Ch. Charan Singh University Campus Meerut

Study & Evaluation Scheme with Syllabus
for
B.Tech. Second Year
Electronics & Instrumentation Engineering

On

Choice Based Credit System
(Effective from the Session: 2018-19)

B. Tech

(Electronics and Instrumentation)

PROGRAMME OUTCOME

The objective of this course is to familiarize the prospective engineers with techniques in sequences, multivariate integration, ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

The students will learn:

- The effective mathematical tools for the solutions of differential equations that modelphysical processes
- To apply integral calculus in various field of engineering. Apart from some otherapplications students will have a basic understanding of Beta and Gamma functions.
- The tool of Fourier series for learning advanced Engineering Mathematics.
- The tools of differentiation of functions of complex variables that are used in varioustechniques dealing with engineering problems

1. facilitate software based learning to provide the required English Language proficiencyto students.
2. To acquaint students with specific dimensions of communication skills i.e. Reading,Writing, Listening, Thinking and Speaking.
3. To train students to use the correct and error-free writing by being well versed in rules ofEnglish grammar.
4. To cultivate relevant technical style of communication and presentation at their work placeand also for academic uses.
5. To enable students to apply it for practical and oral presentation purposes by being honed upin presentation skills and voice-dynamics.
6. To understand the basic concepts of IoT, followed by major components, its layer architecture and how IoT is impacting the Industry in the various forms along with major applications.
7. To make students aware about basic concepts of cloud computing, its benefits and different applications along with insights of major service providers.
8. To understand the basic concepts of Blockchain and its underlying technologies with its implementation as cryptocurrencies.
9. To understand the concept of Additive Manufacturing, its applications in various fields and the basic concepts of drones, their assembly and government regulations involved.
10. To introduce students to the upcoming technology and to develop the required skills for practical applications.

B. Tech

(Electronics and Instrumentation)
Program specific out come

After successful completion of 160 credits, a student shall be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours only, if he/she completes additional university recommended courses only (Equivalent to 20 credits; NPTEL Courses of 4 Weeks, 8 Weeks and 12 Weeks shall be of 2, 3 and 4 Credits respectively) through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL Site http://nptel.ac.in/ as per the NPTEL policy and norms. The students can register for these courses through NPTEL directly as per the course offering in Odd/Even Semesters at NPTEL. These NPTEL courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MooCs courses the students, shall, provide their successful completion NPTEL status/certificates to the University (COE) through their college of study only. The student shall be awarded Hons. Degree (on successful completion of MOOCS based 20 credit) only if he/she secures 7.50 or above CGPA and passed each subject of that Degree Programme in single attempt without any grace marks.

2nd Year III-SEMESTER

S. No.	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
				CT	TA		
1.	Science Based Open Elective/ Mathematics-III	3-1-0	70	20	10	100	4
2.	Universal Human Values & Professional Ethics/ Environment & Ecology	3-0-0	70	20	10	100	3
3.	Network Analysis and Synthesis	3-0-0	70	20	10	100	3
4.	Digital Logic Design	3-0-0	70	20	10	100	3
5.	Electronic Devices and Circuits	3-1-0	70	20	10	100	4
6.	Signals & Systems	3-0-0	70	20	10	100	3
7.	Digital Logic Design Lab	0-0-2	50	30	20	100	1
8.	Electronic Devices and Circuits Lab	0-0-2	50	30	20	100	1
9.	Signals & Systems Lab	0-0-2	50	30	20	100	1
10.	Electronics Workshop & PCB Design Lab	0-0-2	50	30	20	100	1
11.	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
				1000			24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. Manufacturing Process
b. Introduction to soft computing
c. Nano Science
d. Laser System and Application
e. Space Science
f. Polymer Science & Technology
g. Nuclear Science
h. Material Science
i. Discrete Mathematics
j. Applied Linear Algebra

2nd Year IV-SEMESTER

S. No.	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
				CT	TA		
1.	Mathematics-III/ Science Based Open Elective	3-1-0	70	20	10	100	4
2.	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	Microprocessors & Microcontrollers	3-0-0	70	20	10	100	3
4.	Electromagnetic Field Theory	3-1-0	70	20	10	100	4
5.	Electronic Measurement & Instrumentation	3-0-0	70	20	10	100	3
6.	Data Structure & Algorithms	3-0-0	70	20	10	100	3
7.	Microprocessors & Microcontrollers Lab	0-0-2	50	30	20	100	1
8.	Advanced Electronics System Lab	0-0-2	50	30	20	100	1
9.	Electronic Measurement & Instrumentation Lab	0-0-2	50	30	20	100	1
10.	Data Structure & Algorithms Lab	0-0-2	50	30	20	100	1
11.	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
			1000				24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. Manufacturing Process
b. Introduction to soft computing
c. Nano Science
d. Laser System and Application
e. Space Science
f. Polymer Science & Technology
g. Nuclear Science
h. Material Science
i. Discrete Mathematics
j. Applied Linear Algebra

NETWORK ANALYSIS & SYNTHESIS

UNIT I

Signal Analysis, Complex Frequency, General Characteristics and Descriptions of Signals, Node Voltage Analysis, Mesh Current Analysis, Step Function and Associated Wave Forms, The Unit Impulse, Initial and final conditions, Step and Impulse Response, Response of Source Free Circuits, Forced Response, Phasor and Steady State Responses of Circuits to Sinusoidal Functions, Resonance in AC Circuits.

UNIT II

Review of Laplace Transforms, Poles and Zeroes, Initial and Final Value theorems, The transform circuit, Superposition Theorem, Thevenin's and Norton's theorems, Maximum Power Transfer Theorem, Convolution Integral, Amplitude and phase responses. Network functions.

UNIT III

Graph Theory fundamentals, Matrix Representation of Graphs, Formulation of Network Response Equations using Incidence Matrix, Duality in Networks. Computation of Ladder and Non-Ladder Networks, Routh-Hurwitz Stability Criterion, Bode Diagrams.

UNIT IV

Parameters of Two Port Networks, Correlation between Two Port Parameters, Two Port, Relation between Port Parameters, Transfer Functions using Two Port Parameters, Interconnection of TwoPorts , Reciprocal and Symmetric Networks, Terminated Two Port Networks, Interconnections of Two Port Networks, Image Impedance, Iterative Impedance. Harmonics and Dirichlet`s Conditions, Waveform Symmetry and Fourier Coefficients. Filter Networks.

UNIT V

Active Network Synthesis and Realizability: Elements of Relizability Theory, Hurwitz Polynomial, Positive Real Functions (PRF), Characteristics of PRF, Methodology for Simple Network Synthesis, Synthesis of Two Element Type One Port Network.

Text Book:

1. Franklin F. Kuo, "Network Analysis and synthesis", Wiley India Pvt Ltd.
2. MS Sukhija, T.K. Nagsarkar, "Circuits and Networks", Oxford University Publication.

Reference Books:

1. ME Van Valkenberg, "Network Analysis", Prentice Hall of India Ltd.
2. Ghosh, "Network Theory: Analysis and Synthesis", PHI Learning Pvt. Ltd

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Apply Laplace transform for steady state and transient analysis.
4. Determine different network functions.
5. Appreciate the frequency domain techniques.

DIGITAL LOGIC DESIGN

UNIT I

Digital System And Binary Numbers: Number System and its arithmetic, Signed binary numbers, Binary codes, Cyclic codes, Hamming Code, the map method up to five variable, Don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).

UNIT II

Combinational Logic: Combinational Circuits: Analysis Procedure, Design procedure, Binary adder-subtractor, Decimal adder, Binary multiplier, Magnitude comparator, Multiplexers, Demultiplexers, Decoders, Encoders.

UNIT III

Sequential Logic And Its Applications: Storage elements: latches & flip flops, Characteristic Equations of Flip Flops, Flip Flop Conversion, Shift Registers, Ripple Counters, Synchronous Counters, Other Counters: Johnson & Ring Counter.

UNIT IV

Synchronous & Asynchronous Sequential Circuits: Analysis of clocked sequential circuits with state machine designing, State reduction and assignments, Design procedure. Analysis procedure of Asynchronous sequential circuits, circuit with latches, design procedure, Reduction of state and flow table, Race-free state assignment, Hazards.

UNIT V

Memory & Programmable Logic Devices: Digital Logic Families: DTL, DCTL, TTL, ECL & CMOS etc., Fan Out, Fan in, Noise Margin; RAM, ROM, PLA, PAL; Circuits of Logic Families, Interfacing of Digital Logic Families, Circuit Implementation using ROM, PLA and PAL; CPLD and FPGA.

Text Books:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2. David J. Comer, "Digital Logic & State Machine Design", Oxford University Press.
3. RP Jain, "Modern Digital Electronics", Tata McGraw Hill Publication.

Reference Books:

1. DP Kothari and J.S. Dhillon, "Digital Circuits and Design", Pearson Education.
2. A. Anand Kumar, "Fundamentals of Digital Circuits", PHI Learning Pvt. Ltd.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Design and analyze combinational logic circuits.
2. Design and analyze modular combinational circuits with MUX / DEMUX, Decoder & Encoder
3. Design & analyze synchronous sequential logic circuits
4. Analyze various logic families.
5. Design ADC and DAC and implement in amplifier, integrator, etc.

ELECTRONIC DEVICES AND CIRCUITS

UNIT I

Energy Bands and Charge Carrier in Semiconductor: Bonding forces and energy bands in solids, Charge Carriers in Semiconductors, Carrier Concentrations, Drift Mechanism.
Excess carriers in Semiconductors: Optical Absorption, Carrier Lifetime: Direct Recombination, Steady State Carrier Generation, Quasi-Fermi Level, Diffusion of carriers and Einstein relation.

UNIT II

Junctions: Equilibrium Conditions, Forward and Reveres Biased Junctions; Steady State Conditions.
Optoelectronic Devices: Photodiode V-I characteristic, Photodetector, Solar Cells, Light Emitting Diode.

UNIT III

MOSFET: Device structure and its operation in equilibrium, V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier

UNIT IV

BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.

UNIT V

Feedback: The general feedback structure, properties of negative feedback, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt series feedback amplifier.
Oscillators: Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator.

Text Book:

1. AS Sedra and K. C. Smith, "Microelectronic Circuits", Oxford University Press.
2. Millman Jacob, Christos Halkias , Satyabrata Jit, "Electronic Devices and Circuits", Tata McGraw Hill.
3. BG Streetman and S. Banerjee "Solid State Electronics Devices", Prentice Hall of India.

Reference Books:

1. Donald A. Neamen "Semiconductor Physics & Devices", Tata McGraw Hill.
2. Alok K. Dutta, "Semiconductor Devices and Circuits", Oxford University Press.
3. Jacob Millman and Arvin Grabel, "Microelectronics", Tata McGraw Hill.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand working of basic electronics lab equipment.
2. Understand working of PN junction diode and its applications.

3. Understand characteristics of Zener diode.
4. Design a voltage regulator using Zener diode.
5. Understand working of BJT, FET, MOSFET and apply the concept in designing of amplifiers.

SIGNALS & SYSTEMS

UNIT I

Signals: Representation of Signals, Singularity Functions, Discrete Time Signals, Types of Signals, Time Scaling and Shifting, Convolution and Correlation of LTI Systems, Correlation of energy and power signals.

UNIT II

Systems and Analysis of System: System Classification, Linearity/Time Invariance, Causal System, Characterization of LTI Systems, Unit Sample Response, Generalization of D.T. Systems, Concept of Stability, Convolution Integrals/summations, Energy and Power spectral density, Properties of Power spectral Density, Analysis of First order systems, Analysis of second order systems.

UNIT III

Fourier Transforms: Properties and Significance of CTFT, CTFT of Common Signals, Inverse CTFT; Introduction to DTFT, DTFT of Common Signals, Theorems and Properties – DTFT, Inverse DTFT; Continuous Time and Discrete Time Hilbert Transform and its Properties. Introduction of Gaussian signal and its Fourier transform.

UNIT IV

Laplace Transform and Z Transform: Laplace Transforms- Introduction, Laplace Transforms of common signals, Theorems and properties of Laplace Transforms, Concept of Region of Convergence, Inverse Laplace Transforms; Z Transforms – Introduction, Z Transforms of Common Signals, Theorems and properties of Z Transforms, Inverse Z Transforms.

UNIT V

Sampling of Time Signals: Nyquist Criterion, Sampling theorem and frequency domain representation of sampling, Sampling Techniques, Reconstruction of band limited signal from its samples, Sampling of Sinusoidal and other signals.

Text Book:

1. AV Oppenheim, A.S. Willsky and S. Hamid Nawab, 'Signals and Systems', Pearson Education.
2. TK Rawat, "Signals and Systems", Oxford University Press.

Reference Books:

1. BP Lathi, "Principals of Linear Systems and Signals", Oxford University Press.
2. P. Ramakrishna Rao, 'Signal and System', Tata McGraw Hill, New Delhi.
3. Kishore S. Trivedi, "Probability & Statistics with Reliability Queuing and Computer Science Applications", Wiley Publication.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Analyze different types of signals.
2. Analyze linear shift-invariant (LSI) systems.
3. Represent continuous and discrete systems in time and frequency domain using Fourierseries and transform.
4. Analyze discrete time signals in z-domain.
5. Study sampling and reconstruction of a signal.

DIGITAL LOGIC DESIGN LAB

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of V_{cc} and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder using logic gates.
5. Implementation and verification of Encoder using logic gates.
6. Implementation of 4:1 multiplexer using logic gates.
7. Implementation of 1:4 demultiplexer using logic gates.
8. Implementation of 4-bit parallel adder using 7483 IC.
9. Design, and verify the 4-bit synchronous counter.
10. Design, and verify the 4-bit asynchronous counter.
11. Implementation of Mini Project using digital integrated circuit's and other components.

ELECTRONIC DEVICES AND CIRCUITS LAB

1. **Study of Lab Equipments and Components:** CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
2. **P-N Junction diode:** Characteristics of PN Junction diode - Static and dynamic resistance measurement from graph.
3. **Applications of PN Junction diode:** Half & Full wave rectifier- Measurement of V_{rms}, V_{dc}, and ripple factor.
4. **Characteristics of Zener diode:** V-I characteristics of zener diode, Graphical measurement of forward and reverse resistance..
5. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. **Characteristic of BJT:** BJT in CE configuration- Graphical measurement of h-parameters from input and output characteristics. Measurement of A_v, A_I, R_o and R_i of CE amplifier with potential divider biasing.
7. **Measurement of Operational Amplifier Parameters:** Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
8. **Applications of Op-amp:** Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator.
9. **Field Effect Transistors:** Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
10. **Oscillators:** Sinusoidal Oscillators-
    a. Wein's bridge oscillator
    b. phase shift oscillator.
11. Simulation of Amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

SIGNALS & SYSTEMS LAB

1. Introduction to MATLAB
    a. To define and use variables and functions in MATLAB.
    b. To define and use Vectors and Matrices in MATLAB.
    c. To study various MATLAB arithmetic operators and mathematical functions.
    d. To create and use m-files.
2. Basic plotting of signals
    a. To study various MATLAB commands for creating two- and three-dimensional plots.
    b. Write a MATLAB program to plot the following Continuous time and discrete time signals
        1. Step Function
        2. Impulse Function
        3. Exponential Function
        4. Ramp Function
        5. Sine Function
3. Time and Amplitude transformations
    a. Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.
4. Convolution of given signals
    a. Write a MATLAB program to obtain linear convolution of the given sequences.
5. Autocorrelation and Cross-correlation
    a. Write a MATLAB program to compute autocorrelation of a sequence x(n) and verify the property.
    b. Write a MATLAB program to compute cross-correlation of sequences x(n) and y(n) and verify the property.
6. Fourier Series and Gibbs Phenomenon
    a. To calculate Fourier Series coefficients associated with Square Wave.
    b. To Sum the first 10 terms and plot the Fourier Series as a function of time
    c. To Sum the first 50 terms and plot the Fourier Series as a function of time
7. Calculating transforms using MATLAB
    a. Calculate and plot Fourier Transform of a given signal
    b. Calculate and plot Z-transform of a given signal
8. Impulse response and Step response of a given system
    a. Write a MATLAB program to find the impulse response and step response of a system form its difference equation
    b. Compute and plot the response of a given system to a given input
9. Pole-zero diagram and bode diagram
    a. Write a MATLAB program to find pole-zero diagram, bode diagram of a given system from the given system function
    b. Write a MATLAB program to find, bode diagram of a given system from the given system function
10. Frequency response of a system
    a. Write a MATLAB program to plot magnitude and phase response of a given system
11. Checking Linearity/Non-Linearity of a system using SIMULINK
    a. Build a system that amplifies a sine wave by a factor of two.
    b. Test the linearity of this system using SIMULINK

References:

1. "Digital Signal Processing Using MATLAB" ,Vinay K. Ingle ,John G. Proakis, Cengage Learning
2. Mathworks Website www.mathworks.com/
3. Virtual Lab Website http://www.vlab.co.in/, http://iitg.vlab.co.in/?sub=59&brch=166

ELECTRONICS WORKSHOP & PCB DESIGN LAB

1. Study of CRO, DMM & Function Generator.
2. Study of various types of Active & Passive Components based on their ratings.
3. Winding shop: Step down transformer winding of less than 5VA.
4. Soldering shop: Fabrication of DC regulated power supply
5. Identification of various types of Printed Circuit Boards (PCB) and soldering Techniques.
6. Introduction to PCB Design software
7. PCB Lab: a. Artwork & printing of a simple PCB.
   b. Etching & drilling of PCB.
8. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.

DATA STRUCTURE & ALGORITHMS

UNIT I

Abstract Data Types, Sequences as value definitions, Data types in C, Pointers in C, Data Structures and C, Arrays in C, Array as ADT, One Dimensional Array, Implementing one Dimensional Array, Array as parameters, Two Dimensional Array, Structures in C, Implementing Structures, Unions in C, Implementation of unions, Structure Parameters, Allocation of storage and scope of variables, Recursive Definition and Processes: Factorial Function, Fibonacci Sequence, Recursion in C, efficiency of Recursion, Hashing: Hash Function, Open Hashing, Closed Hashing: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

UNIT II

Stack, Queue And Linked List: Stack definition and examples, Primitive Operations, Example Representing Stacks in C, Push And Pop Operation Implementation, Queue as ADT, C Implementation of Queues, Insert Operation, Priority Queue, Array Implementation of Priority Queue, Inserting and Removing Nodes from a list-linked Implementation of stack, Queue and Priority Queue, Other List Structures, Circular Lists: Stack and Queue as Circular List -Primitive Operations on circular lists, Header Nodes, Doubly Linked Lists, Addition of Long Positive Integers on Circular and Doubly Linked List.

UNIT III

Trees: Binary trees: Operations on Binary Trees, Applications of Binary Trees, Binary Tree Representation, Node Representation of Binary Trees, Implicit Array Representation of Binary Tree, Binary Tree Traversal in C, Threaded Binary Tree, Representing List as Binary Tree, Finding the Kth element, Deleting an Element, Trees and their applications: C Representation of trees, Tree Traversals, Evaluating an Expression Tree, Constructing a Tree.

UNIT IV

Sorting And Searching: General Background of Sorting: Efficiency Considerations, Notations, Efficiency of Sorting, Exchange Sorts: Bubble Sort; Quick Sort; Selection Sort; Binary Tree Sort; Heap Sort, Heap as a Priority Queue, Sorting Using a Heap, Heap Sort Procedure, Insertion Sorts: Simple Insertion, Shell Sort, Address Calculation Sort, Merge Sort, Radix Sort, Sequential Search: Indexed Sequential Search, Binary Search, Interpolation Search.

UNIT V

Graphs: Application of Graph, C Representation of Graphs, Transitive Closure, Warshall's Algorithm, Shortest Path Algorithm, Linked Representation of Graphs, Dijkstra's Algorithm, Graph Traversal, Traversal Methods for Graphs, Spanning Forests, Undirected Graph and their Traversals, Depth First Traversal, Application of Depth First Traversal, Efficiency of Depth First Traversal, Breadth First Traversal, Minimum Spanning Tree, Kruskal's Algorithm, Round Robin Algorithm.

Text Book:

1. Aaron M. Tenenbaum, Yeedidyah Langsam, Moshe J. Augenstein, “Data structures using C and C++”, Pearson Education.
2. Reema Theraja, “Data Structure using C”, OUP Publication.

References Books:

1. E. Balagurusamy, “Programming in ANSI C', Second Edition, Tata McGraw Hill Publication.
2. Robert L. Kruse, Bruce P. Leung Clovis L. Tondo, “Data Structures and Program Design in C”, Pearson Education.
3. Lipschutz, “Data Structures With C”, Tata McGraw-Hill Education.
4. TH Koreman, “Introduction to Algorithms“, MIT Press.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand the basics operation of MATLAB.
2. Analysis the time domain and frequency domain signals.
3. Implement the concept of Fourier series and Fourier transforms.
4. Find the stability of system using pole-zero diagrams and bode diagram.
5. Design frequency response of the system.

MICROPROCESSORS & MICROCONTROLLERS

UNIT I

8085 MICROPROCESSOR: History and Evolution of Microprocessor and their Classification, Architecture of 8085 Microprocessor, Address / Data Bus multiplexing and demultiplexing. Status and Control signal generation, Instruction set of 8085 Microprocessor, Classification of instructions, addressing modes, timing diagram of the instructions.

UNIT II

Hardware Interfacing with 8085: Methods of data Transfer and Interrupts of 8085 microprocessor: Classification of interrupts, Programming using interrupts, Direct Memory Access, Serial and parallel data transfer, Interfacing of Memory Chips with 8085 Microprocessor, Interfacing of 8085 with 8155/8156 (RAM), 8355/8755 (ROM). Interfacing of Programmable Devices with 8085 Microprocessor, 8279 programmable Keyboard/Display interface, 8255A programmable Parallel interface, 8254 programmable Interval Timer, 8259A programmable Interrupt Controller, Assembly language programming.

UNIT III

16-bit low power MCU MSP430: Introduction to microcontrollers and embedded systems, Von Neumann (Princeton) and Harvard architecture, RISC and CISC machine, Introduction to MSP430: Architecture, Programming Techniques, Addressing Modes, Programming System registers and configuration I/O ports pull up/down registers concepts, Low Power aspects of MSP430: low power modes, Active vs Standby current consumption.

UNIT IV

Configuring Peripherals in MSP430: External interrupts and software interrupt, interrupt programming, Watchdog timer, Clock Tree in MSP430, Timer/ counter interrupt, Programming MSP430 timer, counter programming, Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.

UNIT V

Serial Communication Interfaces in MSP430: Basics of serial communication, mode of serial communication, RS232, serial communication issue, Serial port programming. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices, external memory, keyboards, display devices, DAC/ADC, DC Motor, Stepper Motor, Servomotor, power management, Sensor Interfacing and signal conditioning. Case Study: MSP430 based embedded system application using the interface protocols for communication with external devices: "A Low-Power Battery less Wireless Temperature and Humidity Sensor with Passive Low Frequency RFID.

Text Book:

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", Penram International Publication (India) Pvt. Ltd.
2. DV Hall, "Microprocessors Interfacing", Tata McGraw Hill Publication.
3. N. Senthil Kumar, M. Saravanan, S. Jeevananthan, "Microprocessors and Microcontrollers", Oxford University Press Publication.
4. Getting Started with the MSP430 Launchpad by Adrian Fernandez, Dung Dang, Newness publication ISBN-13: 978-0124115880

5. MSP430 microcontroller basics 1st Edition by John H. Davies (Author), Newnes Publication ISBN-13: 978-0750682763

Reference Books:

1. http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_Low_Power_Mode
2. http://processors.wiki.ti.com/index.php/MSP430_16-Bit_Ultra-Low_Power_MCU_Training
3. AK Roy & KM Bhurchandi, "Advance Microprocessor and Peripherals (Architecture, Programming & Interfacing)", Tata McGraw Hill Publication.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand the basics operation of MATLAB.
2. Analysis the time domain and frequency domain signals.
3. Implement the concept of Fourier series and Fourier transforms.
4. Find the stability of system using pole-zero diagrams and bode diagram.
5. Design frequency response of the system.

ELECTROMAGNETIC FIELD THEORY

UNIT I

Coordinate Systems and Transformation :

Basics of Vectors: Addition, subtraction and multiplications**;** Cartesian, Cylindrical, Spherical transformation.

Vector calculus: Differential length, area and volume, line surface and volume integrals, Del operator, Gradient, Divergence of a vector, Divergence theorem, Curl of a vector, Stokes's theorem, Laplacian of a scalar.

UNIT II

Electrostatic fields: Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses' Law- Maxwell's equation, Electric dipole and flux line, Energy density in electrostatic fields, Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, Dielectric-constants, Continuity equation and relaxation time, boundary conditions, Electrostatic boundary value problems: Poisson's and Laplace's equations., Methods of Images.

UNIT III

Magneto statics : Magneto-static fields, Biot - Savart's Law, Ampere's circuit law, Maxwell's equation, Application of ampere's law, Magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential.

UNIT IV

Magnetic forces: Materials and devices, Forces due to magnetic field, Magnetic torque and moment, a magnetic dipole. Magnetization in materials, Magnetic boundary conditions, Inductors and inductances, Magnetic energy.

UNIT V

Waves and Applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, Displacement current, Maxwell's equation in final form
Electromagnetic wave propagation: Wave propagation in loss dielectrics, Plane waves in lossless dielectrics Plane wave in free space. Plain waves in good conductors, Power and the pointing vector, Reflection of a plain wave in a normal incidence. Transmission Lines and Smith Chart.

Text Book:

1. MNO Sadiku, "Elements of Electromagnetic', Oxford University Press.

Reference Books:

1. WH Hayt and JA Buck, "Engineering Electromagnetic", McGraw- Hill Education.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

6. Understand basics electrical circuits with nodal and mesh analysis.
7. Appreciate electrical network theorems.
8. Apply Laplace transform for steady state and transient analysis.
9. Determine different network functions.
10. Appreciate the frequency domain techniques.

ELECTRONIC MEASUREMENT AND INSTRUMENTATION

UNIT I

Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimensions and standards.

Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis.

PMMC instrument, Galvanometer, DC ammeter, DC voltmeter, series ohm meter.

UNIT II

Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes, Digital voltmeter systems, Digital multimeter, digital frequency meter System.

UNIT III

Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, Low Resistance Measuring Instruments, AC bridge theory, capacitance bridges, Inductance bridges, Q meter.

UNIT IV

CRO: CRT, Wave Form Display, Time Base, Dual Trace Oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications.

UNIT V

Instrument calibration: Comparison method, digital multimeter as standard instrument, calibration instrument, Recorders: X-Y recorders, plotters Transducers.

Text Book:

1. David A. Bell, “Electronic Instrumentation and Measurements”, Oxford University Press.

Reference Books:

1. Oliver and Cage, “Electronic Measurements and Instrumentation”, Tata McGraw Hill Publication.
2. Alan S. Morris, “Measurement and Instrumentation Principles”, Elsevier (Buterworth Heinmann).

Course Outcomes:

At the end of this course students will demonstrate the ability to:

11. Understand basics electrical circuits with nodal and mesh analysis.
12. Appreciate electrical network theorems.
13. Apply Laplace transform for steady state and transient analysis.
14. Determine different network functions.
15. Appreciate the frequency domain techniques.

MICROPROCESSORS AND MICROCONTROLLERS LAB

1. To study 8085 microprocessor system.
2. i) Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
   ii) Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
   iii) To perform multiplication and division of two 8 bit numbers using 8085.
3. Learn and understand how to configure MSP-EXP430G2 Launchpad digital I/O pins. Write a C program for configuration of GPIO ports for MSP430 (blinking LEDs, push buttons interface).

   Exercises:

   a) Modify the delay with which the LED blinks.
   b) Modify the code to make the green LED blink.
   c) Modify the code to make the green and red LEDs blink:
      i. Together
      ii. Alternately

   d) Alter the code to turn the LED ON when the button is pressed and OFF when it is released.

   e). Alter the code to make the green LED stay ON for around 1 second every time the button is pressed.

   f). Alter the code to turn the red LED ON when the button is pressed and the green LED ON when the button is released.
4. Usage of Low Power Modes:

   Configure the MSP-EXP430G2 Launchpad for Low Power Mode (LPM3) and measure current consumption both in active and low power modes. Use MSPEXP430FR5969 as hardware platform and measure active mode and standby mode current.

   Exercises:

   a) How many Low power modes are supported by the MSP430G2553 platform?

   b) Measure the Active and Standby Current consumption in LPM3 mode for the same application using MSP430F5529 LaunchPad
5. Learn and understand GPIO based Interrupt programming. Write a C program and associated GPIO ISR using interrupt programming technique.

   Exercises:

   a) Write the code to enable a Timer interrupt for the pin P1.1.
   b) Write the code to turn on interrupts globally
6. Implement Pulse Width Modulation to control the brightness of the on-board, green LED. This experiment will help you to learn and understand the configuration of PWM and Timer peripherals of the MSP430G2553.

   Exercises:

   a) Observe the PWM waveform on a particular pin using CRO.
   b) What is the maximum resolution of PWM circuitry in MSP430G2 Launchpad?
   c) Change the above code to create a PWM signal of 75% duty cycle on particular PWM pin.
7. The main objective of this experiment is to control the on-board, red LED by the analog input from a potentiometer. This experiment will help you to learn and understand how to configure an ADC to interface with a potentiometer.

Exercises:

a) Alter the threshold to 75% of Vcc for the LED to turn on.

b) Modify the code to change the Reference Voltage from Vcc to 2.5V.

8. Learn and understand how to configure the PWM and ADC modules of the MSP-EXP430G2 Launchpad to control the DC motor using external analog input.

   Exercises:

   a) What is the maximum resolution of PWM circuitry in MSP430G2 LaunchPad and how it can be achieved using program?
   b) Create a PWM signal of 75% duty cycle on particular PWM pin.
   c) Create Switch case code from the example code to run the DC Motor in 3 set of speeds.

9. Understand the ULP Advisor capabilities and usage of ULP Advisor to create optimized, power-efficient applications on the MSP-EXP430G2 Launchpad.

   Exercises:

   a) How does the ULP Advisor software help in designing power-optimized code?
   b) Which ULP rule violation helps us to detect a loop counting violation?
   c) Connect the MSP430 to terminal on PC and echo back the data

10. Configure of Universal Serial Communication Interface (USCI) module of MSP430G2553 for UART based serial communication. The main objective of this experiment is to use UART of the MSP430G2553 to communicate with the computer.

    Exercise:

    Modify the above code to transmit the set of strings to the serial terminal via UART as shown below:

    char str1[]="MSP430G2 launchpad"

    char str2[]= "Ultra low power mixed signal processing applications"

11. Understand and Configure 2 MSP430F5529 Launchpads in master-slave communication mode for SPI protocol.

    Exercises:

    a) Which port pins of MSP430 can be configured for SPI communication?

    b) What is the data transfer rate supported by MSP430 for SPI communication?

ADVANCED ELECTRONICS SYSTEM LAB

Transistor Modeling and Circuits

- Metal Oxide Semiconductor Field Effect Transistors (MOSFETs)
    - *DC biasing of Common Source
    - *MOSFET Common Source Amplifier
    - *MOSFET Source Follower
    - *Current Mirror
- SPICE parameters for MOSFET transistors.
- Step-Down (Buck) DC-DC Converters.
- Step-Up (Boost) DC-DC Converter
- CMOS Amplifier design.

Timing

- -MOSFET based Ring oscillators
- -MOSFET based Relaxation oscillators
- - MOSFET based Voltage-controlled oscillators
- - Integration of crystal oscillator into circuits

Data Conversion

- - Analog to Digital Conversion
    - * Successive Approximation ADC
- - Digital to Analog Conversion
    - * Scaled Resistor Network

System Considerations

- - System-level stability: decoupling, ground loops
- - Basics of EMC and screening
- - Examples of complete electronic systems

ELECTRONIC MEASUREMENT & INSTRUMENTATIONLAB

1. Study of semiconductor diode voltmeter and its use as DC average responding AC voltmeter.
2. Study of L.C.R. Bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given scillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer (i) PT-100 transducer (ii) J- type transducer (iii) K-type transducer (iv) Pressure transducer
6. Measurement of phase difference and frequency using CRO (Lissajous Figure)
7. Measurement of low resistance Kelvin's double bridge.
8. To measure unknown capacitance of small capacitors by using Schering's bridge.
9. To measure unknown Inductance using Hay's bridge.
10. To measure unknown frequency using Wein's frequency bridge.

DATA STRUCTURE AND ALGORITHMS LAB

1. Run time analysis of Fibonacci Series
2. Study and Application of various data Structure
3. Study and Implementation of Array Based Program
   a. Searching (Linear Search, Binary Search)
   b. Sorting (Bubble, Insertion, Selection, Quick, Merge etc)
   c. Merging
4. Implementation of Link List
   a. Creation of Singly link list, Doubly Linked list
   b. Concatenation of Link list
   c. Insertion and Deletion of node in link list
   d. Splitting the link list into two link list
5. Implementation of STACK and QUEUE with the help of
   a. Array
   b. Link List
6. Implementation of Binary Tree, Binary Search Tree, Height Balance Tree
7. Write a program to simulate various traversing Technique
8. Representation and Implementation of Graph
   a. Depth First Search
   b. Breadth First Search
   c. Prim`s Algorithm
   d. Kruskal`s Algorithms
9. Implementation of Hash Table

Course Outcomes:

At the end of this course students will demonstrate the ability to:

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19. Determine different network functions.
20. Appreciate the frequency domain techniques.