3rd Semester

Course No.	Subject	Teaching Periods		Credits
		L	T	
BSCMTH31	**Engineering Mathematics - III**	2	1	3

Section	Course contents	Hours
1.	Laplace transform, shifting theorem	4
2.	Laplace transform of differential functions	4
3.	Heaviside's unit step function	2
4.	Dirac-delta function and its Laplace transform	2
5.	Heaviside's expansion theorem	2
6.	Inverse Laplace transform	4
7.	Initial and final value theorem	3
8.	Convolution theorem	1
9.	Applications of Laplace transform in the solution of linear differential equations	4
10.	Fourier series, Harmonic Analysis	4
11.	Definition of Fourier transform, Fourier sine and Cosine Transform	3
12.	Fourier integral formula	4
13.	Applications to solutions of BVP	4
14.	Data modeling , types, tools and techniques	4
15.	Data interpretation , types methods and tools	5
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Laplace Transforms by Murray R. Speigal
2. Advanced Engg. Mathematics: Erwin Kreyzing- Wiley Eastern. Pub.
3. Higher Engg. Mathematics: B.S. Grewal - Khanna publishers.
4. Advanced Engineering Mathematics: Michael D Greenberg-PHI.
5. Higher engineering mathematics: H. K. Dass, Rajnish Verma-S. Chand

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE32	**Network Analysis and Synthesis**	3	1	4

Section	Course contents	Hours
1	Charge and energy, capacitance, inductance and resistance parameters in the light of field and circuit concepts	3
2	Approximate realization of a physical system as a circuit. Reference directions for currents and voltages, conventions for magnetically coupled circuits, Circuit topology	4
3	First order differential equation: Differential equations as applied in solving networks. Application of initial conditions. Evaluating initial conditions in networks	6
4	Laplace Transformations. Wave form analysis and Synthesis; The unit step, ramp and impulse functions and Laplace transforms. Initial and final value theorem, Convolution integral, convolution as summation	6
5	Network theorems and impedance functions: Complex frequency, transformer impedance and transform circuits, series and parallel combination of elements	5
6	Network Functions – Poles and Zones: Ports of terminal pairs. Network functions for one port and two port network. Time domain behavior from poles zero plot	5
7	Two port parameters: Relationship between two-port parameters. Admittance, Impedance, transmission and hybrid parameters	6
8	Relationship between parameter sets. Parallel connection of two port Networks. Characteristic impedance of two port networks	5
9	Filters Filter fundamentals - pass & stop band, filter classification	5
10	Constant-k and m-derived Filters	5
TOTAL HOURS FOR THE COURSE		**50**

References

1. Network Analysis by Van Valkenberg
2. Network Analysis & Synthesis by F. Kuo
3. Network Analysis by G.K.Mittal

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE33	**Analog Electronic Circuits - I**	2	1	3

Section	Course contents	Hours
1	***P-N Junction diode*****:** Brief review of structure and operation, **c**urrent components in a p-n junction, Circuit models	6
2	Temperature dependence, Diode capacitances and switching times, rectifier circuits, voltage regulation, limiting circuits, level shifters, voltage multipliers	4
3	***BJT*****:** Brief review of structure and operation, IV characteristics, Equivalent circuit models, Ebers-Moll model, CE, CC and CB configurations, input and output characteristics, Biasing and bias stability, analysis of basic amplifier configurations	8
4	Low frequency h-parameter model, Analysis and design of transistor amplifiers using h-parameters. Millers theorem	4
5	High frequency hybrid-pi model, Analysis and design of transistor amplifier circuits at high frequencies. Multistage amplifiers, phototransistors, transistor as a switch	5
6	***FET*****:** Brief review of structure, operation and characteristics of JFET and MOSFET, Depletion and enhancement type MOSFETS, FET biasing	4
7	FET Small signal model, Common source, Common drain and Common gate amplifiers and their analysis. Low and High frequency response of FET amplifier	5
8	***Building Blocks of IC Amplifiers*****:** Current sources, current mirrors and current steering circuits, CE and CS amplifiers with current source loads	4
9	Cascode amplifier, folded cascode, double cascoding, Wilson current mirror, Wildar current source, Darlington pair	4
10	***Feedback Basics*****:** General feedback structure, impact of positive and negative feedback on circuit parameters, feedback topologies (series-shunt, series-series, shunt-series, shunt-shunt), Analysis of example circuits for each feedback topology, stability in feedback amplifiers	8
TOTAL HOURS FOR THE COURSE		**52**

References

1. Sedra A.S. and Smith K.C., Microelectronic Circuits, *Oxford University Press.*
2. Razavi B., Fundamentals of Microelectronics, *John Wiley & Sons.*
3. Boylestad R. and Nashelsky L., Electronic Devices and Circuits, *Prentice Hall*
4. J. Millman and C. Halkias, Integrated Electronics, *McGraw Hill Publications*
5. Neamen D. A., Microelectronics: Circuit Analysis and Design, *McGraw Hill Publications*

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE34	**Digital System Design – I**	2	1	3

Section	Course contents	Hours
1.	Introduction to Digital Electronics, Digital Systems and Digital Logic. Advantages and Disadvantages of Digital Systems. Review of Digital Signals and their attributes. Review of Number systems, Radix conversion, Binary and Hexadecimal Arithmetic.9's, 10's, 1's & 2's complements and their usage, Binary codes (Weighted and non-Weighted), Error detecting and Correcting codes, Applications of various binary digital codes	8
2.	Introduction to Boolean Algebra, Theorems of Boolean algebra, Canonical forms, Representation of logical functions using Boolean Algebra, Truth Tables and Simplification using Boolean functions, Karnaugh map and Tabulation method	8
3.	Basic Logic Gates, Implementation of Boolean functions using various logic gates. Implementation of various Boolean functions using AND-OR-NOT, NAND-NAND, NOR- NOR, OR-AND-NOT and DEDICATED Gate logic	6
4.	**Digital Logic Families:** Introduction to bipolar Logic families: DDL, RTL, DTL, TTL, ECL and MOS Logic families: NMOS, PMOS, CMOS, Details of TTL logic family- Totem pole, Open collector outputs, TTL subfamilies, Comparison of different logic families on the basis of design parameters	10
5.	Multiplexers and De-multiplexers, Encoders and Decoders, Code Converters, Adders, Subtractors, Multipliers, Parity Checker and Magnitude Comparator. Multiplexer and decoder logic. Implementation of various Boolean functions using multiplexer and decoder logic	10
6.	**Introduction to Sequential logic:** Flip-flops-SR,JK,D and T flip-flops- Level triggering and edge triggering, Counters-Asynchronous and synchronous Counters, Modulo counters.	10
TOTAL HOURS FOR THE COURSE		**52**

References

1. Anil K. Maini, "Digital Electronics", Wiley.
2. Malvino and Leach, "Digital principles and Applications" Tata Mc Graw Hill.
3. Jain R P, "Modern Digital Electronics", Tata Mc Graw-Hill, Third Edition,(2003)
4. Mano M. Morris, "Digital Design", Pearson Education, Third Edition,(2006)
5. Flecther, "An Engineering Approach to Digital Design", Prentice Hall of India, New Delhi.
6. Tocci Ronald J, "Digital Systems- Principles and Applications" Prentice Hall of India, New Delhi

Course No.	Subject	Teaching Periods		Credits
		L	T	
ESCECE35	**Data Structures**	2	1	3

Section	Course contents	Hours
1	**Introduction:** Basic concept of data, structures and pointers	5
2	**Arrays:** Representation, implementation, polynomial representation. Limitations	4
3	**Strings:** Representation, String operations, Implementing String. h library functions	4
4	**Linked List:** Static and dynamic implementation. Single, double, circular, multiple linked lists	5
5	**Stacks:** Recursion and Stacks. Static and dynamic implementation. Expression evaluation. Infix, postfix expressions, multiple stacks	5
6	**Queues:** Static and dynamic implementation, circular queues, and implementation	4
7	**Hash Tables:** Hash tables implementation. Hashing techniques, single, double	4
8	**Storage Management:** Memory Management techniques, garbage collection	4
9	**Trees:** Binary trees, binary search trees, static and dynamic implementation. Tree operations, insert, delete, and search	6
10	**Heaps:** Brief introduction.	1
11	**Sorting and Searching:** Different sorting techniques. Insertion sort, selection sort, bubble sort, radix sort, quick sort, merge sort, heap sort.	6
12	**Graphs:** Representation of graphs, BFS, DFS sort. Graph Algorithms	4
TOTAL HOURS FOR THE COURSE		**52**

References

1. Data Structures by Rajni Jindal
2. Data Structures by Schaum's Series
3. Data Structures by Knuth
4. Data Structures by Farouzan
5. Data Structures using C and C++ by Langsam, A

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE32L	**Network Analysis and Synthesis Lab**	2	1

List of Experiments

1) Lissajous Patterns- Measurement of Voltage frequency and Phase of a different waveform.
2) To assemble LCR circuits and find time constant of each. Observe their performance in low pass and high pass mode.
3) For a given two port network measure:
    a. z parameters.
    b. y parameters.
    c. ABCD parameters.
    d. h parameters.
4) To experimentally determine the characteristic impedance and to plot the attenuation characteristics of the following circuits.
    a. Constant-k Low Pass Filter.
    b. Constant-k High Pass Filter.
    c. m-derived Low Pass Filter.
    d. m-derived High Pass Filter.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE33L	**Analog Electronic Circuits Lab – I**	2	1

List of Experiments

1) Introduction about basic equipments in Analog electronics lab.
2) Study of CRO & DSO - Measurement of Voltage, frequency and Phase of a given waveform.
3) Study of Function Generator and working with various signals and their attributes.
4) To study VI characteristics of a silicon rectifier Diode, Shottky barrier Diode, LED and Zener Diode using Multisim and Hardware Test bench.
5) Halfwave, Full-wave rectifier circuits and to study their performance using Multisim and Hardware Test bench.
6) To study clipping and clamping circuits on Multisim and Hardware Test bench.
7) To study voltage regulation using Zener diode.
8) Study V-I characteristics of transistor (PNP and NPN) and calculate the performance parameters of a transistor in CB and CE Configurations.
9) To assemble a CB amplifier with various biasing configurations and observe its performance.
10) To assemble a CE amplifier with various biasing configurations and observe its performance.
11) To design a practical amplifier using transistors with given specifications and parameters.
12) To Study V-I characteristics of JFET and MOSFET and determine their performance parameters.
13) To Study various FET and MOSFET configurations and their practical application circuits.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE34L	**Digital System Design Lab – I**	2	1

List of Experiments

1. To do the following:
   A. To verify the truth table of following logic gates:
      a. AND OR and NOT
      b. NAND, NOR, XOR and XNOR
   B. Design of Basic NOT, OR, AND, NAND, NOR Gates using DDL, RTL, DTL, TTL, and CMOS integrated circuits. Study of Open Collector, Open Drain and Totem-Pole Logic Family Configurations.
2. To implement XOR and XNOR using universal logic gates.
   A. To verify De-Morgan's law using logic gates.
   B. To implement certain Boolean expressions and check their equality.
3. To design and realize:-
   A. Half adder and verify its truth table.
   B. Full adder and verify its truth table.
   C. Half Subtractor and verify its truth table
   D. Full Subtractor and verify its truth table.
4. To design a multiplexer/demultiplexer using two input NAND gates
5. To design a 4 bit binary to decimal converter.
6. Design and realize the following flip flops using logic gates.
   A. RS flip flop
   B. JK flip flop
   C. D flip flop
   D. T flip flop

Course No.	Subject	Teaching Periods	Credits
		P	
ESCECE35L	**Data Structures Lab**	2	1

List of Experiments

1. Basic concepts of data, linear lists, strings, arrays and orthogonal lists, representation of trees & graphs, storage systems, Arrays, Recursion, Stacks, Queues, Linked lists, Binary trees, General Trees, Tree Traversal, Symbol Table and Searching Techniques, Sorting Techniques, graphs.
2. Implement singly and doubly linked lists.
3. Represent a polynomial as a linked list and write functions for polynomial addition.
4. Implement stack and use it to convert infix to postfix expression.
5. Implement array-based circular queue and use it to simulate a producer consumer problem.
6. Implement an expression tree. Produce its pre-order, in-order, and post-order traversals.
7. Implement binary search tree.
8. Implement priority queue using heaps.
9. Implement hashing techniques.
10. Implement various sorting techniques as taught in class.
11. Implement Dijkstra's algorithm using priority queues.
12. Implement Prim's and Kruskal's algorithms.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE36L	**EDA Tools Lab – I**	2	1

Introduction to ARDUINO

Section	Course Contents
1	**Basic IDE:** Creating and Saving a Sketch-Structuring an Arduino Program-Using Simple Primitive Types- Using Floating-Point Numbers Working with Groups of Values Using Arduino -Structuring Your Code into Functional Blocks Returning More Than One Value from a Function-Taking Actions Based on Conditions-Repeating a Sequence of Statements-Repeating Statements with a Counter-Breaking Out of Loops-Taking a Variety of Actions Based on a Single Variable-Comparing Character and Numeric Values-Comparing Strings -Performing Logical Comparisons Performing Bitwise Operations-Combining Operations and Assignment.
2	**Using Mathematical Operators:** Finding the Remainder After Dividing Two Values-Determining the Absolute Value Constraining a Number to a Range of Values Finding the Minimum or Maximum of Some Values Raising a Number to a Power Taking the Square Root Rounding Floating-Point Numbers Up and Down Using Trigonometric Functions Generating Random Numbers Setting and Reading Bits Shifting Bits Extracting High and Low Bytes in an int or long Forming an int or long from High and Low Bytes.
3	**Serial Communications:** Sending Debug Information from Arduino to Your Computer Sending Formatted Text and Numeric Data from arduino , Receiving Serial Data in Arduino Sending Multiple Text Fields from Arduino in a Single Message, Receiving Multiple Text Fields in a Single Message in Arduino Sending Binary Data from Arduino Receiving Binary Data from Arduino on a Computer Sending Binary Values from Processing to Arduino Sending the Value of Multiple Arduino Pins Logging Arduino Data to a File on Your Computer.
4	**Digital and Analog input/Output**: Using a Switch Using a Switch Without External Resistors Reliably, Detecting the Closing of a Switch Determining How Long a Switch Is Pressed Detecting Movement Detecting Light Detecting Motion (Integrating Passive Infrared Detectors) Measuring Distance Measuring Distance Accurately Detecting Vibration Detecting Sound Measuring Temperature Connecting and Using LEDs Adjusting the Brightness of an LED Driving High-Power LEDs Adjusting the Color of an LED Sequencing Multiple LEDs: Creating a Bar Graph Sequencing Multiple LEDs: Driving a 7-Segment LED Display Driving Multidigit, Increasing the Number of Analog Outputs Using PWM Extender Chips (TLC5940) Controlling Servos from the Serial Port.

Tools Required: Matlab, Labview, Arduino IDE and Supported Hardware