

**FACULTY OF ENGINEERING
SYLLABUS FOR THE
T. E.
(ELECTRONICS AND TELECOMMUNICATION ENGINEERING)**

**WITH EFFECT FROM
THE YEAR 2014-2015**

UNIVERSITY OF PUNE

**TE (E & TC) Structure
(2012 Course w.e.f. June 2014)**

TE (E & TC) Structure

2012 Course w.e.f. June 2014

SEMESTER I

Subject Code	Subject	Teaching Scheme			Examination Scheme					Marks
		Lect	Tut	Pr	Pr	Oral	TW	In Semester Assessment	End Semester Examination	Total
								Phase I	Phase II	
304181	Digital Communication	4						30	70	100
304182	Digital Signal Processing	4						30	70	100
304183	Micro Controller and Applications	3						30	70	100
304184	Electromagnetics and Transmission Lines	3	1					30	70	100
304185	System Programming and Operating System	3						30	70	100
304186	Digital Communication and Signal Processing Lab			4	50		50			100
304187	System Programming and Microcontroller Applications Lab			4	50		50			100
304188	Employability Skills in Electronics Design	2		2		50				50
	Total	19	1	10	100	50	100	150	350	750

TE (E & TC) Structure

2012 Course w.e.f. June 2014

SEMESTER II

Subject Code	Subject	Teaching Scheme			Examination Scheme					Marks
		Lect	Tut	Pr	Pr	Oral	TW	In Semester Assessment	End Semester Examination	Total
								Phase I	Phase II	
304189	Information Theory and Coding Techniques	4						30	70	100
304190	Antenna and Wave Propagation	4						30	70	100
304191	Embedded Processors	4						30	70	100
304192	Industrial Management	3						30	70	100
304193	Power Electronics	3						30	70	100
304194	Communication Lab			4	50		50			100
304195	Power Electronics and Embedded Lab			4	50		50			100
304196	Mini project and Seminar			4		50				50
	Total	18		12	100	50	100	150	350	750

Dr. D. S. Bormane
BOS Chairman

Digital Communication(304181)

Teaching Scheme:

Lectures: 4 Hrs/ Week

Examination Scheme:

In Semester Assessment:

Phase I : 30

End Semester Examination:

Phase II: 70

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:

After successfully completing the course students will be able to

- Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
- Perform the time and frequency domain analysis of the signals in a digital communication system.
- Select the blocks in a design of digital communication system.
- Analyze Performance of spread spectrum communication system.

Unit I : Digital Transmission of Analog Signal

8L

Introduction to Digital Communication System: Why Digital?, 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

7L

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 Processes

8L

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 Receivers

8L

Detection Theory: MAP, LRT, Minimum Error Test, Error Probability, 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 : Passband Digital Transmission

8L

Pass band transmission model, Signal space diagram, Generation and detection, Error Probability derivation and Power spectra of coherent BPSK, BFSK and QPSK. Geometric representation, Generation and detection of M -ary PSK, M -ary QAM and their error probability, Generation and detection of Minimum Shift Keying, Gaussian MSK, Non-coherent BFSK, DPSK and DEPSK, Introduction to OFDM

Unit VI : Spread Spectrum Techniques

7L

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, Wireless Telephone Systems, Personal Communication System.

Text Books

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

Reference Books

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

Digital Signal Processing(304182)

Teaching Scheme:

Lectures: 4 Hrs/ Week

Examination Scheme:

In Semester Assessment:

Phase I : 30

End Semester Examination:

Phase II: 70

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.
- To understand concept of sampling rate conversion and DSP processor architecture.

Course Outcomes:

After successfully completing the course students will be able to

- Understand use of different transforms and analyze the discrete time signals and systems.
- Realize the use of LTI filters for filtering different real world signals.
- Capable of calibrating and resolving different frequencies existing in any signal.
- Design and implement multistage sampling rate converter.

Unit I : DSP Preliminaries

6L

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. Basic elements of DSP and its requirements, advantages of Digital over Analog signal processing.

Unit II : Discrete Fourier Transform

8L

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, Introduction to Discrete Cosine Transform.

Unit III : Z transform

6L

Need for transform, relation between Laplace transform and Z transform, between Fourier transform and Z transform, Properties of ROC and 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.

Unit IV : IIR Filter Design

8L

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

Unit V : FIR Filter Design

6L

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. FIR filters realization using direct form, cascade form and lattice form, Finite word length effect in FIR filter design

Unit VI : Multirate DSP and Introduction to DSP Processor

6L

Concept of Multirate DSP, Sampling rate conversion by a non-integer factor, Design of two stage sampling rate converter, General Architecture of DSP, Case Study of TMS320C67XX, Introduction to Code composer studio. Application of DSP to Voice Processing, Music processing, Image processing and Radar processing.

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. Dr. Shaila Apte, “Digital Signal Processing” Wiley India Publication, second edition
3. K.A. Navas, R. Jayadevan, “ Lab Primer through MATLAB”, PHI
4. Li Tan, Jean Jiang, “ Digital Signal Processing : Fundamentals and applications“ Academic press,

Microcontroller and Applications(304183)

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:

Phase I : 30

End Semester Examination:

Phase II:70

Course Objectives:

- To understand the applications of Microprocessors and Microcontrollers.
- To understand need of microcontrollers in embedded system.
- To understand architecture and features of typical Microcontroller.
- 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

- Learn importance of microcontroller in designing embedded application
- Learn use of hardware and software tools
- Develop interfacing to real world devices

Unit I : Introduction to Microcontrollers

6L

8 bit Microprocessor and Microcontroller architecture, comparison, advantages and applications of each Harvard and Von Neumann architecture, RISC and CISC comparison. Survey of 8 bit controllers and its features Definition of embedded system and its characteristics. Role of microcontroller in embedded System. Limitation of 8 bit microcontrollers. Study of RS232, RS 485, I2C, SPI protocols. Software and hardware tools for development of microcontroller based system such as assembler, compiler, IDE, Emulators, debugger, programmer, development board, DSO, Logic Analyzer.

Unit II : 8051 Architecture

6L

MCS-51 architecture, family devices & its derivatives. Port architecture, memory organization, Interrupt structure, timers and its modes & serial communication and modes. Overview of Instruction set.

Unit III : PIC Microcontroller Architecture

6L

PIC 10, PIC12, PIC16, PIC18 series architectures, comparison, features and selection as per application. PIC18f architecture, registers, memory Organization and types, stack, oscillator options, BOD, power down modes and configuration bit settings. Brief summary of Peripheral support Overview of instruction set, MPLAB IDE & C18 Compiler

Unit IV : Real World Interfacing Part I

6L

Port structure, interrupt structure & timers of PIC18F. Interfacing of switches. LED, LCD, Keypad, use of timers With interrupts, PWM generation. All programs in embedded C.

Unit V : Real World Interfacing Part II

6L

MSSP structure,UART,SPI,I2C,ADC,Comparators Interfacing serial port, ADC, RTC with I2C and EEPROM with SPI. All programs in embedded C.

Unit VI : Case studies with PIC

6L

Design of DAS system, Design of frequency counter with display on LCD, Design of Digital Multimeter, Design of DC Motor control using PWM Should cover necessary signal conditioning of input stage ,hardware interfacing with PIC Microcontroller and algorithm or flowchart.

Text Books

1. Mazidi, 8051 microcontroller & embedded system 3rd Edition ,Pearson
2. Mazidi, PIC microcontroller & embedded system 3rd Edition ,Pearson

Reference Books

1. 18F xxx reference manual www.MICROCHIP.COM
2. I2C,EEPROM,RTC data sheets from www.ti.com

Electromagnetics and Transmission Lines(304184)

Teaching Scheme:

Lectures:3 Hrs/ Week

Tutorial: 1 Hr/Week

Examination Scheme:

In Semester Assessment:

Phase I : 30

End Semester Examination:

Phase II: 70

Course Objectives:

- To study Basic Electrostatic and Magneto static Laws, Theorems.
- To understand Maxwell's Equation and apply to the basic electromagnetic problem.
- To interpret the given problem, and solve it using Maxwell's equations.
- To analyze boundary conditions, and understand the field at the interface of two different media.
- To analyze time varying electric and magnetic fields, wave propagation in different types of media.
- To understand transmission line fundamentals and apply them to the basic problem.
- To understand the fundamentals of electromagnetic theory and transmission lines.

Course Outcomes:

After successfully completing the course students will be able to

- Interpret the electromagnetic problem and solve using Maxwell's equations.
- Apply boundary conditions to different media, and formulate uniform plane wave equation, which is the basic of Antenna and wave propagation.
- Analyze the transmission line problem, use the Smith chart for impedance calculations

Unit I : Fundamentals of Electrostatic Fields

6L

Coulomb's Law & Electric Field Intensity, Electric Field due to point charge, line charge and surface charge distributions, Electric Flux Density, Gauss's Law and its Application to differential volume element, divergence, divergence theorem. Electric potential, Relationship between E & V, Potential Gradient. An electric dipole and flux lines.

Unit II: Fields in Material Space and Boundary-Value Problem

6L

Energy density in electrostatic field, Current and current Density, continuity equation, Polarization in dielectrics, capacitance, capacitance of parallel plate; spherical; cylindrical capacitors with multiple di-electrics, Boundary conditions, Poisson's and Laplace's equation, General procedures for Solving Poisson's and Laplace's equations.

Unit III : Magnetostatics

6L

Biot-Savart's Law, Ampere's Circuital Law and its Applications, magnetic flux density, Magnetic Scalar and vectors potentials, Derivations of Biot-savarts law and Ampere's law based on Magnetic Potential, Forces due to magnetic field, magnetic dipole, Classification of Magnetic Materials, Magnetic boundary conditions.

Unit IV : Time Varying Fields and Maxwell's equations

6L

Faraday's law, Displacement current, Maxwell's equations in point form and integral form, Power and Poynting theorem, Boundary conditions for time varying field, Retarded magnetic vector potential, Time harmonic field, Introduction to the concept of Uniform Plane Wave and Helmholtz equation.

Unit V : Transmission Lines

6L

Line parameters, inductance of a line of two parallel round conductors, coaxial line, skin effect, A line of cascaded T sections, general solution, physical significance of the equations; the infinite line, wavelength, velocity of propagation, the distortion less line, Inductance loading of telephone cables, Reflection on a line not terminated in Z_0 , reflection coefficient, open and short circuited lines, reflection factor and reflection loss, T and π sections equivalent to lines.

Unit VI : The Line at Radio Frequency

6L

Voltages and currents on the dissipation less line, 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 line, quarter-wave line; impedance matching, Single-stub impedance matching on a line, The circle diagram for the dissipation less line, Application of the circle diagram, The Smith circle diagram, Application of the Smith chart for calculating impedance and admittance.

Text Books:

1. Matthew N.O. Sadiku, Principles of Electromagnetics, , 4th Edition, Oxford University Press, 2009.
2. J. D. Ryder, Networks, Lines and Fields, 2nd Edition, PHI.

Reference Books:

1. Edminister J.A, Electromagnetics, Tata McGraw-Hill.
2. Hayt & Buck, Engineering Electromagnetics, 7th Edition, Tata McGraw-Hill.
3. Kraus/Fleisch, Electromagnetics with applications, 5th Edition, McGraw Hill.

Electromagnetics

(Tutorial Assignments)

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/problems based on paper work. 12 assignments have to be carried out covering entire syllabus.

- Find the Electric field intensity and electric flux density at a given point due to following charge distributions. (In all coordinate systems)
 - 1) Point charges
 - 2) Line charges (finite and infinite)
 - 3) Surface charges (finite and infinite)
 - 4) Mixed charges (Point charge, Line charge, Surface charge)
- Find the Electric potential due to different charge distributions (Point charge, Line charge, Surface charge), in different coordinate systems.
- Application of Gauss's law.
 - 1) Given ρ_v (volume charge density) in a particular region, find \bar{D} (electric flux density) using Gauss's Law at the given location.
 - 2) Given ρ_s (surface charge density), find \bar{D} (electric flux density) using Gauss's Law at the given location.
 - 3) Given \bar{D} (electric flux density), find total charge enclosed by the surface(Q), ρ_v (volume charge density) using Gauss's Law.(In all coordinate systems)
 - 4) Given \bar{D} (electric flux density), prove both sides of Divergences Theorem.
- Given ρ_v (volume charge density), and the region with reference potential, find the potential in a given region, using Poisson's equation.
- Using Laplace's equation, find capacitance between any two surfaces, if the boundary conditions are given.
- Find the electrostatic fields (Tangential and Normal) at the boundary between,
 - 1) Free space and dielectric medium
 - 2) Free space and conductor
 - 3) dielectric medium and conductor
 - 4) Two dielectric media.
 - 5) Two dielectric media when boundary is defined by a equation of plane.
- Find the capacitance of,
 - 1) Parallel plate capacitor with multiple dielectric layers.
 - 2) Spherical capacitor with multiple dielectric layers
 - 3) Cylindrical capacitor with multiple dielectric layers,Also find the total Energy stored within the region for all above mentioned capacitor.

- Find \vec{H} (Magnetic field intensity) and \vec{B} (Magnetic flux density) at a given point due to,
 - 1) Infinitely long current carrying conductor
 - 2) Finite current carrying conductor
 - 3) Infinite conducting surface
 - 4) Finite conducting surface
 - 5) Different current carrying configurations (i.e. thin conductor, surface all together)
- For the following current carrying configurations, find the \vec{H} (Magnetic field intensity) in a given region (or point) using Ampere's circuital law.
 - 1) Infinitely long current carrying conductor
 - 2) Infinite cylindrical surfaces of different radii all centered at the same axis.
 - 3) Spherical surfaces of different radii all centered at a given point.
- Given the \vec{H} (Magnetic field intensity) of a particular region, find current (I), current density (\vec{J}), enclosed by the given surface. (In all coordinate systems)
- Prove both sides of Stokes' theorem when \vec{H} (Magnetic field intensity) is given in Cartesian, cylindrical and spherical coordinate system separately.
- Find the static magnetic fields (Tangential and Normal) at the boundary between,
 - 1) Two different magnetic media with nonzero surface current density (\vec{K})
 - 2) Two different magnetic media with zero surface current density (\vec{K})
 - 3) Two different magnetic media when boundary is defined by a equation of plane.
- Given \vec{H} (or \vec{E}) and the region properties (like ϵ, μ, σ etc.), find \vec{B}, \vec{D} and \vec{E} (or \vec{H}) using Maxwell's equations. (In all coordinate systems)
- Given \vec{H} (or \vec{E}) and the region properties (like $\epsilon, \mu, \sigma, \eta$), the average power density in W/m^2 , Total power crossing the given surface in watts using Poynting Theorem (In all coordinate systems)
- Given the primary constants (R, L, G, C) along with the generator specifications and termination, find secondary constants ($\alpha, \beta, \gamma, Z_0$) and other parameters like velocity, wavelength, received voltage, received power, reflection coefficient etc.
- Given secondary constants (γ, Z_0), find the primary constants (R, L, G, C) at the given frequency.
- Problems on Transmission Line Analysis.
- Problems on Impedance matching and design of stub matching using Smith Chart.

System Programming and Operating Systems(304185)

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:

Phase I : 30

End Semester Examination:

Phase II: 70

Course Objectives:

- To understand fundamentals of system programming and operating systems.
- To study and understand how the system programming and operating system abstractions can be implemented.
- To develop comprehensive skills to design Assembler, Macro Processor, Compiler and Interpreters.
- To understand the importance of application of linkers, loaders and Software tools in system programming
- To Implement System Programming concepts and Operating systems components
- To analyze memory allocation methods, input output devices and file system w. r. t. various operating system.
- To study and implement various process scheduling techniques and dead lock avoidance schemes in operating system

Course Outcomes:

After successfully completing the course students will be able to

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

Unit I : Basics of System Programming

7L

Language processors: Language processing activities, Fundamentals of language processing, Fundamentals of language specification, Language processor development tools. Data structures for language processing: Search data structure, Allocation data structures. Scanning and parsing Assembler: Assembly language programming, simple assembly scheme, Pass structure of assembler, design of two pass assembler

Unit II: Macro Processor, Compilers and Interpreters

7L

Macro Processor: Macro definition and call, macro expansion, Machine Independent macro processor features, Nested macro calls, advanced macro facilities, Design of macro pre processor. Compilers: Basic compilers function, Phases of compilation, memory allocation, compilation of expression, Compilation of expressions, compilation of control structures, Code of optimization Interpreters.

Unit III: Linkers and Loaders and Software Tool **6L**

Linkers and Loaders: Basic loaders functions, central loaders scheme, absolute loaders, Subroutine linkers, relocation loader, Direct linking loader, Dynamic linking loader, Design of absolute loaders and direct linking loader, Software tools: Software tools for program development, editors, debug monitor, programming environment, user interfaces.

Unit IV : Introduction to OS, Process Management and Deadlocks **8L**

Operating System: Evolution of OS, OS Functions, Various OS, OS structure, OS System Calls with example. Process Management: Processes, Inter process communication, Classical IPC problems, Threads, CPU Scheduling. Deadlocks: System Model, Deadlock Characterization, Deadlock Prevention, Deadlock Avoidance, Deadlock detection and recovery.

Unit V : Memory Management **6L**

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 **6L**

Input and Output: Review of computer hardware, principles of I/O hardware, and principles of I/O software, I/O software layers, disks, disk scheduling Algorithms. File System w.r.t. Linux: Files, directories, file system and implementation, File system layout, implementing files, implementing directories, shared files, disc space management

Text Books

1. D. M. Dhamdhare, “Systems Programming and Operating System”, TMH.
2. Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, PHI.

Reference Books

1. J. J. Donovan, “Systems Programming”, McGraw Hill.
2. Siberschatz A; Galvin P.B; Gagne G, “Operating System Concepts”, John Wiley.
3. Leland L. Beck, “System Software,” Pearson Editions.

Digital Communication and Signal Processing Lab(304186)

Teaching Scheme:

Practicals: 4 Hrs/week

Examination Scheme:

PR: 50Marks

TW:50Marks

Digital Communication

Note :

1. Perform any 6 experiments from Group A and any 3 from Group B
2. Group A experiments are to be performed with hardware
3. Group B experiments are to be performed using suitable software like Matlab, Octave, LabVIEW, Scilab etc.

Name of the experiment

Group A

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

Group B

1. Write a simulation program to implement PCM/ DM/ADM system.
2. Write a simulation program to study effect of ISI and noise in baseband communication system.
3. Write a simulation program to study Random Processes.
4. Write a simulation program for calculation and plotting the error probability of BPSK, QPSK, QAM. Comparison of theoretical and practical BERs.
5. Write a simulation program for implementation of any digital communication system.
6. Write a simulation program for Constellation diagram of any passband modulated signal in presence of noise.

Signal Processing

Instructions:

- a) Minimum eight practical's to be performed.
- b) Practical number 12 is mandatory.

Note: Practical 1 to 11 can be performed in any appropriate software like C/MATLAB/SCILAB etc.

1. Implement the sampling theorem and aliasing effects by sampling an analog signal with various sampling frequencies.
2. To study the properties of DFT. Write programs to confirm all DFT properties.
3. To study the circular convolution for calculation of linear convolution and aliasing effect. Take two sequences of length 4. Write a program to find 4 point circular convolution and compare the result with 8 point circular convolution to study aliasing in time domain.
4. (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.
5. To plot the poles and zeros of a transfer function when the coefficients of the transfer function are given, study stability of different transfer functions.
6. To study the effect of different windows on FIR filter response. Pass the filter coefficients designed in experiment 6 via different windows and see the effect on the filter response.
7. Design Butterworth filter using Bilinear transformation method for LPF and write a program to draw the frequency response of the filter.
8. To plot the mapping function used in bilinear transformation method of IIR filter design.(assignment may be given)
9. Effect of coefficient quantization on the impulse response of the filter using direct form I and II realization and cascade realization.(theory assignment)
10. Design and implement two stage sampling rate converter.
11. Computation of DCT and IDCT of a discrete time signal and comment on energy compaction density.
12. To implement at least one of the following operations using DSP Processor
 - i) Linear and Circular convolution.
 - ii) Low pass filter an audio signal input to DSK with FIR filter.
 - iii) Low pass filter an audio signal input to DSK with IIR filter.
 - iv) To generate sine wave using lookup table with table values generated within the programme.

Microcontroller Applications and System Programming Lab(304187)

Teaching Scheme:

Practicals: 4 Hrs/week

Examination Scheme:

PR: 50Marks

TW:50Marks

Microcontroller Applications

List of Practical:

1. write a program for interfacing button, LED, relay & buzzer as follows
 - A. when button 1 is pressed relay and buzzer is turned ON and LED's start chasing from left to right
 - B. when button 2 is pressed relay and buzzer is turned OFF and Led start chasing from right to left
2. To display message on LCD without using any standard library function
3. Interfacing 4X4 keypad and displaying key pressed on LCD OR on HyperTerminal.
4. Generate square wave using timer with interrupt
5. Interfacing serial port with PC both side communication.
6. Interfacing DS1307 RTC chip using I2C and display date and time on LCD
7. Interfacing EEPROM 24C128 using SPI to store and retrieve data
8. Interface analog voltage 0-5V to internal ADC and display value on LCD
9. Generation of PWM signal for DC Motor control.
10. Observing supply current of PIC18F controller in various power saving modes and by varying clock frequency.

System Programming

List of Practical:

1. 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)
2. Design of PASS I of two pass assembler for pseudo machine code.
3. Design of a MACRO PASS-I
4. Implement Job scheduling algorithms: FCFS, SJF
5. Implement Bankers Algorithm for deadlock detection and avoidance
6. Implementation of page replacement algorithm: FIFO / LRU
7. Write an shell scripting on UNIX / LINUX
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
 - d. Basic Linux Commands

Employability Skills in Electronics Design (304188)

Teaching Scheme:

Lectures: 2Hrs/ Week

Practicals: 2Hrs/Week

Examination Scheme:

In Semester Assessment:

Phase I : NIL

Phase II: NIL

End Semester Examination:

OR: 50

Course Objectives:

- To teach the student , the art of applying basic concepts for designing electronic systems
- To imbibe good design practices for robust design of electronic systems
- To highlight the importance and significance of customer specifications/requirements
- To teach electronic circuit function verification with an EDA tool
- To create an interest in the field of electronic design as a prospective career option

Course Outcomes:

After successfully completing the course students will be able to

- Shall be able to understand and interpret the specifications
- Shall be able to select optimal design topologies
- Shall be able to interpret datasheets and thus select appropriate components and devices
- Shall be able to use an EDA tool for circuit schematic and simulation
- Shall be able to design an electronic system/sub-system and validate its performance by simulating the same

Unit I : Design of Linear Power Supply

6L

Typical specifications, Concept of ideal power supply & Voltage regulation, Rectifier and filter design, Basic shunt regulator design, Series pass transistorized regulator, Variable output voltage regulator, Protection circuits for critical devices in regulator circuits (Short-circuit, over-voltage protection circuits), Heat-sink selection, Three terminal IC regulator, Design examples of IC based power supplies.

Unit II : Design of Data Acquisition Systems

10L

Generalized control system, Concept of set point and error, Typical control mechanisms, Role of data acquisition system, Transducers, sensor and actuator, Active and passive transducers, Transfer characteristics and non-linearities of transducers, Resolution, accuracy and precision, Characteristics of an ideal transducer, Instrumentation Amplifiers(IA), Characteristics of an ideal IA, Selection criteria of IA, Tradeoffs with practical IA, Signal conditioning circuits, Need of signal conditioners, Design of signal conditioning circuits, Span-zero circuit, Overview of Analog to Digital Converters, Types of ADCs, Parameters of ADC devices, Selection criteria for

ADC, Overview of Microcontrollers, Types of microcontrollers, Characteristics of microcontrollers, Examples of MCU devices, Selection criteria for MCU, Overview of Interface devices and storage, RS-232 interface, RTC, I2C EEPROM, LCD, Keyboard interface, DC motor driver, relay driver interface.

Unit III : Design of Switched Mode Power Supply 8L

Advantages of SMPS, Basic concept of switching regulator, Basic topologies ,Step down converter, Step up converter, Polarity inverter, Characteristics of components, Switching element, BJT, MOSFET, IGBT, Switching diode, Filter capacitor and inductor, PWM circuit, General block diagram of SMPS, High frequency transformer design (steps only), Practical topologies of SMPS, Flyback design, Pushpull Design, Start up circuit design, PWM control circuit, Isolation circuit.

Unit IV : Design of Active Filters 4L

Design of various filter types , Low-pass filter (second order), High-pass filter (second order), Band-pass filter , Band-reject Filter , All-pass filter, State variable filter design, Selection of components , Sensitivity analysis.

List of Assignments:

[Note:

- Students are expected to complete FOUR assignments during the semester.
- Paper design should be functionally verified with an appropriate EDA tool (NI Multisim/OrcadPspiceetc)
- Specifications should be different for different group of students
- Documentation shall consist of :
 - Problem statement
 - Specifications
 - Block Diagram
 - Detailed circuit diagram (separate sheet Imperial /Half Imperial size)
 - Calculations
 - Component selection
 - Calculations using the selected component values
 - Simulation results (partial simulations , in the case where models are not available)
 - Component List
 - Conclusion
 - Datasheets]

Assignment 1: Design of Linear Power Supply:

- Single Polarity (Variable/Fixed, Display)
- Dual Polarity (Variable/Fixed, Display)
- Dual Polarity (tracking, display)

Note:

- Protection circuits are also expected to be included
- Heat-sink design is mandatory wherever necessary
- Transformer design steps are expected

Assignment 2: Design of Data Acquisition System

- Multi-channel data acquisition systems
 - Serial communication/ EEPROM storage/SD card storage
 - RTC interface, LCD display, Push-button /Matrix Keyboard
 - DC motor driver, relay driver

Note:

- Sub-circuit designs are also expected except for power supply sub-system
- Micro-controller programming is expected (cross-compiler/assembly language)

Assignment 3: Design of Switched Mode Power Supply

- Single polarity , multiple outputs (Flyback/ Push-pull)
- Dual polarity output (Flyback/ Push-pull)

Note:

- Protection and isolation circuits are also expected to be included
- Heat-sink design is mandatory wherever necessary
- High frequency transformer design steps are expected
- Sub-systems like start-up circuit are expected to be designed

Assignment 4: Design of Active Filter

- Second-order LPF/HPF/BRF/BPF
- State variable filter design/ Biquad

Note:

- Sensitivity analysis should be provided

Reference Books :

1. Practical design of power supplies” , Ron Lenk, John Wiley & Sons, 2005, ISBN: 978-0-08-097138-4
2. “Intuitive Analog Circuit Design A Problem-Solving Approach using Design Case Studies”, Marc T. Thompson, Elsevier Inc, 2006, ISBN-10: 0-7506-7786-4
3. “Linear Circuit Design Handbook”, Hank Zumbahlen, Elsevier Inc, 2008 , ISBN 978-0-7506-8703-4
4. “The Circuit Designer’s Companion”, Peter Wilson, Elsevier Ltd, 2012
5. “Switching Power Supply Design ,”3E, Abraham I. Pressman et. al, The McGraw-Hill Companies, 2009
6. “Measurement, Instrumentation, and Sensors Handbook”, John G. Webster, CRC Press, 1999
7. “Electronic Filter Design Handbook”,4E, Arthur Williams, Fred Taylor, McGraw-Hill ,2006

Information Theory and Coding Techniques(304189)

Teaching Scheme:

Lectures:4 Hrs/ Week

Examination Scheme:

In Semester Assessment:

Phase I : 30

End Semester Examination:

Phase II: 70

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 analyze performance of communication system with coding and modulation.

Course Outcomes:

After successfully completing the course students will be able to

- Perform information theoretic analysis of communication system.
- Design a data compression scheme using suitable source coding technique.
- Design a channel coding scheme for a communication system.
- Evaluate performance of a communication system.

Unit I : Information Theory and Source Coding

7L

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. Case Study: Huffmans coding in image compression/Detail overview of JPEG.

Unit II : Information Capacity and Channel Coding

8L

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. Case Study: Shannon's Publications on information theory.

Unit III : Cyclic Codes

8L

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 RS Codes

7L

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, CRC code, FEC and ARQ systems. Case Study: RS Coding in CD recording. Case Study: CRC used in Ethernet LAN.

Unit V : Convolutional Codes

7L

Introduction of convolution code, State diagram, Polynomial description of convolution code, Generator matrix of convolution code, Tree diagram, Trellis diagram, Sequential decoding and Viterbi decoding, Known good convolution code, Introduction to LDPC and Turbo codes.

Unit VI : Coding and Modulation

8L

Goals of a communication System designer, Error Probability plane, Nyquist minimum bandwidth, Shannon Hartley theorem, Bandwidth efficiency plane, Modulation and coding tradeoffs, Defining, designing and evaluating digital communication system. Trellis Coded Modulation: Concept of TCM and Euclidean distance, Asymptotic coding gain, Mapping by set partitioning, Ungerboeck's TCM design rule. Case Study : TCM used in MODEMS

Text Books

1. Ranjan Bose, "Information Theory coding and Cryptography", McGraw-Hill Publication, 2nd Edition
2. J C Moreira, P G Farrell, "Essentials of Error-Control Coding", Wiley Student Edition.

Reference Books

1. BernadSklar, "Digital Communication Fundamentals & applications", Pearson Education. Second Edition.
2. Simon Haykin, "Communication Systems", John Wiley & Sons, Fourth Edition.
3. Shu lin and Daniel j, Cistellojr., "Error control Coding" Pearson, 2nd Edition.
4. Todd Moon, "Error Correction Coding : Mathematical Methods and Algorithms", Wiley Publication
5. Khalid Sayood, "Introduction to Data compression", Morgan Kaufmann Publishers

Antenna and Wave Propagation(304190)

Teaching Scheme:

Lectures:4 Hrs/ Week

Examination Scheme:

In Semester Assessment:

Phase I : 30

End Semester Examination:

Phase II: 70

Course Objectives:

- To understand the applications of electromagnetic engineering.
- To formulate and solve the Helmholtz wave equation and solve it for Uniform plane wave
- To analyze and understand the Uniform plane wave propagation in various media
- To solve the electric field and magnetic fields for a given wire antenna.

Course Outcomes:

After successfully completing the course students will be able to

- Formulate the wave equation and solve it for uniform plane wave
- Analyze the given wire antenna and its radiation characteristics
- Identify the suitable antenna for a given communication system

Unit I : Uniform Plane Waves

8L

Maxwell Equations in phasor form, Wave Equation, Uniform Plane wave in Homogeneous, free space, dielectric, conducting medium. Polarization: Linear, circular & Elliptical polarization, unpolarized wave. Reflection of plane waves, Normal incidence, oblique incidence, Electromagnetic Power and Poynting theorem and vector.

Unit II : Wave Propagation

8L

Fundamental equations for free space propagation, Friis Transmission equation. Attenuation over reflecting surface, Effect of earth's curvature. Ground, sky & space wave propagations. Structure of atmosphere. Characteristics of ionized regions. Effects of earth's magnetic field. Virtual height, MUF, Skip distance. Ionospheric abnormalities. Multi-hop propagation. Space link geometry. Characteristics of Wireless Channel: Fading, Multipath delay spread, Coherence Bandwidth, and Coherence Time.

Unit III : Antenna Fundamentals

6L

Introduction, Types of Antenna, Radiation Mechanism. Antenna Terminology: Radiation pattern, radiation power density, radiation intensity, directivity, gain, antenna efficiency, half power beam width, bandwidth, antenna polarization, input impedance, antenna radiation efficiency,

effective length, effective area, reciprocity. Radiation Integrals: Vector potentials A , J , F , M , Electric and magnetic fields electric and magnetic current sources, solution of inhomogeneous vector potential wave equation, far field radiation

Unit IV : Wire Antennas

6L

Analysis of Linear and Loop antennas: Infinitesimal dipole, small dipole, and finite length dipole half wave length dipole, small circular loop antenna. Complete Analytical treatment of all these elements.

Unit V : Antenna Arrays

6L

Antenna Arrays: Two element array, pattern multiplication N-element linear array, uniform amplitude and spacing, broad side and end-fire array, N-element array: Uniform spacing, non uniform amplitude, array factor, binomial and DolphTchebyshev array. Planar Array, Circular Array, Log Periodic Antenna, YagiUda Antenna Array

Unit VI : Antennas and Applications

6L

Structural details, dimensions, radiation pattern, specifications, features and applications of following Antennas: Hertz & Marconi antennas, V- Antenna, Rhombic antenna. TW antennas. Loop antenna, Whip antenna, Biconical, Helical, Horn, Slot, Microstrip, Turnstile, Super turnstile & Lens antennas. Antennas with parabolic reflectors

Text Books

1. C.A. Balanis, "Antenna Theory - Analysis and Design", John Wiley.
2. Mathew N O Sadiku, " Elements of Electromagnetics" 3rd edition, Oxford University Press

Reference Books

1. John D Kraus, Ronald J Marhefka, Ahmad S Khan, Antennas for All Applications, 3rd Edition, TheMcGraw Hill Companies.
2. K. D. Prasad, "Antenna & Wave Propagation", SatyaPrakashan, New Delhi.
3. John D Kraus, " Antenna& Wave Propagation", 4th Edition, McGraw Hill, 2010.
4. Vijay K Garg, Wireless Communications and Networking, Morgan Kaufmann Publishers, An Imprint of Elsevier, 2008.

Embedded Processors (304191)

Teaching Scheme:

Lectures: 4 Hrs/ Week

Examination Scheme:

In Semester Assessment:

Phase I : 30

End Semester Examination:

Phase II: 70

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& ARM CORTEX-M3 Microcontroller.
- To learn interfacing of real world input and output devices
- To learn embedded communication systems.

Course Outcomes:

After successfully completing the course students will be able to

- Describe the ARM microprocessor architectures and its feature.
- Interface the advanced peripherals to ARM based microcontroller
- Design embedded system with available resources.

Unit I : ARM7, ARM9, ARM11 Processors

7L

Introduction to ARM processors and its versions, ARM7, ARM9 & ARM11 features, advantages & suitability in embedded application, ARM7 data flow model, programmer's model, modes of operations, Instruction set, programming in assembly language.

Unit II: ARM7 Based Microcontroller

7L

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, interfacing with LED, LCD, GLCD, KEYPAD.

Unit III: Real World Interfacing with ARM7 Based Microcontroller

7L

Interfacing the peripherals to LPC2148: GSM and GPS using UART, on-chip ADC using interrupt (VIC), EEPROM using I2C, SDCARD using SPI, on-chip DAC for waveform generation.

Unit IV : ARM CORTEX Processors

7L

Introduction to ARM CORTEX series, improvement over classical series and advantages for embedded system design. CORTEX A, CORTEX M, CORTEX R processors series, versions,

features and applications. Need of operating system in developing complex applications in embedded system, desired features of operating system & hardware support from processor, Firmware development using CMSIS standard for ARM Cortex. Survey of CORTEX M3 based controllers, its features and comparison.

Unit V : ARM CORTEX M3 based Microcontroller 7L

ARM-CM3 Based Microcontroller LPC1768: Features, Architecture (Block Diagram & Its Description), System Control, Clock & Power Control, GPIO, Pin Connect Block, interfacing with RGB LED, Seven Segment, TFT Display, MOTOR control using PWM.

Unit VI : Real World Interfacing with ARM-CM3 Based Microcontroller 7L

Concept of USB, CAN, and Ethernet based communication using microcontrollers. CAN, USB, ETHERNET applications in embedded c.

Text Books:

1. Andrew Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide – Designing and Optimizing System Software", ELSEVIER
2. Joseph Yiu, "The Definitive Guide to the ARM Cortex-M", Newness, ELSEVIER

Reference Books:

1. LPC 214x User manual (UM10139) :- www.nxp.com
2. LPC 17xx User manual (UM10360) :- www.nxp.com
3. ARM architecture reference manual : - www.arm.com
4. Trevor Martin,"An Engineer's Introduction to the LPC2100 series", Hitex (UK) Ltd.

Industrial Management(304192)

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:

Phase I : 30

End Semester Examination:

Phase II: 70

Course Objectives:

- To get awareness about various domains in Industrial Management.
- To understand concept of Quality Management, Financial Management and Project Management.
- To learn Human Resource Management as one of the major tasks in industry.
- To promote Entrepreneurship.

Course Outcomes:

After successfully completing the course students will be able to

- Get overview of Management Science aspects useful in Industry.
- Get motivation for Entrepreneurship

Unit I : Basics of Management

6L

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, Distinction between Traditional organization and Modern organization, concept of Globalization

Unit II : Quality Management

6L

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 (Mistake Proofing).quality circles, TQM, Kaizen, Five S (5S), Six sigma Quality Management Standards (Introductory aspects only)- The ISO 9001:2008 Quality Management System Standard

Unit III : Financial and Project Management

6L

Capital Structure, Fixed & working capital, Role of Securities and Exchange Board of India(SEBI), 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, CVP graph, Project Management, Planning and execution of IT projects, Project network analysis, CPM, PERT and Project crashing and resource Leveling.

Unit IV : Human Resource Development

6L

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 programme; executive development, Case study on Recent trends in Human Resource Development.

Unit V : Entrepreneurship Development

6L

Concept of entrepreneurship, Identification of business opportunities, Generation of business idea, Business plan, Preparation of business proposal, Sources of finance – government and nongovernment agencies, Types of businesses / ownerships – Partnership, Proprietorship, Private limited company, Public limited company, Joint stock, Co-operative society, Govt. Sector etc, 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 : Management Information Systems

6L

Concept of data and information, characteristics of information, types of information, Definition of MIS, Need, Purpose and Objectives, Contemporary Approaches to MIS, Components of an information system, Need to study information systems, Information as a commodity, Types of information systems, Functional Business systems – sales & marketing, Human resources, accounting, manufacturing etc. Decision-making models, Types of decisions, Decision Support Systems, Introduction to e-commerce, types – B2B, B2C, C2B, C2C etc. Overview of ERP, Business Process Re-engineering.

Text books:

1. P. Khanna, “Industrial Engineering and Management”, Dhanpatrai publications Ltd, New Delhi.
2. L.C.Jhamb , Savitri Jhamb , Industrial Management – I , Everest Publishing House .

Reference Books:

1. Waman S. Jawadekar, "Management Information Systems", Mc-Graw-Hill Education (India) Pvt. Ltd.
2. G. S. Batra , “Development of Entrepreneurship ”, Deep and Deep Publications, New Delhi
3. Kenneth C. Laudon and Jane P. Laudon, “Management Information Systems", Eighth Edition, Pearson Education
4. Ashwathappa, “Human Resource Management”, Mc-Graw-Hill Education (India) Pvt. Ltd.
5. M.Y. Khan and P. K. Jain, “Financial Management”, Mc-Graw-Hill Education (India) Pvt. Ltd.
6. Ravi M. Kishore, “Project Management”, Mc-Graw-Hill Education (India) Pvt. Ltd.
7. Pravin Kumar, “ Fundamentals of Engineering Economics”, Wiley India

Power Electronics(304193)

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:

Phase I : 30

End Semester Examination:

Phase II: 70

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:

After successfully completing the course students will be able to

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

Unit I : Power Devices

6L

Construction, Steady state characteristics & Switching characteristics of SCR, Construction, Steady state characteristics Power MOSFET & IGBT. SCR ratings: I_L , I_H , V_{BO} , V_{BR} , dv/dt , di/dt , surge current & rated current. Gate characteristics, Gate drive requirements, Synchronized UJT triggering for SCR, triggering of SCR using IC-785, gate drive circuits for Power MOSFET / IGBT.

Unit II : AC-DC Power Converters

6L

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.

Unit III : DC-AC Converters

6L

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.

Unit IV : DC-DC converters & AC Voltage Controller

6L

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. Single-phase full wave AC voltage controller with R load.

Unit V :Power Electronics Applications

6L

ON-line and OFF line UPS with battery AH, back up time, battery charger rating. Electronic ballast: Characteristics of fluorescent lamps and advantages over conventional ballast. Single phase separately excited DC motor drive, stepper motor drive, BLDC motors. Variable voltage & variable frequency three phase induction motor drive.

Unit VI: Resonant Converters & Protection of Power Devices & Circuits

6L

Need for resonant converters, SLR half bridge DC/DC converter in low frequency, Concept of zero current switching (ZCS) and zero voltage switching (ZVS) resonant converters. Cooling & heat sinks, over voltage conditions, over voltage protection circuits, over current fault conditions, over current protection. Electromagnetic interference: Sources, minimizing techniques.

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
2. U. R. Moorthi, "POWER ELECTRONICS, DEVICES, CIRCUITS & INDUSTRIAL APPLICATIONS" , Oxford University Press, New Delhi, 2005
3. P.C. Sen, "Modern Power Electronics", S Chand & Co New Delhi.
4. "GE SCR MANUAL" 6th edition, General Electric, New York, USA
5. Dr. P. S. Bimbhra, "Power Electronics", Khanna Publishers, Delhi.
6. Nagrath Kothari, "Electrical Machines", TMH.

Embedded and Power Lab (304195)

Teaching Scheme:
Practicals: 4 Hrs/week

Examination Scheme:
PR: 50Marks
TW:50Marks

Embedded Processors

List of Experiments:

Group A: LPC2148 Based Experiments

1. Interfacing LPC2148 to LCD/GLCD
2. UART Interfacing LPC2148 in embedded system (GSM/GPS)
3. Interfacing LPC2148 for internal ADC on interrupt basis
4. Interfacing SD card to LPC2148
5. Interfacing EEPROM to LPC2148 using I2C protocol

Group B: LPC1768 Based Experiments

6. Interfacing LPC1768 to Seven Segment / RGB LED
7. Generation of PWM signal for motor control using LPC1768
8. Interfacing TFT display to LPC1768
9. Implementing CAN protocol using LPC1768
10. Implementing ETHERNET protocol using LPC1768

Power Electronics

List of Experiments (Any 8)

- 1) Characteristics of SCR
 - i) Plot V-I characteristics
 - ii) Observe the effect of gate current
 - ii) Measure I_H & I_L
- 2) V-I Characteristics of MOSFET / IGBT
 - i) Plot output characteristics
 - ii) Plot transfer characteristics
- 3) Triggering circuit for SCR (Using UJT or IC-785)
 - i) Verify the range of firing angle
 - ii) Turn on the SCR, observe waveforms across load & SCR
- 4) 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.

- 5) Single-Phase PWM bridge inverter for R load
 - i) Observe output rms voltage waveforms,
- 6) Step down dc chopper using power MOSFET / IGBT
 - i) Measure duty cycle and observe effect on average load voltage for DC chopper
- 7) Find load & line regulation of given SMPS
- 8) 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.
- 9) 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 microstepping
OR
 - iii) Plot speed-torque characteristic of three phase induction motor.
- 10) To study over voltage / over current protection circuit.

Communications Lab(304195)

Teaching Scheme:
Practicals: 4 Hrs/week

Examination Scheme:
PR: 50Marks
TW: 50Marks

Information Theory & Coding Techniques

Note :

1. Perform any 9 experiments from the given list
2. Experiments are to be performed using suitable software like C/C++, Matlab, Octave, LabVIEW, Scilab etc.
3. Minimum 2 experiments are to be implemented in C/C++.

Name of the experiment

- 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 channelCompare channel capacity of above channels.
- 2 Write a program for generation and evaluation of variable length source coding using C/MATLAB (Any 2)
 - a) Shannon – Fanocoding 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 the error probability)
- 8 Write a simulation program to implement source coding and channel coding for transmitting a text file.
- 9 Implementation of any compression algorithm for either audio, image or video data.
- 10 Implement a model of communication system based on Spread Spectrum Communication System

Antenna and Wave Propagation

Group A

To Measure Radiation pattern, Return Loss, Impedance, Gain, Beam width for the following antennas (Any Five)

1. Dipole antenna
2. Folded Dipole
3. Yagi-Uda
4. Horn
5. Parabolic Reflector
6. Micro strip Antennas

Group B

Plot Standing Wave pattern and Measure SWR for open, short and matched termination

Group C

MATLAB/C/Scilab Simulation of following antenna arrays (Plotting radiation pattern)

1. Broad side linear array with uniform spacing and amplitude
2. End fire linear array with uniform spacing and amplitude
3. Binomial array
4. Dolph-Tchebyshev

Any three of above experiments from Group C to be carried out by using any **EM simulation software** (compulsory).

Mini Project and Seminar(304196)

Teaching Scheme:

Practical: 4 Hrs/Week

Examination Scheme:

Oral Examination: 50 marks

Course Objectives:

- To undertake & execute a Mini Project through a group of students.
- To understand the 'Product Development Cycle' through Mini Project.
- To plan for various activities of the project and distribute the work amongst team members.
- To learn budget planning for the project.
- To inculcate electronic hardware implementation skills by -
 - a. Learning PCB artwork design using an appropriate EDA tool.
 - b. Imbibing good soldering and effective trouble-shooting practices.
 - c. Following correct grounding and shielding practices.
 - d. Knowing the significance of aesthetics & ergonomics while designing electronic product.
- 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:

After successfully completing this course, the student shall be able to:

- Understand, plan and execute a Mini Project with team.
- Implement electronic hardware by learning PCB artwork design, soldering techniques, trouble shooting etc.
- Prepare a technical report based on the Mini project.
- Deliver technical seminar based on the Mini Project work carried out.

Guidelines:

- Project group shall consist of not more than 3 students per group.
- 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 & 6: Hardware assembly, Testing
Week 7 & 8: Enclosure Design, Fabrication etc
Week 9 & 10: Preparation, Checking & Correcting of the Draft Copy of Report
Week 11 & 12: Demo and Group presentations
- Mini Project Work should be carried out in the Projects Laboratory.
- Project designs ideas can be necessarily adapted from recent issues of electronic design magazines Application notes from well known component manufacturers may also be referred.
- Hardware component is mandatory.

- Layout versus schematic verification is mandatory.
- 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.
- A project report with following contents shall be prepared:
 - Title
 - Specifications
 - Block diagram
 - Circuit diagram
 - Selection of components
 - Simulation results
 - PCB artwork
 - Layout versus schematic verification report
 - Testing procedures
 - Enclosure design
 - Test results
 - Conclusion
 - References

For the enhancement of Technical Communication Skills, it is advised to refer to the following or any other good book.

1. Meenakshi Raman, Sangeeta Sharma, ' Technical Communication, Principles and Practice', Oxford University Press
2. M Ashraf Rizvi, ' Effective Technical Communication', Tata McGraw Hill Education Pvt. Ltd.
3. C Muralikrishna, Sunita Mishra, ' Communication Skills for Engineers', Pearson