamentals of Digital Logic with VHDL design – Stephen Brown, Zvonko Vranesic – TMH.
3. Digital Design Principles – Fletcher.
4. VHDL Synthesis – J Bhasker.
5. VHDL Primer – J Bhasker – Pearson Education.

REFERENCE BOOKS:

1. Digital System Design Using VHDL – Chales H. Roth.
2. Digital System Design – John Wakerley.
3. VHDL – Zainalabedin Navabbi.
4. VHDL – D. Smith.

DIGITAL SYSTEM DESIGN LAB

CE : 30 Marks
ESE: 70 Marks
Credit: 1
Subject Code :

Practical Examination:3 Hours, 70 marks

Note: Programming can be done using any compiler. Download the programs on a FPGA/CPLD boards such as Apex/Acex/Max/Spartan/Sinfi/TK Base or equivalent and performance testing may be done using 32 channel pattern generator and logic analyzer apart from verification by simulation with tools such as Altera/Modelsim or equivalent.

PROGRAMMING (using VHDL)

1. Write HDL code to realize all the logic gates
2. Write a HDL program for the following combinational designs
   a. 2 to 4 decoder
   b. 8 to 3 (encoder without priority & with priority)
   c. 8 to 1 multiplexer
   d. 4 bit binary to gray converter
   e. Multiplexer, de-multiplexer, comparator.
3. Write a HDL code to describe the functions of a Full Adder Using three modeling styles.
4.. Write a model for 32 bit ALU using the schematic diagram shown below

A (31:0) B (31:0)

Opcode (3:0)

Enable

- ALU should use combinational logic to calculate an output based on the four bit op-code input.
- ALU should pass the result to the out bus when enable line in high, and tri-state the out bus when the enable line is low.
- ALU should decode the 4 bit op-code according to the given in example below.

OPCODE	ALU OPERATION
1	A + B
2	A – B
3	A Complement
4	A * B
5	A AND B
6	A OR B
7	A NAND B
8	A XOR B

4. Develop the HDL code for the following flip-flops, SR, D, JK, T.
5. Design 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset) and “any sequence” counters

INTERFACING (at least four of the following must be covered using VHDL)

1. Write HDL code to display messages on the given seven segment display and LCD and accepting Hex key pad input data.
2. Write HDL code to control speed, direction of DC and Stepper motor.
3. Write HDL code to accept 8 channel Analog signal, Temperature sensors and display the data on LCD panel or Seven segment display.
4. Write HDL code to generate different waveforms (Sine, Square, Triangle, Ramp etc.,) using DAC change the frequency and amplitude.
5. Write HDL code to simulate Elevator operations
6. Write HDL code to control external lights using relays.

ELECTROMAGNETIC ENGINEERING

Structure of the Course:

Lecture	: 4 hrs. / Week
Credits: 3	
Mid Semester Examination	: 20 Marks
End Semester Examination	: 80 Marks
Theory Examination	: 3 Hours
Subject Code	: ECT314

COURSE OBJECTIVES

To provide the basic skills required to understand, develop & design various engineering applications involving electrostatic and electromagnetic fields. To lay the foundations of electromagnetism & its practice in modern communications such as wireless, guided wave principles such as fiber optics & electromagnetic structures.

COURSE OUTCOMES

After the successful completion of the course student should be able to:

1. Apply vector calculus to static electric-magnetic fields in different engineering situations.
2. Analyze Maxwell's equations in different forms (differential & integral) & apply them to engineering problems.
3. Examine the phenomena of wave propagation in different media & its interfaces & in applications of microwave engineering.
4. Analyze the nature of electromagnetic wave propagation in guided medium which are used in microwave applications.

UNIT I - Vector analysis Coulomb's Law and Electric field Intensity. [5 Hours]

Scalars & vectors, Vector Algebra, The Cartesian Coordinate System, Vector components & Unit Vectors, The vector field, The Dot Product, The cross product, Other Coordinate Systems: Circular Cylindrical Coordinates, The Spherical Coordinate System. The experimental law of coulomb, electric field intensity, field due to a continuous volume charge distribution, field of a line charge, field of a sheet charge, streamlines and sketch's of field.

UNIT II- Electric flux density, gauss law and Divergence: [4 Hours]

Electric flux density, Gauss's law application of Gauss law, Divergence, Maxwell's first equation, Vector operator del and divergence theorem.

UNIT III- Energy and potential: [5 Hours]

Energy expanded in moving a point charge electric field, Line integral, definition of potential difference and potential, Potential field of a point charge and system of charges, Potential gradient, The dipole, energy density in the electrostatic field.

UNIT IV- Conductor's Dielectrics and capacitance: [6 Hours]

Current and current density, continuity of current, conductor properties and boundary condition's, Method's of images, nature of dielectric materials, boundary condition's for perfect dielectric materials, capacitances and it's example, capacitance of two wire line.

UNIT V- Poisson's and lap lace's Equations: [4 Hours]

Poisson and laplaces equations, Uniqueness theorem, Example of solution of laplaces and poisons equation.

UNIT VI- Steady Magnetic field: **[5 Hours]**
Biot savart law, Ampere's circuital law, Curl, Stoke's theorem, Magnetic flux and magnetic flux density, scalar and vector magnetic potentials.

UNIT VII- Magnetic Forces, Materials and Inductance: **[4 Hours]**
Force on a moving charge, force between differential current elements and force and torque on a closed circuit, Magnetic boundary condition.

UNIT VIII- Time varying field and Maxwell's equations: **[4 Hours]**
Faraday's law, displacement current, Maxwell's equations in point form and integral form.

UNIT IX- Uniform Plane wave: **[3 Hours]**
The wave motion in free space and perfect dielectrics.

REFERENCE BOOKS:

1] W.H. Hayt, Engineering Electromagnetic, Tata McGraw Hill.
2] N.Narayanrao, Basic Electromagnetic with application.
3] J.D. Kraus, Electromagnetic, McGraw Hill.
4] M.A. Wazed Miah, Fundamental's of electromagnetic, Tata McGraw Hill.

POWER ELECTRONICS

Structure of the Course:

Lecture	: 4 hrs. / Week
Credits: 3	
Mid Semester Examination	: 20 Marks
End Semester Examination	: 80 Marks
Theory Examination	: 3 Hours
Subject Code	: ECT315

COURSE OBJECTVIES :

1. To teach fundamental principles of thyristor family.

2. To develop an overall approach for students from construction of control rectifier , inverter, choppers, study its specification, the functionality, design and practical applications

3.To become familiar with power devices and their application in various fields

4. Learners are expected to understand various controllers , converters , inverters and choppers

COURSE OUTCOMES :

After successful completion of the course student will be able to

1. Demonstrate an understanding of fundamentals of thyristor family.

2. Analyze the various applications and circuits based on thyristor .

3.Build and test circuits using power devices such as SCR, IGBT and MOSFET.
4. Analyze and design controlled rectifier, DC to DC converters, DC to AC inverters, how to analyze these inverters and some basic application examples

UNIT-I] Characteristics of Semiconductor Power Devices [5 Hours]

Power Transistor ,Power MOSFET and IGBT. Treatment should consist of structure, Characteristics, operation, ratings. Concept of fast recovery and Schottky diodes and feedback diode as free wheeling.

UNIT-II] THYRISTOR FAMILIES AND TRIGGERING DEVICES [6 Hours]
SCR, TRIAC, GTO, LASCR, UJT, PUT and DIAC- Construction, steady state and switching characteristics, performance parameters and SCR protection circuit.

UNIT-III] TRIGGERING, CONTROLLED CONVERTERS [9Hours]
R and RC triggering, UJT triggering circuits. Single phase and three phase half controlled converters, full controlled converters, and dual converters, effect of load and source inductance, power factor improvement technique.

UNIT-IV] COMMUTATIONS OF SCR AND INVERTERS [8 Hours]
Different commutation techniques – circuits and principle of operation. Parallel inverters, series inverters, 3-phase inverters.

UNIT-V] AC VOLTAGE CONTROLLER **[6 Hours]**

Principle of ON\OFF control and phase control, single phase ac voltage controllers with R and RL loads, cycloconverters, reduction of output harmonics in cycloconverters.

UNIT-VI] DC CHOPPERS **[6 Hours]**

Principle of operation of step-down and step-up choppers, 2-Quadrant and 4- Quadrant choppers, Voltage and current commutated choppers, use of source filter.

TEXT BOOK:

1] M.H. RASHID, POWER ELECTRONICS, PHI

REFRENCE BOOKS:

1] P.S. Bimbra, "Power Electronics", Khanna publishers.
2] M. Ramamoorthy, "Introduction to Thyristor and Their Applications", Eastwest press.
3] P.C. Sen." Power Electronics", Tata McGraw Hill.
4] General Electric, SCR manual, Prentice Hall.
5] M D Singh & K B Khanchandani –"Power Electronics", Tata McGraw Hill.
6] G K Dubey "Thyristorised Power Controllers" - Willy Eastern.

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POWER ELECTRONICS LABORATORY

CE : 30 Marks Practical Examination:3 Hours, 70 marks
ESE : 70 Marks
Credit : 1
Subject Code: ECT315

List of Experiments: (Any eight)

1] Device characteristics of SCR and UJT.

2] Device characteristics of TRIAC & DIAC

3] Triggering circuits R, RC and UJT triggering circuits.

4] Commutations circuits Class ‘A’,’B’,’C’,’D’

5] Controlled converters: full wave converters.

6] Phase control of TRIAC using DIAC.

7] 1Φ series inverter.

8] 1Φ parallel inverter.

9] 1Φ AC voltage controller.

10] Study of cyclo converter.

11] Dual converter.

ELECTRONIC INSTRUMENTS AND MEASUREMENTS

Structure of the Course:

Lecture	: 4 hrs. / Week
Credits: 3	
Mid Semester Examination	: 20 Marks
End Semester Examination	: 80 Marks
Theory Examination	: 3 Hours
Subject Code	: ECT316

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COURSE OBJECTIVES

1. To understand scientific measurement principles and concepts behind modern electronic instrumentattion
2. To understand the principle of various types of transducers
3 To know the construction and working of frequently used equipments like CRO, Signal generator, spectrum analyzer etc.

COURSE OUTCOMES

Upon completion of this course, the students shall be able to
1 To identify various errors in measurement system and correct them.
2 To know the fundamentals of measuring systems including the particular limitations and capabilities of
a number of measuring devices (pressure transducers, strain gages, thermocouples, etc.) and equipments
(oscilloscope, spectrum analyser, etc.).
3. To be familiar with various computer controlled test systems

UNIT – I **[05 Hours]**
Measurement errors : Gross errors and systematic errors, Absolute errors and relative errors, Accuracy
, precision, resolution, and significant figures, Measurement error combinations, Basics of Statistical Analysis, probability of errors

UNIT – II **[08 Hours]**
Primary sensing elements and transducers: Definition and Classification of Transducers, Characteristics and Choice of Transducers, Potentiometer, Strain Gauges, RTD, Thermister, Thermocouple, LVDT, RVDT, Capacitive Transducer, Piezo-Electric Transducer, Hall Effect Transducers, Photo Emissive Cell, Photoconductive Cell, Photovoltaic Cell, Photo Diode, Photo Transistor, Microphone, Loud Speaker and their Applications.

UNIT – III (07 Hours)
Digital Instruments: Digital multimeter, digital frequency meter, digital measurement of time, Digital
measurement of frequency, automation in digital instruments, microprocessor based instruments, digital
phase meter

UNIT – IV **[06 Hours]**
Oscilloscopes: Block Diagram of General Purpose Oscilloscope, Vertical Deflection System, Horizontal
Deflection System, Probes, Dual Beam Oscilloscope, Dual Trace Oscilloscope, Oscilloscope controls, Lissajous Patterns, Storage Oscilloscope, Oscilloscope specifications and Performance

UNIT – V **[08Hours]**
Computer Controlled Test Systems: Testing an audio amplifier, testing a radio receiver, instruments used in computer controlled instrumentation, IEEE 488 Electrical interface, digital control description,
example of signal timing in a microprocessor based measurement.

UNIT – VI Signal Generator and Waveform analyzer [06 Hours]
Low frequency signal generator, Function generator, distortion meter, spectrum analyzer, digital
spectrum analyzer,

TEXT BOOKS

1. Albert D. Helfrick and William D. Cooper- Electronic instrumentation and Measurement techniques,
Prentice Hall of India
2.E David Bell- Electronic instrumentation and Measurements, Oxford university Press

REFERENCE BOOKS

1.Ernest O. Doeblin,- Measurement Systems-Applications and Design, TMH,2007
2.H. S. Kalsi, Electronic Measurements and Instruments, Mc-Grawhill Edition
3. M. M. S. Anand- Electronis Instrumentation Technology, Prentice-Hall of India

PROFESSIONAL APTITUDE AND LOGICAL REASONING

Structure of the Course:

Lecture : 2 hrs. / Week
Credits: 1
Subject Code : ECT317
CE 30 Marks : ESE: 70 Marks

UNIT – I PROFESSIONAL APTITUDE [07 Hours]

Number systems, geometry, trigonometry, probability, permutation combination, algebra, mensuration, time and work, averages, percentages, profit and loss, quadratic and linear equations, etc.

UNIT – II LOGICAL REASONING [07 Hours]

Number and Letter Series, Calendars , Clocks, Cubes, Venn Diagrams, Binary Logic, Seating Arrangement, Logical Sequence, Logical Matching, Logical Connectives, Syllogism, Blood Relation

UNIT – III DATA INTERPRETATION [06 Hours]

Interpretation and analysis of data based on text, tables, graphs (line, area), charts (column, bar, pie), venn diagram, etc.

REFRENCE BOOKS:

1. Quantity Aptitude by R.S. Aggrawal
2. Modern Approach to Logical Reasoning by R.S. Aggrawal

Mini Project-II

Structure of the Course:

Practical : 4 hrs. / Week Credits: 2

Continuous Evaluation: 100 Marks

COURSE OBJECTIVES

1) To be able to apply some of the techniques/principles you have been taught

2) To carry out budget and time planning for the project**.**

3) To inculcate electronic hardware implementation skills by learning PCB artwork design using an appropriate EDA tool.
4) To follow correct grounding and shielding practices
5) To do effective trouble-shooting of the mini project.
6) To develop effective communication skill by delivering a seminar based on mini project

Course Outcome:
Upon completion of mini project the students will be able to
1) Demonstrate a through and systematic understanding of project contents.

2) Understand methodologies and professional way of documentation and communication.

3) Know the key stages in development of the project.

4) **Extend or use the idea in mini project for major project.**

Guidelines for Mini project:

1) Each mini project group should consist of two students.
2) Mini Project work should be carried out in the department laboratories only.
3) Project design ideas should be discussed with respective guide.
4) Hardware component is mandatory.
5) Layout versus schematic verification is mandatory and must be completed in department laboratory only.
6) Domains for projects may be from the following, but not limited to:
Electronic Communication Systems, Analog or Digital Electronics, Biomedical Electronics, Power Electronics, Audio , Video Systems, Embedded Systems, Instrumentation and Control Systems , etc.Microcontroller based projects should preferably use Microchip PIC Controllers.
7) After completion of mini project at the end of the semester, each group should show the demonstration and deliver seminar based on mini project.
8) A spiral bound project report should be prepared in MS Office or LATEX using the following guidelines