FACULTY OF ENGINEERING
SYLLABUS FOR THE

T. E.
(ELECTRONICS ENGINEERING)

WITH EFFECT FROM

THE YEAR 2014-2015

UNIVERSITY OF PUNE

TE (ELECTRONICS) Structure
(2012 Course w.e.f. June 2014)

TE (ELECTRONICS) 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	
304201	Electrical Machines and PowerDevices	4						30	70	100
304202	Data Communication	4						30	70	100
304203	Micro Controller and Applications	3						30	70	100
304204	Electromagnetics and Wave Propagation	3	1					30	70	100
304205	Network Synthesis	3						30	70	100
304206	EMPD and NS Lab			4	50		50			100
304207	Microcontroller and Data Communication Lab			4	50		50			100
304208	Employability Skills in Electronics Design	2		2		50				50
	Total	**19**	**1**	**10**	**100**	**50**	**100**	**150**	**350**	**750**

TE (ELECTRONICS) 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 Phase I	End Semester Examination Phase II	Total
304209	Instrumentation Systems	4						30	70	100
304210	Discrete Time Signal Processing	4						30	70	100
304211	Embedded Processors	4						30	70	100
304212	Power Electronics and Applications	3						30	70	100
304213	Industrial Management	3						30	70	100
304214	Instrumentation and Power Electronics Lab			4	50		50			100
304215	Embedded and DSP Lab			4	50		50			100
304216	Mini project and Seminar			4		50				50
	Total	**18**		**12**	**100**	**50**	**100**	**150**	**350**	**750**

Dr. D. S. Bormane

BOS Chairman

Electrical Machines and Power Devices(304201)

Teaching Scheme:
Lectures: 4 Hrs/Week

Examination Scheme:
In Semester Assessment:
Phase I : 30

End Semester Examination:
Phase II: 70

Course Objectives:

- To understand construction, switching characteristics and protection of power devices.
- To understand construction, switching characteristics and protection of thyristors.
- To understand construction and operating principle of DC machines.
- To understand construction and operating principle of AC machines (1φ and 3φ).

Course Outcomes:

After successfully completing the course students will be able to

- Explain construction, switching characteristics and justify the selection of power devices and thyristors.
- Explain operating principle and suggest protection circuit for power devices and thyristors.
- Explain construction and operating principle of DC machines and AC machines (1φ and 3φ).
- Students shall be able to identify the causes of bad commutation and suggest remedies.

Unit I : Power Devices 8L

Power Diodes: Construction, Switching characteristics; Power BJT, PBJT: Construction, Operation, Steady state characteristics, switching characteristics, switching limits, Break down voltages; Power MOSFET: PMOSFET, Construction, Operation, Static characteristics, switching characteristics, forward and reverse bias, safe Operating Area, Parallel operation; IGBT: Construction, Operation, Steady state characteristics, Switching characteristics, Safe operating area.

Unit II : Thyristors 6L

Thyristor: Construction, Operation, transistor analogy, static characteristics, switching characteristics, thyristor turn-on, thyristor turn-off. DIAC / TRIAC – construction and operating Principle, key terminologies and specifications, TRIAC drivers (MOC3011), Applications. GTO: Construction, Operation, Turn off mechanism, Applications. di/dt and dv/dt protection.

Unit III : Protection of Devices and circuits 6L

Cooling and heat sinks. Thermal modeling of power switching devices – electrical equivalent of thermal model, mathematical thermal equivalent circuit, coupling of electrical and thermal components. Snubber circuits, reverse recovery transients, supply and load side transients. Voltage protection by selenium diodes and MOVs. Current protections – fusing, fault current with AC source, fault current with DC source. Electromagnetic Interference – sources of EMI, minimizing EMI generation, EMI shielding.

Unit IV : DC Machines 7L

Electromagnetic conversion, DC machines - Construction, Evolution of DC machines, armature windings, armature voltage, developed torque, magnetization curve of DC machines, classifications of DC Machines. DC Generators – Separately excited DC generators, shunt (self-excited) generator, compound DC machines, series generator, Interpoles or commutator poles. DC Motors – shunt motors, series motor, starter. Permanent magnet DC motors (PMDC), Commutation: Process of Commutation, time of commutation, reactance voltage, straight line commutation, under and over voltage commutation, causes of bad commutation and remedies, inter poles, compensation (descriptive treatment only).

Unit V : Induction Machines 7L

Induction (Asynchronous) machines – constructional features, rotating magnetic field –graphical method, analytical method, Induced voltages, poly phase induction machines – stand still operation, phase shifter, Induction regulator, running operation, Three modes of operation – Motoring, generating, plugging. Equivalent circuit, various equivalent configurations, Thevenin equivalent circuit. No load test, blocked –rotor test and equivalent circuit parameters, performance characteristics, effects of rotor resistance, classes of squirrel-cage motors. Synchronous Machines – construction, synchronous generators, synchronous motors, equivalent circuit model, power and torque characteristics and applications.

Unit VI : Special Machines 7L

Brushless DC motors (BLDC), switched reluctance motors (SRM), Servomotors – DC servomotors, AC servo motors, analysis – transfer function and block diagram. Stepper motors – variable Reluctance stepper motor, permanent magnet stepper motor. Single-phase motors – single phase induction motors – double revolving field theory, equivalent circuit of a single phase induction motor, starting of single phase induction motors, single phase series (universal) motors.

Text Books

1. P. C. Sen, “Principles of Electrical machines and power electronics”, 2nd edition, John Wiley & Sons.
2. M H Rashid, “Power Electronics – circuits, devices and applications”, 3rd edition, Pearson Education.

Reference Books

1. A E Fitzgerald, Charles Kingsley Jr., Stephen D Umans, “Electric machinery”, 6th Edition, TMH.
2. Ashfaq Hussain, “Electric Machines”, Dhanpat Rai and Co.
3. I J Nagrath, D P Kothari, “Electric Machines”, 2nd edition, TMH.

Data Communication(304202)

Teaching Scheme:

Lectures:4 Hrs/Week

Practicals:4Hr/Week

Examination Scheme:
In Semester Assessment:
Phase I : 30

End Semester Examination:
Phase II: 70

Course Objectives:

- To provide an in-depth introduction to all aspects of data communication system
- To define different data formats for better transmission
- To introduce various digital bandpass modulation schemes
- To identify the need of data coding and error detection/correction mechanism
- To provide knowledge of various multiplexing schemes

Course Outcomes:

After successfully completing the course students will be able to

- Define and explain terminology of data communications
- Propose efficient, reliable and appropriate technology to establish communication links
- Understand the impact and limitations of various modulation techniques
- Get exposure to entropy and other coding techniques
- Identify and explain error detection and correction using appropriate techniques.
- Understand the need and limitations of various multiplexing techniques
- To acknowledge the need of spread spectrum schemes

Unit I : Data Transmission Fundamentals 8L

Data transmission concepts and terminology, analog and digital data transmission, Transmission modes (simplex, half duplex, full duplex), Transmission Impairments and Channel Capacity, transmission media : Guided (UTP, STP, Optical, coaxial) & wireless(Radiowave, Microwave, Infrared), Data Transmission(parallel and serial- synchronous and asynchronous transmission), analog and digital signal properties, Bandwidth, bit rate, baud rate data rate limits. Layered Architecture(OSI Model), ISDN

Unit II : Baseband Signal Encoding 8L

DPCM, DM and applications, Basic line codes: RZ, NRZ, Unipolar, Polar, Bipolar, AMI, Manchester: properties and comparison; Multilevel line codes: MLT3, 2B1Q. Digital Baseband signal receivers: Maximum likelihood receiver structure, Matched filter receiver, Probability error of the Matched filter, Intersymbol interference, Signal design for zero ISI, post processing technique: Eye Pattern Synchronization techniques: Bit synchronization, frame synchronization

Unit III: Error Control Coding 8L

Linear block codes, Hamming code, Hamming distance, CRC, syndrome detection, convolution code, trellis diagram, coding gain, Veterbi algorithm for detection. Error control systems: FEC, ARQ Stop and Wait, go back N, selective repeat.

Unit IV: Information Theory 6L

The concept of Information, Information rate, entropy, mutual information, channel capacity, Bandwidth-SNR tradeoff, use of orthogonal signals to achieve Shannon's limit. Entropy coding: Huffman coding, Shannon-Fano coding, code efficiency, channel through put, overview of BSC.

Unit V: Bandpass Digital Signaling 8L

Generation, detection, signal space diagram and Probability of error for ASK, FSK, PSK, QPSK, OQPSK, QAM schemes, comparison. M-ary signaling: MPSK, MFSK signaling, OFDM.

Unit VI: Multiple Access Techniques 6L

Introduction to Multiple Access Techniques – TDMA, FDMA, CDMA Spread spectrum techniques DSSS and FHSS, introduction to orthogonal codes and their properties; suitable example of orthogonal code and its autocorrelation, random access, Pure and slotted ALOHA, Media access control protocol (CSMA)

Text Books

1. Bernard Sklar, Digital Communication,2/E, Pearson Education India, 2009
2. Willam Stallings, Data and Computer Communications,8/E, Pearson, 2007

Reference Books

1. Behrouz A. Forouzan, Data Communications and Networking, 4/E, McGraw-Hill, 2006
2. Leon W. Couch II, Digital and Analog Communication Systems,6/E,Pearson Education Asia,2002
3. Taub Schilling, Principals of Communication Systems, 2/E, Tata McGrawHill,2004
4. John J Proakis,Digital Communications , 3/E,McGraw-Hill Higher Education, 2001
5. Simon Haykin, Digital Communication,4/E, Wiley,1988

Microcontroller and Applications(304203)

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 & 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 & Microcontroller architecture, comparison, advantages & applications of each. Harward & Von Neumann architecture, RISC & CISC comparison. Survey of 8 bit controllers and its features Definition of embedded system & its characteristics. Role of microcontroller in embedded System. Limitation of 8 bit microcontrollers. Study of RS232,RS 485,I2C,SPI protocols. Software & hardware tools for development of microcontroller based system such as assembler, compiler, IDÉ, 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, 4 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 Wave Propagation(304204)

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, Poission's and Laplace's equation, General procedures for Solving Poission'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: 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 VI: 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-hoppropagation. Space link geometry. Characteristics of Wireless Channel: Fading, Multipath delay spread, Coherence Bandwidth, and Coherence Time.

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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.
4. K. D. Prasad, "Antenna & Wave Propagation", SatyaPrakashan, New Delhi.
5. John D Kraus, " Antenna& Wave Propagation", 4th Edition, McGraw Hill, 2010.
6. Vijay K Garg, Wireless Communications and Netwoking, Morgan Kaufmann Publishers, An Imprint of Elsevier, 2008.

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 based on paper work.

- 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 $\overline{D}$ (electric flux density) using Gauss's Law at the given location.
    2) Given ρ_s (surface charge density), find $\overline{D}$ (electric flux density) using Gauss's Law at the given location.
    3) Given $\overline{D}$ (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 $\overline{D}$ (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 $\overline{H}$ (Magnetic field intensity) and $\overline{B}$ (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 $\overline{H}$ (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 $\overline{H}$ (Magnetic field intensity) of a particular region, find current (I), current density ($\bar{J}$), enclosed by the given surface. (In all coordinate systems)

- Prove both sides of Stokes' theorem when $\overline{H}$ (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($\overline{K}$)
    2) Two different magnetic media with zero surface current density($\overline{K}$)
    3) Two different magnetic media when boundary is defined by a equation of plane.

- Given $\overline{H}$ (or $\overline{E}$) and the region properties(like ε, μ, σ etc.), find $\overline{B}, \overline{D}$ and $\overline{E}$ (or $\overline{H}$) using Maxwell's equations. (In all coordinate systems)

- Given $\overline{H}$ (or $\overline{E}$) and the region properties(like $\varepsilon, \mu, \sigma, \eta$), the average power density in W/m^2, Total power crossing the given surface in watts using Poynting Theorem (In all coordinate systems)

- Uniform plane in various medium and exercises related

- Case studies on various propagation techniques, an assignment on each of the techniques to be detailed

Network Synthesis(304205)

Teaching Scheme:
Lectures/Week: 3 Hrs

Examination Scheme:
In Semester Assessment:
Phase I : 30

End Semester Examination:
Phase II: 70

Course Objectives:

- The objective of the course is to introduce the student to Network synthesis including the concepts of positive real function.
- Synthesis of one port network will be studied in detail and also will be applied to two port networks. With this the students will have the knowledge of how to realize given network function into physical canonical form and apply it to filter design problem.

Course Outcomes:

Having successfully completed this course, the student will be able to:

- Understand how to test positive real function for synthesis.
- Realize given driving point function into number of canonical forms.
- Realize given transfer function into ladder and constant resistance networks with termination.
- Design passive filters to meet desired specifications and to scale it into frequency and impedance.
- Realize the Butterworth and Chebyshev filters using active elements.
- Understand the variation of circuit performance with circuit elements and some of the parameters.
- Understand and analyze effect of operational amplifier parameters on filer response.

Unit I : Fundamentals of Network Synthesis 6L

Network functions, properties of all types of network functions, Effect of location of poles and zeros on the system response, Network synthesis problem, elements of realizability, Hurwitz polynomial, testing of Positive Real Function (PRF), elementary synthesis operations, synthesis by inspection

Unit II : Synthesis of One Port Networks 6L

Properties of LC, RC and RL driving point functions and their synthesis in canonical (Foster and Cauer) forms. Synthesis of RLC driving point functions which can be synthesized by partial fraction or continued fractions.

Unit III : Synthesis of Transfer Functions 6L

Properties of transfer functions, Zeros of Transmissions(ZOTs), synthesis of Y_{21} and Z_{21} with 1ohm termination. Synthesis of transfer functions using constant resistance single and double terminated lattice and bridge T networks. Synthesis of open circuit transfer functions.

Unit IV : Passive Filter Design 6L

Filter design by approximation problem. The maximally flat (Butterworth) low-pass filters approximation. The Chebyshev or equal-ripple low-pass filters approximation. Designing of normalized low pass filter transfer function up to 3rd order by Butterworth/Chebyshev approximation from basic principles. Synthesis of above mentioned filters with 1ohm termination. Frequency transformation to high pass, band pass and band stop forms. Normalized low pass filters, frequency scaling and Impedance scaling.

Unit V : Active Filter Design 6L

Factored forms of the approximation functions, cascade approach, Biquad topologies: negative and positive feedback topology, coefficient matching techniques for obtaining element values. Impedance and frequency scaling. Sallen Key low pass circuits. RC to CR transformations for high pass filter design. Sallen Key band pass circuit.

Unit VI : Sensitivity and Performance Parameters 6L

Definition of sensitivities. Sensitivity analysis of the above circuits with respect to parameters like Q, w and component values. Operational Amplifier Frequency characteristics and compensation techniques. Effect of practical OP-AMP characteristics on active filter performance: Dynamic range, slew rate, offset voltage and currents, noise.

Text Books

1. Franklin Kuo, “Network Analysis and Synthesis” ,Wiley international.
2. Gobind Daryanani, “Principles of Active Network Synthesis and Design”, Wiley Int.

Reference Books

1. M.E. Van Valkenberg, “Analog Filter Design”, Harcourt Brace Jovanovich College Publishers.
2. Van Valkenberg M.E. “Introduction to Modern Network Synthesis, John Wiley and Sons New York, 1960.
3. Wai-Kai Chen, “Passive and Active Filters ,theory and implementations”, Wiley international

Electrical Machines and Power Devices and NS Lab (304206)

Teaching Scheme: **Examination Scheme:**

Practicals: 4 Hrs/Week PR: 50 Marks

TW: 50 Marks

Electrical Machines and Power Devices

List of Experiments (Perform any 5 experiments from 1 to 7 and any 2 from the remaining)

1. V-I Characteristics of MOSFET / IGBT
2. V-I Characteristics of thyristor & measurement of holding & latching current.
3. V-I Characteristics of DIAC
4. V-I Characteristics of TRIAC
5. Triggering circuit for MOSFET / IGBT.
6. Triggering circuit for thyristor (Using UJT or IC-785)
7. Light dimmer using TRIAC / Lamp flasher using TRIAC
8. Single phase AC voltage controller using thyristors for R load
7. Load characteristics of D.C. series motor.
8. Brake test on D.C. Shunt motor
9. Load test on 3-phase induction motor.
10. No load & blocked-rotor test on 3-phase induction motor :
    a. Determination of parameters of equivalent circuit
    b. Plotting of circle diagram.
11. Report on Industrial visit.

Industrial Visit:-

Minimum One visit to above machines manufacturing industry is recommended.

NS Practical

List of Practicals: (Minimum 4 practicals to be performed using software like MultiSim)

1) Consider two port LC network, find all network functions and plot poles and zeros.
2) To carry out synthesis of one port LC network into any of the Canonical forms and verify practically.
3) To synthesize given transfer function into constant resistance network (Bridge T or Lattice) and verify practically.
4) To design 3rd order passive Butterworth/Chebyshev filters and realize/synthesize with scaling of frequency and impedance.
5) Design a Butterworth low/high pass filter Sallen Key circuit and verify (at least 2nd order).
6) Design a Chebyshev low/high pass filter Sallen Key circuit and verify (at least 2nd order).
7) To find gain of biquad op amp circuit & study sensitivity of gain against the different components.
8) To study effect of op amp characteristics on filter performance and compensation techniques for the same at least one parameter to be studied practically.

Microcontroller Applications and Data Communication Lab (304207)

Teaching Scheme:
Practicals:4 Hrs/week

Examination Scheme:
PR: 50Marks
TW:50Marks

Microcontroller Applications Lab

List of Practicals:

1) 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 mode and by varying clock frequency.

Data Communication Lab

List of Practicals:(Any Six from 1 to 8):

1) Differential Pulse Code Modulation or delta modulation and signal reconstruction
2) Basicline codes and Multi level line codes
3) Matched filter receiver
4) ASK, PSK, FSK and comparison
5) QPSK and OQPSK modulation and demodulation
6) Design of PN sequence generator
7) Spread Spectrum System (DSSS)
8) Orthogonal Frequency Division Multiplexing

Software Assignments: (Any Two from 9 to 11):

9) Implementation of linear block code
10) Implementation of Convolution code and Viterbi algorithm
11) Implementation of Shannon Fano and Huffman codes

Employability Skills in Electronics Design(304208)

Teaching Scheme:
Lectures:2Hrs/ Week
Practical: 2Hrs/Week

Examination Scheme:
In Semester Assessment:
Phase I : NIL
End Semester Examination:
Phase III: 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: 1. Students are expected to complete FOUR assignments during the semester.

2. Paper design should be functionally verified with an appropriate EDA tool (NI Multisim/OrcadPspice etc).
3. Specifications should be different for different group of students.
4. 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

Instrumentation Systems(304209)

Teaching Scheme:
Lectures:3 Hrs/ Week

Examination Scheme:
In Semester Assessment:
Phase I : 30

End Semester Examination:
Phase II: 70

Course Objectives:

- To provide a basic understanding of instrumentation and general Instrumentation systems.
- Explain the operation/working of different sensors
- To get fundamental knowledge of sensors and transducers and their operating principles, for measurement of mechanical parameters.
- To impart interdisciplinary knowledge regarding transducers, pneumatic actuators, hydraulic actuators.
- Describe advantages, disadvantages, and applications of limit switches, photoelectric sensors, inductive sensors, capacitive sensors, and ultrasonic sensors
- Transform a temperature reading among different scales.
- Explain the operation of pressure, flow, and level transducers in context with applications.
- Understand the concept of final control elements in various applications

Course Outcomes:

After successfully completing the course students will be able to

- Applications and selection of sensors/transducers for particular application.
- Describe the various types of sensors including thermal, mechanical, electrical, electromechanical and optical sensors.
- Select appropriate transducers and instrumentation system components for a specific application.
- Design and development of temperature/pressure/flow etc measurement systems.
- Select appropriate Switches and final control elements for a specific application.
- Selection of communication protocol and smart sensors for particular application.

Unit I : Basics of Instrumentation Systems 6L

General Configuration and functional description of measuring instruments, static and dynamic characteristics of instruments, errors in instrumentation systems, active and passive transducers and their classification, fundamental standards and units for common physical parameters.

Unit II : Position, Motion, Pressure and Force Sensors 6L

Position and motion sensing: Potentiometers, LVDT, proximity sensors (inductive, capacitive and optical), absolute and incremental optical encoders, piezoelectric accelerometer. Pressure Sensors: Diaphragms, capsules, bellows and bourdon tube. LVDT as secondary transducer to measure pressure. Stress, Strain and Force: Strain Gauges and load cell.

Unit III : Temperature, Flow and Level Sensing 6L

Temperature: Resistance temperature detectors, thermistors, thermocouples and pyrometers. Level: Ultrasonic, Capacitance probe type, Hydrostatic pressure and Nuclear level detection techniques. Flow Rate: Bernoulli Equation , Differential head type flow meters (orifice, venturi tube and flow nozzle) , Pitot static tube , Variable area type flow meter – rotameter , vortex shedding , electromagnetic , ultrasonic flow meters.

Unit IV : Semiconductor , MEMS and SMART Sensors 6L

Semiconductor temperature sensing – LM75 block diagram, temperature compensated integrated phototransistor ,Magnetic field sensors – Hall effect and magneto-resistive elements (MRE) , magneto-transistors, piezoelectric (PZT) sensors and actuators. Microelecromechanical systems (MEMS) - Bulk micromachining, micro-machined absolute pressure sensor, Surface micromachining-Hot wire anemometer micro-miniature temperature sensor, surface micro-machined accelerometer, micro-resonator, SMART sensors.

Unit V : Data Acquisition, Bus Standards and Protocols 6L

Multichannel data logging and computer based data acquisition system – RS 232C standard, IEEE 488 bus, I2C bus, HART protocol , Fieldbus technology - Foundation Field bus and Profibus. Signal converters such as V/I, I/V, I/P, P/I for data acquisition interfacing.

Unit VI : Actuators and Final Control Elements 6L

Pneumatic and hydraulic actuators- Directional control valves, Pressure control valves, Cylinders, Process control valves - Electrical actuators- Mechanical switches, Solid state switches, Solenoids, DC motors, AC motors and Stepper motors.

Text Books

1. W. Bolton; " Mechatronics, Electronic Control Systems in Mechanical and Electrical Engineering "; Pearson Education; 3rd Edition
2. William C. Dunn , "Introduction to Instrumentation,Sensors, and Process Control" , Artech House Sensors Library.

Reference Books

1. Curtis Johnson; " Process Control Instrumentation Technology "; Prentice Hall of India Pvt. Ltd.;7th Edition
2. Ernest O. Doebelin; "Measurement System Application and Design "; Mc-Graw Hill; 5th Edition
3. David G. Alciatore, Michael B Histand; " Introduction to Mechatronics and Measurement System "; Tata McGraw Hill
4. C.S. Rangan, G.R. Sarma, V.S.V. Mani; " Instrumentation Devices and Systems "; Tata McGraw Hill; 2nd Edition.

Discrete Time Signal Processing(304210)

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

- The student will be in position to understand use of different transforms and analyze the discrete time signals and systems.
- The student will realize the use of LTI filters for filtering different real world signals.
- The student will be capable of calibrating and resolving different frequencies existing in any signal.
- The student will be in a position to 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 TMS320C28XX, Introduction to Code composer studio. Implementation of Triggering for Converter, D.C.Motor Control , AC Phase Control, Proportional Control.

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,

Embedded Processors (304211)

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.

Power Electronics and Applications(304212)

Teaching Scheme:
Lectures: 4 Hrs/ Week

Examination Scheme:
In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives:

- To study working & analysis of controlled rectifiers for different loads
- To study working & analysis of single phase bridge inverter.
- To study the working of PWM inverter & 3-¢ inverter.
- To study working & analysis of different DC choppers.
- To understand the working of SMPS
- To study working & analysis of AC voltage controller using SCRs and Triacs
- To study different resonant converters.
- To study power quality issues.
- To study working of different power electronics applications like UPS, electronic ballast, HVDC transmission etc.
- To study use of power electronics for renewable energy sources like solar and wind.

Course Outcomes:

After successfully completing the course students will be able to

- Design & implement a triggering / gate drive circuit for a power converters
- Design and analyze different line commutated converter circuits
- Design and analyze different inverter circuits
- Design a step down chopper
- Design a single phase AC voltage controller i.e. light dimmer / fan regulator
- Evaluate battery backup time & design a battery charger
- Understand various power quality issues and their remedies
- Understand various applications of power electronics like HVDC transmission, UPS, Electronic Ballasts etc.
- Understand renewable energy systems like photovoltaic and wind.

Unit I : AC-DC power converters 7L

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 and RL load. Simple triggering circuits for single phase converters, triggering circuit requirement for three phase converters

Unit II : DC-AC Converters 7L

Single phase bridge inverter for R & R-L load using MOSFET / IGBT, performance parameters, single phase PWM inverters. Three phase voltage source inverter for balanced star R load. Control circuits for single phase bridge inverters, control circuit requirement for three phase inverters

Unit III : DC-DC converters & AC Voltage Controller 7L

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. Typical control circuits for single quadrant and two quadrant choppers. Single-phase full wave AC voltage controller with R load.

Unit IV: 7L

a) Resonant converters: Need for resonant converters, Classification, Resonant Switch: ZC resonant switch and ZV resonant switch, Quasi Resonant Converters: ZCS and ZVS, their comparison, Load resonant converters: SLR half bridge DC/DC converter in low frequency.

b) Power Quality: Power Quality considerations, Reactive Power and Harmonic Compensation, Active filters for power conditioning.

Unit V: Power Electronics Applications 7L

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. Power Electronics in Capacitor Charging Applications. HVDC transmission: Main components of HVDC Converter station, Types of HVDC systems. Universal motor speed control.

Unit VI : Power Electronics for Renewable Energy Sources 7L

Power Electronics for Photovoltaic Power Systems: Basics, Types, Stand-alone PV systems, Grid connected PV systems. Power Electronics for wind power systems: Basics, Types, Stand-alone wind energy systems, Grid connected wind energy systems, Control of wind turbines.

Text Books

1. M. H. Rashid, “Power Electronics Handbook”, Academic Press, 2001.
2. M. S. Jamil Asgar, "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. "GE SCR MANUAL" 6th edition, General Electric, New York, USA
4. Timothy Skvarenina, “The Power Electronics Handbook”, CRC Press, 2002

Industrial Management(304213)

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

Instrumentation and Power Lab (304214)

Teaching Scheme:
Practicals 4Hrs/Week

Examination Scheme:
PR:50 Marks
TW: 50 Marks

Instrumentation

List of Experiments : (Any 8 experiments)

1. Weight measurement using load cell and strain gauges.
2. Measurement of vibration.
3. Liquid level measurement(Capacitance probe/ Ultrasonic/Hydrostatic-any one technique)
4. Flow measurement with orifice plate and differential pressure transmitter (DPT).
5. Measurement of speed of rotation of shaft using optical incremental encoder.
6. Temperature measurement. (RTD signal conditioning with bridge circuit, instrumentation amplifier, ADC and microcontroller)
7. Simulation of temperature measurement experiment with anysoftware's (RTD signal conditioning with bridge circuit, instrumentation amplifier, ADC and microcontroller)
8. Determine RTD characteristic and find the sensitivity PT 100/500
9. Determine thermistor or Thermocouplecharacteristic and find its sensitivity.
10. Design of signal converters using Electronics/electro-mechanical components (any one out of V/I, I/V, I/P, P/I)
11. Pneumatic cylinder sequencing with simple logic.
12. Data acquisition and analysis using PC.
13. Study of various switches
14. Study of different valves and their characteristics.
15. Study of characteristics of valves

Power Electronics

List of Experiments:

1. Single phase Semi / Full Converter with R & R-L load
2. Three phase Semi / Full Converter with R load
3. Single phase AC voltage controller using SCRs for R load
4. Single-Phase PWM bridge inverter for R load
5. Three-Phase inverter for R load
6. Step down dc chopper using power MOSFET / IGBT
7. Resonant converter
8. Load & line regulation of SMPS
9. Simulation of any two quadrant chopper circuit
10. Simulation of PWM inverter
11. Case study of any one of the following: HVDC transmission system, Photovoltaic System, Wind generator system

Embedded and DTSP Lab(304215)

Teaching Scheme:
Practical 4Hrs/Week

Examination Scheme:
PR:50 Marks
TW: 50 Marks

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

DTSP

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.

    To generate sine wave using lookup table with table values generated within the programme.

Mini Project and Seminar(304216)

Teaching Scheme:
Practical: 4 Hrs/Week

Examination Scheme:
OR: 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