Savitribai Phule Pune University

FACULTY OF ENGINEERING

Structure for the

T.E (Electronics and Telecommunication Engineering)

(2015 Course)

(w.e.f . June 2017)

Third Engineering-E&TC (2015 Course)

(With effect from Academic Year 2017-18)

Course Code	Course	Teaching Scheme Hours / Week			Semester Examination Scheme of Marks						Credits	
		Theory	Tutorials	Practicals	In-Sem	End-Sem	TW	PR	OR	Total	TH/TW	PR+OR
304181	Digital Communication	4	--	--	30	70	--	--	--	100	4	--
304182	Digital Signal Processing	4	--	--	30	70	--	--	--	100	4	--
304183	Electromagnetics	3	1	--	30	70	--	--	--	100	4	--
304184	Microcontrollers	3	--	--	30	70	--	--	--	100	3	1
304185	Mechatronics	3	--	--	30	70	--	--	--	100	3	1
304191	Signal Processing and Communications Lab (DC/DSP)	--	--	4	--	--	50	50		100	--	2
304192	Microcontrollers and Mechatronics Lab	--	--	4	--	--	50	50		100		
304193	Electronics System Design	2	--	2	--	--	-	--	50	50	2	1
	Audit Course 3	--	--	--	--	--	--	--	--	--	----	
	Total	19	1	10	150	350	100	100	50	750		
	Total Credits										**25**	

Abbreviations:

TH: Theory   **OR: Oral**
TW: Term Work   **PR: Practical**

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

Third Engineering-E&TC (2015 Course)

(With effect from Academic Year 2017-18)

Course Code	Course	Teaching Scheme Hours / Week			Semester Examination Scheme of Marks						Credit	
		Theory	Tutorials	Practicals	In-Sem	End-Sem	TW	PR	OR	Total	TH/TW	PR+OR
304186	Power Electronics	4	--	--	30	70	--	--	--	100	4	--
304187	Information Theory, Coding and Communication Networks	4	--	--	30	70	--	--	--	100	4	--
304188	Business Management	3	--	--	30	70	--	--	--	100	3	--
306189	Advanced Processors	4	--	--	30	70	--	--	--	100	4	1
304190	System Programming and Operating Systems	3	--	--	30	70		--	--	100	3	1
304194	Power and ITCT Lab	--	--	4	--	--	50	50	--	100	--	2
304195	Advanced Processors and System Programming. Lab	--	--	4	--	--	50	50	--	100		
304196	Employability Skills and Mini Project	2	--	2	--	--	--	--	50	50	2	1
	Audit Course 4	--	--	--	--	--	--	--	--	--		
	Total	20	---	10	150	350	100	100	50	750		
	Total Credits											**25**

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304181   **Digital Communication**

Credits: 04

Teaching Scheme: **Examination Scheme:**

Lecture : 04 hr/week   **In-Sem   : 30 Marks**

                                                       End-Sem: 70 Marks

Course Objectives:

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

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

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

Course Contents

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

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

Unit II :Baseband Digital Transmission   (7Hrs)

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

Unit III : Random Signal & Noise (8Hrs)

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

Unit IV : Baseband Receiver (8Hrs)

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

Unit V : PassbandDigital Transmission (8Hrs)

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

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

Unit VI : Spread Spectrum Modulation (7Hrs)

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

Text Books:

1. A.B Carlson, P B Crully, J C Rutledge, "Communication Systems", Fourth Edition, McGraw Hill Publication.

2. Simon Haykin, "Digital Communication Systems", John Wiley&Sons, Fourth Edition.

Reference Books:

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

304182   **Digital Signal Processing**

Credits: 04

Teaching Scheme: **Examination Scheme:**

Lecture :   04 hr/week   **In-Sem   : 30 Marks**

                                                    End-Sem   : 70 Marks

Course Objectives:

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

Course Outcomes:

On completion of the course, student will be able to

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

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

3) Develop different signal processing applications using DSP processor.

Course Contents

Unit I :DSP Preliminaries and Applications   (6 Hrs)

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

Unit II :Discrete Fourier Transform   (8 Hrs)

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

Unit III : Z transform   **(6 Hrs)**

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

Unit IV : IIR Filter Design   **(8 Hrs)**

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

Unit V : FIR Filter Design   **(6 Hrs)**

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

Unit VI : DSP Applications   **(6Hrs)**

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

 Text Books:

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

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

Reference Books:

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

304183   **Electromagnetics**

Credits: 04

Teaching Scheme: **Examination Scheme:**

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

Tutorial: 01 hr/week   **End-Sem   : 70 Marks**

Course Objectives:

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

Course Outcomes:

On completion of the course, student will be able to

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

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

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

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

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

Course Contents

Unit I :Electrostatics – I   **(8 Hrs)**

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

Unit II :Electrostatics – II   **(8 Hrs)**

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

Unit III : Magnetostatics **(9 Hrs)**

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

Unit IV : Electrodynamic Fields **(8 Hrs)**

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

Unit V : Transmission Lines(8 Hrs)

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

Unit VI : Uniform Plane Waves **(8Hrs)**

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

 Text Books:

1. Mathew N. O. Sadiku, 'Principles of Electromagnetics', 4th Edition ,Oxford University Press Inc, 2009.

2. William H. Hayt and John A. Buck, 'Engineering Electromagnetics', Tata McGraw Hill, 8th Revised edition, 2011.

Reference Books:

1. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, 5th edition, 2010.

2. Jordan and Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 1964.

304184   **Microcontrollers**

Credits: TH-03

Teaching Scheme: **Examination Scheme:**

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

                                                              End-Sem   : 70 Marks

Course Objectives:

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

Course Outcomes:

On completion of the course, student will be able to

1) Learn importance of microcontroller in designing embedded application.

2) Learn use of hardware and software tools.

3) Develop interfacing to real world devices.

Course Contents

Unit I :Introduction to Microcontroller Architecture   (6 Hrs)

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

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

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

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

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

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

Unit IV : PIC Microcontroller Architecture   (6 Hrs)

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

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

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

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

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

 Text Books:

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

304185   Mechatronics

Credits: TH-03

Teaching Scheme: **Examination Scheme:**

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

                                                             End-Sem   : 70 Marks

Course Objectives:

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

Course Outcomes:

On completion of the course, student will be able to

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

 2 Understanding basic principal of Sensors and Transducer.

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

Course Contents

Unit I :Introduction to Mechatronics   (6 Hrs)

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

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

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

Linear).

Classification and selection of transducers:

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

Pressure: Strain Gauge, Piezoelectric

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

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

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

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

 Introduction to MEMS& Nano Sensors . Rotary Optical Encoder

Unit III : Hydraulic Systems   (6 Hrs)

Introduction to Hydraulic Actuators

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

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

Unit IV : Pneumatic Systems   (6 hrs)

Introduction to Pneumatic   a Actuators

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

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

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

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

Selection Criterionofcontrol valve, Single acting and Double acting Cylinders.

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

Cables: Power cable and Signal cables

Unit VI :Mechatronics Systems in Automobile   (6Hrs)

(Treatment with Block Diagram Approach)

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

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

Text Books:

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

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

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

Reference Books:

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

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

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

304191   **Signal Processing and Communications Lab**

Credits: PR-02

Teaching Scheme: **Examination Scheme:**

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

                                                  Termwork :   50 Marks

Digital Communication

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

Group A

1   Study of PCM and Companded PCM.

2   Study of DM and ADM.

3   Study of Pulse shaping, ISI and eye diagram

4   Study of Generation &detection of BPSK and QPSK.

5   Study of Generation &detection of BFSK.

6   Study of line codes (NRZ, RZ, POLAR RZ, BIPOLAR (AMI), MANCHESTER) & their spectral analysis.

7   Study of Detection of digital base band signal in presence of noise.

8   Study of Generation of PN Sequence and its spectrum.

9   Study of Generation &detection of DS-SS coherent BPSK&its spectrum.

Group B

1   Program for implementation to simulate PCM/ DM/ADM system.

2   Simulation program to study effect of ISI and noise in baseband communication system.

3   Simulation Program to study Random Processes.

4   Simulation program for calculation and plotting the error probability of BPSK, QPSK, QAM. Comparison of theoretical and practical BERs.

5   Simulation of any digital communication system using Simulink or similar software.

6   Simulation program for Constellation diagram of any pass band modulated signal in presence of noise.

Digital Signal processing

- Minimum eight experiments to be performed.

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

1. Write a program to verify the sampling theorem and aliasing effects with various sampling frequencies.

2. Write a programs to study and verify DFT properties (Minimum two properties).

3. Write a program to find 4 point circular convolution and compare the result with 8 point circular convolution to study aliasing effect in time domain.
    (a) To find Z and inverse Z transform and pole zero plot of Z-transfer function.
    (b) To solve the difference equation and find the system response using Z transform.

4. To plot the poles and zeros of a transfer function when the coefficients of the transfer
    (a) function are given, study stability of different transfer functions.

5. To study the effect of different windows on FIR filter response. Pass the filter coefficient designed in experiment 6 via different windows and see the effect on the filter response.

6. Design Butterworth filter using Bilnear transformation method for LPF and write a
    (a) program to draw the frequency response of the filter.

7. To plot the mapping function used in bilinear transformation method of IIR filter design.(assignment may be given)

8. Effect of coefficient quantization on the impulse response of the filter using direct form I
    (a) and II realization and cascade realization.(theory assignment)

9. Design and implement two stage sampling rate converter.

10. Computation of DCT and IDCT of a discrete time signal and comment on energy compaction density

11. Write a program for speech signal enhancement using pre-emphasis filter and speech filtering using bandpass filter. Any biomedical signal e.g. ECG can also be used for signal enhancement

304192   Microcontrollers and Mechatronics Lab

Credits: PR-02

Teaching Scheme: **Examination Scheme:**

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

Termwork :   50 Marks

Microcontrollers

List of Practical's: Minimum 10 experiments

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

1. Simple programmes on Memory transfer.

2. Parallel port interacting of LEDS—Different programs(flashing, Counter, BCD, HEX, Display of Characteristic)

3. Waveform Generation using DAC

4. Interfacing of Multiplexed 7-segment display (counting application)

5. Interfacing of LCD to 8051 (4 and 8 bit modes)

6. Interfacing of Stepper motor to 8051- software delay using Timer

7. Write a program for interfacing button, LED, relay & buzzer as follows

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

    B. On pressing button2 relay and buzzer is turned OFF and LED start chasing from right to left .

8. Interfacing 4X4 keypad and displaying key pressed on LCD.

9. Generate square wave using timer with interrupt

10. Interfacing serial port with PC both side communication.

11. Interfacing EEPROM 24C128 using SPI to store and retrieve data

12. Interface analog voltage 0-5V to internal ADC and display value on LCD

13. Generation of PWM signal for DC Motor control.

Mechatronics

List of Practical's

1. Servomotor position control using photo electric pickup

2. Position and velocity measurement using encoders

3. Study of liquid flow measurement.

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

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

6. Study of Hydraulic Trainer.

7. Study of Pneumatic Trainer.

8. Study of Electro-Pneumatic Trainer.

9. Study of Electro-Hydraulic Trainer.

10. Demonstration of any one case study.

304193   Electronic System Design

Credits: TH-02 PR-01

Teaching Scheme: **Examination Scheme:**

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

Practical : 02 hr/week

Course Objectives:

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

Course Outcomes:

On completion of the course, student will be able to

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

Course Contents

Unit I : Design of SMPS   (6 Hrs)

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

Unit II : Design of Data Acquisition Systems (DAS)   (6 Hrs)

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

and LCD), GUI Development.

Unit III :Introduction to DBMS and SQL   (6 Hrs)

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

Unit IV : Design of Communication System(5Hrs)

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

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

Unit V :PCB Design (4 Hrs)

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

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

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

7. http://www.ti.com/lit/an/slua143/slua143.pdf

8. https://www.onsemi.com/pub/Collateral/SMPSRM-D.PDF

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

Guidelines:

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

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

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

    1. Problem statement (Different for each group)

    2. Specifications   3.Block Diagram

    4. Component Selection   5. Design Calculations

    6. Simulation results   7. Bill of Material (generated from SQL)

    8. Conclusion   **9.** Datasheets

    10. Detailed circuit diagram (separate sheet: Imperial /Half Imperial size)

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

List of Practicals:

Assignment 1: Design and Implementation of SMPS

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

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

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

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

b) Interface display device such as LED, 7-segment and LCD

c) Interface the actuators such as Relay, DC Motor, Solenoid

d) Serial interface such as RS-232, USB to transmit the data to PC

e) Optional: GUI development using Lab-View, MATLAB, C#, .net, python etc.

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

a) Database for Electronic components shall be created with specification details.

b) Manipulate data using DML commands.

c) Use SQL queries for following

    I.   Add and delete particular component.

    II.   Display all the components with given criteria.

    III.   Retrieve particular component as per the specification. This shall involve join of minimum two tables.

    IV.   To sort / filter component according their values / tolerances

d) Generate Report s like consumption, inventory, Purchases during specified period.

e) **Generate Bill of Materials for SMPS or DAQ design by entering all related components to database and using queries and report tool.**

Assignment 4: Design of Building block in communication System

a) Design of block level system used for communication (Choose any one system for design)

b) Design any one building block in detail with selection of components, specifications and calculations. Specifications related to frequency and Power must be mentioned. Termination matching with preceding and next block.

Audit Course 3

Japanese Language Audit Course

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

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

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

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

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

Course Objectives:

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

Course Outcomes:

On completion of the course

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

Course Duration: 4 semesters   (3 units / semester)

Unit 1 : Introduction to Kanji Script,

> Describing one's daily routine. To ask what someone does.

> Expressions of Giving & Receiving.

Unit 2 : Adjectives (Types of adjectives)

> Asking impression or an opinion about a thing / person / place that the listener

> Has experienced, visited, or met

> Describing things / person / places with the help of the adjectives.

Unit 3 : Expressions of Like & Dislikes. Expressing one's ability, hobby

> Comparison between objects, persons & cities

Audit Course 3

Cyber and Information Security

Course objective :

> 1.Students will able to learn the issues of security in IT

> 2. Students will able to investigate various security threats in IT

Course Outcomes :

On completion of course students

> 1. will increase the awareness about cyber security

> 2. will increase the awareness about information and network security

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Basic Concepts of Technology and Law

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

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

Information Security Fundamentals:Background, Importance, Statistics, National and International Scenario, Goals of security, Confidentiality, Privacy, Integrity, Non-repudiation, Availability.

Essentials of computer security - Sources of security threats – Intruders, Viruses, Worms and related threats - Threat identification - Threat analysis -Vulnerability identification and Assessment.

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

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

dards, Security Models.Security Management Practices, Security Laws, Information Classificatio

n Process, Risk Management, Security Proceduresand Guidelines, Business Continuity and Disaster Recovery, Ethics and Best Practices, Security Assurance

SEMESTER II

304186   **Power Electronics**

Credits: 04

Teaching Scheme: **Examination Scheme:**

Lecture : 04 hr/week   **In-Sem   : 30 Marks**

End-Sem   : 70 Marks

Course Objectives:

• To introduce students to different power devices to study their construction, characteristics and   turning on circuits.

• To give an exposure to students of working & analysis of controlled rectifiers for different loads, inverters, DC choppers, AC voltage controllers and resonant converters.

• To study the different motor drives, various power electronics applications like UPS, SMPS, etc. and some protection circuits.

Course Outcomes:

On completion of the course, student will be able to

 1) Design & implement a triggering / gate drive circuit for a power device

 2) Understand, perform & analyze different controlled converters.

3) Evaluate battery backup time & design a battery charger.

4) Design & implement over voltage / over current protection circuit.

Course Contents

Unit I : Power Devices   **(8 Hrs)**

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

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

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

Unit III : DC-AC Converters   **(8 Hrs)**

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

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

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

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

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

Unit VI : Power Electronics Applications   **(8 Hrs)**

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

Text Books:

1) M. H. Rashid, "Power Electronics circuits devices and applications", PHI 3rd edition,

   2004 edition, New Delhi.

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

Reference Books:

 1) Ned Mohan, T. Undeland & W. Robbins, "Power Electronics Converters Applications and

    Design" 2nd edition, John Willey & sons, Singapore, Oxford University Press, New Delhi, 2005

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

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

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

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

304187   **Information Theory ,Coding Techniques and**

Communication Networks

Credits: 04

Teaching Scheme: **Examination Scheme:**

Lecture :   04 hr/week   **In-Sem   : 30 Marks**

                                                        End-Sem   : 70 Marks

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

Course Outcomes:

On completion of the course, student will be able to

1) Perform information theoretic analysis of communication system.

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

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

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

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

Course Contents

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

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

Unit II :Information Capacity & Channel Coding   **(8 Hrs)**

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

Unit III : Cyclic Codes   **(8 Hrs)**

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

Unit IV : BCH and Convolutional Codes   **(7 Hrs)**

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

Unit V : Data Communication & Physical Layer(7 Hrs)

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

Unit VI : Data Link Layer   **(7Hrs)**

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

Text Books:

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

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

Reference Books:

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

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

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

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

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

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

304188   **Business Management**

Credits: 03

Teaching Scheme: **Examination Scheme:**

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

Tutorial: **End-Sem   : 70 Marks**

                                                        Term Work   :

Course Objectives:

- To get awareness about various domains in Business Management.

- To understand concept of Quality Management, Financial Management and Project Management.

- To learn Human Resource Management, marketing management are the major tasks in Business

- To promote Entrepreneurship.

Course Outcomes:

On completion of the course, student will be able to

1) Get overview of Management Science aspects useful in business.

2) Get motivation for Entrepreneurship

3) Get Quality Aspects for Systematically Running the Business

4) To Develop Project Management aspect and Entrepreneurship Skills.

Course Contents

Unit I :Basics of Business Management   (8 Hrs)

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

Unit II :Quality Management   (6 Hrs)

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

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

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

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

Unit IV : Human Resource Development   (6 Hrs)

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

Unit V : Entrepreneurship Development (6 Hrs)

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

Unit VI : Marketing   (6 Hrs)

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

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

Introduction to supply chain management and customer relationship management

Text Books:

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

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

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

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

Reference Books:

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

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

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

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

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

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

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

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

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

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

304189   **Advanced Processors**

Credits: TH-04

Teaching Scheme: **Examination Scheme:**

Lecture : 04 hr/week   **In-Sem   : 30 Marks**

                                                 End-Sem   : 70 Marks

Course Objectives:

- To understand need and application of ARM Microprocessors in embedded system.

- To study the architecture of ARM series microprocessor

- To understand architecture and features of typical ARM7& DSP Processors.

- To learn interfacing of real world input and output devices

- To learn embedded communication systems.

Course Outcomes:

On completion of the course, student will be able to

 1) Describe the ARM microprocessor architectures and its feature.

 2) Interface the advanced peripherals to ARM based microcontroller

 3) Design embedded system with available resources.

 4) Use of DSP Processors andresources for signal processing applications.

Course Contents

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

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

Unit II :ARM7 Based Microcontroller   **(6 Hrs)**

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

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

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

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

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

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

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

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

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

Text Books:

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

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

Reference Books:

i.   LPC 214x User manual (UM10139) :- www.nxp.com

ii. ARM architecture reference manual : - www.arm.com

iii. Trevor Martin,"An Engineer's Introduction to the LPC2100 series", Hitex (UK)

iv. TMS320C67XX User manual: www.ti.com

v.   Digital Signal Processing A Practical Approach by Emmanuel Ifeachor, Barrie W. Jervis Pearson Second edition

vi. Joseph Yiu, "The Definitive Guide to the ARM Cortex-M", Newness, ELSEVIER.

304190   System Programming and Operating System

Credits: TH-03

Teaching Scheme: **Examination Scheme:**

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

                                                    End-Sem   : 70 Marks

Course Objectives:

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

Course Outcomes:

On completion of the course, student will be able to

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

Course Contents

Unit I: Introduction to Systems Programming   (8 Hrs)

Introduction:
Components of System Software, Language Processing Activities, Fundamentals of Language Processing.
Assemblers:
Elements of Assembly language programming. Simple assembler scheme, Structure of an assembler, Design of single and two pass assembler.
Macro Processors:
 Macro Definition and call, Macro expansion, Nested Macro Calls, Advanced Macro Facilities, Design of a two-pass macro-processor.

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

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

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

Linkers:

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

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

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

Unit IV : Concurrency control   **(6Hrs)**

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

Unit V : Memory Management   (8 Hrs)

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

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

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

Text Books:

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

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

Reference Books:

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

304194   **Power Electronics and Information Theory Laboratory**

Credits: PR-02

Teaching Scheme: **Examination Scheme:**

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

                                                                Term work :   50 Marks

Power Electronics

List of Experiments (Any 8)

1) Characteristics of SCR

     i) Plot V-I characteristics ,   ii) Observe the effect of gate current

     iii) Measure I_H & I_L

2) V-I Characteristics of MOSFET / IGBT

     i) Plot output characteristics   ii) Plot transfer characteristics

3) Single phase Semi / Full Converter with R & R-L load

     i) Observe load voltage waveform,

     ii) Measurement of firing angle, average o/p voltage across loads,

     iii) Verification of theoretical values with practically measured values.

4) Single-Phase PWM bridge inverter for R load

     i) Observe output rms voltage waveforms,

5) Step down dc chopper using power MOSFET / IGBT

     i) Measure duty cycle and observer effect on average load voltage for DC chopper

6) Find load & line regulation of given SMPS

7) Single phase AC voltage controller using SCRs for R load

     i) Observe output rms voltage waveforms,

     ii) Measurement of firing angle, o/p voltage across load,

     iii) Verification of theoretical values with practically measured values.

8) Speed control of DC motor / Stepper motor / AC motor

      i) Speed control of DC motor using armature voltage control / field control method.

        Measure RPM and plot graph of speed versus armature voltage and field currentOR

     ii) Study drive circuit for stepper motor- phase sequencing and microstepping.OR
     iii) Plot speed-torque characteristic of three phase induction motor.

9) To study over voltage / over current protection circuit.

10) i) Study of Power Factor improvement techniques.OR

ii) Simulation of circuits by using Powersim software

Information Theory, Coding Techniques and Communication Networks

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

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

   a) Noise free channel.b) Error free channel

   c) Binary symmetric channel   d) Noisy channel

   Compare channel capacity of above channels.

2   Write a program for generation and evaluation of variable length source codingusing(C/MATLABor any relevant software) (Any 2)

   a) Shannon – Fano codingand 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 forcoding and decoding of BCH and RS codes.

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

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

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

10   Study of Networking Components and LAN.

11   Write a simulation program to implement ARQ techniques

304195 Advanced Microprocessors and System Programming Lab

Credits: PR-02

Teaching Scheme: **Examination Scheme:**

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

Term work :   50 Marks

Advanced Microprocessors

List of Practical's

Group A: LPC2148 Based Experiments (Any 6)

1   Interfacing LPC2148 with GLCD to display image on it

    OR

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

2. Using UART of LPC2148 for serial reception and transmission from/to computer

3. Interfacing GSM with LPC2148 for sending and receiving message and voice call

4. Interfacing GPS with LPC2148 for finding current location latitude and longitude values

5. Using built-in ADC of LPC2148 for displaying its values (Programming built-in ADC with interrupt and without interrupt) OR

    Programming of onchip ADC and displaying converted digital values on HyperTerminal on TIVA Platform

6. Interfacing SD card to LPC2148 using SPI

7. Interfacing EEPROM to LPC2148 using I2C protocol

8. Introduction to Programming environment with CCS and Tiva library

Group B: DSP Based Experiments (Any 2)

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

1. Convolution

2. Discrete Fourier Transform Using FFT Algorithm

3. Discrete Fourier Transform Using DFT FFT Radix 2 Algorithm

4. FIR filter

5. Real time audio signal capture

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

System Programming and Operating Systems Lab

List of Practicals:

List of Assignments:

1. a. Study of Basic Linux Commands
   b. Write an shell scripting on LINUX OS

2. Write C Program to implement Lexical Analyzer for simple arithmetic operation which creates output tables (Uniform Symbol Table or a. Identifier Table b. Literal Table c. Symbol Table)

3. Design of PASS I of two pass assembler for pseudo machine code.

4. Design of a MACRO PASS-I

5. Implement Job scheduling algorithms: FCFS, SJF

6. Implement Bankers Algorithm for deadlock detection and avoidance

7. Implementation of page replacement algorithm: FIFO / LRU

8. Case Study
   a. Android mobile operating system
   b. Study of System calls to list files, directories
   c. Study of System calls to handles process

304196   Employability Skills and Mini Project

Credits: TH-02 PR-01

Teaching Scheme: **Examination Scheme:**

Lecture :   02 hr/week   Oral   : 50 Marks

Practical : 02 hr/week

Course Objectives:

- To understand the "Product Development Process" including budgeting through Mini Project.

- To plan for various activities of the project and distribute the work amongst team members.

- To inculcate electronic hardware implementation skills by -

- Learning PCB artwork design using an appropriate EDA tool.

- Imbibing good soldering and effective trouble-shooting practices.

- Following correct grounding and shielding practices.

- To develop student's abilities to transmit technical information clearly and test the same by delivery of Seminar based on the Mini Project.

- To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

Course Outcomes:

On completion of the course, student will be able to

1. Understand, plan and execute a Mini Project with team.

2. Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.

3. Prepare a technical report based on the Mini project.

4. Deliver technical seminar based on the Mini Project work carried out.

Course Contents

Execution of Mini Project

● Project group shall consist of **not more than 3** students per group.

● Mini Project Work should be carried out in the Design / Projects Laboratory.

● Project designs ideas can be necessarily adapted from recent issues of electronic design magazines Application notes from well known device manufacturers may also be referred.

- Use of Hardware devices/components is mandatory.

- Layout versus schematic verification is mandatory.

- Bare board test report shall be generated.

- Assembly of components and enclosure design is mandatory.

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

- Instrumentation and Control Systems

- Electronic Communication Systems

- Biomedical Electronics

- Power Electronics

- Audio , Video Systems

- Embedded Systems

- Mechatronic Systems

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

C. Monitoring: (for students and teachers both)

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

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

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

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

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

Week 11 & 12: Demonstration and Group presentations.

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

D. Report writing

- A project report with following contents shall be prepared:

- Title

- Specifications

- Block diagram

- Circuit diagram

- Selection of components, calculations

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

Text Books:

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

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

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

Reference Books:

1. . Robert Boylested, " Essentials of Circuit Analysis", PHI Puublications

2. Meenakshi Raman, Sangeeta Sharma," Technical Communication, Principles and Practice", Oxford University Press

3. A.E. Ward, Angus, " Electronic Product Design", Stanley thornes Publishers, UK.

4. C Muralikrishna, Sunita Mishra," Communication Skills for Engineers", Pearson

Audit Course 4

Japanese Language Audit Course

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

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

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

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

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

Course Objectives:

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

Course Outcomes:

On completion of the course

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

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

Course Content

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

Relative positions, Counters

Unit   2   :   Expressing one's Desire & wants Verb groups,

Asking, Instructing a person to do something

Unit   3   :   Indicating an action or motion is in progress. Describing habitual action

Describing a certain continuing state which resulted from a certain action in

the past.   Express permission & prohibition.

Audit Course 4

Embedded System Design using MSP430

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

Learning outcomes:

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

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

Prerequisite:

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

Basic knowledge of C language programming

Digital Electronics fundamentals

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

Embedded Systems and role of TI platforms

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

Programming MSP430 using CCS

MSP430's Internal Architecture and Programmer's model

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

Clock tree structure and its role

Interfacing Analog sensors

Enabling Low power modes and understanding Interrupt based programming techniques

Various Serial Communication Interfaces : UART / I2C / SPI

UART programming and data logging applications

Programming SPI Interface, Programming I2C Interface

Embedded Wi-Fi and Internet of things

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