DKTE Society's
TEXTILE & ENGINEERING INSTITUTE
(An Autonomous Institute)

Rajwada , Ichalkaranji 416115

DEPARTMENT: ELECTRONICS ENGINEERING

CURRICULUM
Electronics Engineering Program

Second Year

With Effect From
2017-18

DKTE
Promoting Excellence in Teaching
Learning & Research

Second Year UG Program in Electronics Engineering
Semester-III

Sr. No.	Course Code	Name of the Course	Group	Teaching Scheme				Credits	Audit
				Theory Hrs/ Week	Tutorial Hrs/ Week	Practical Hrs/ Week	Total		
1	ELL201	Engineering Mathematics III	A	3	-	-	3	3	
2	ELL202	Electronics Devices And Circuits	D	4	-	-	4	4	
3	ELL203	Linear Circuits	D	4	-	-	4	4	
4	ELL204	Analog Communication	D	3	-	-	3	3	
5	ELL205	Structured Programming	D	3	-	-	3	3	
6	ELP202	Electronics devices and circuits	D		-	2	2	1	
7	ELP204	Analog Communication lab	D		-	2	2	1	
8	ELP205	Structured Programming	D			2	2	1	
9	ELP206	Circuit Simulation	D			2	2	1	
10	ELD207	Mini Project I	F			2	2	2	
11	ELL208	Environmental Studies Part I (Mandatory Course)	C	**2**			2	Grade	
Total				**19**	**0**	**10**	**29**	**23**	

Second Year B.Tech. Sem. III
ELL201 ENGINEERING MATHEMATICS –III

Teaching Scheme	
Lectures	3 Hrs. /Week
Tutorials	--
Total Credits	3

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	**100**

Prerequisites-Engineering Mathematics-I, Engineering Mathematics-II

Course Objectives	
1.	To provide knowledge of Linear differential equations and partial differential equations.
2.	Discuss fourier series.
3.	To provide knowledge of Laplace transforms
4.	To provide knowledge of vector differentiation and vector integration.

Course Outcomes At the end of the course students will be able to	
1.	Use the knowledge of L.D.E. And P.D.E. to solve the problems related to linear circuits.
2.	Apply fourier series to solve the problems of signal system
3.	Apply the Laplace transforms to solve differential equations.
4.	Apply the knowledge of vector differentiation and vector integration .

	Course Contents	
Unit No.	**Topics**	**Hrs**
Unit 1.	**Linear Differential Equations** Linear Differential Equations with constant coefficients, Homogenous Linear differential Equations, Applications of LDE with constant coefficients to Electrical systems.	**7 Hrs.**
Unit 2.	**Partial Differential Equation :** Four standard forms of partial differential equation of first order viz : i)f(p,q)=0 ii)f(p,q,z)=0 iii)f(x,p)=f(y,q) iv)f(x,y,p,q,z)=0	**6 Hrs.**

Unit 3.	**Fourier series:** Definition, Euler's formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, change of interval, expansions of odd and even periodic functions, Half range series.	**7 Hrs.**
Unit 4.	**Laplace Transform and applications** Definition, properties of Laplace transforms, transforms of derivatives, transforms of integral, Inverse Laplace transforms, Convolution theorem. Applications to initial value boundary problems, Heaviside Unit step function, Dirac-delta function, Periodic function	**7 Hrs.**
Unit 5.	**Vector Differentiation :** Differentiation of vectors, Gradient of scalar point function, Directional derivative, Divergence of vector point function, Curl of a vector point function. Irrotational and solenoidal vector field.	**6 Hrs.**
Unit 6.	**Vector Integration:** The line integral, Surface integral, volume integral, Gauss's Divergence theorem, Stoke's theorem, Green's theorem (Without proof).	**6 Hrs**

Text Books	
1.	A text book of Applied Mathematics: Vol. I, II and III by J. N. Wartikar& P. N. Wartikar VidyarthiGriha Prakashan , Pune.
2.	Higher Engineering Mathematics by Dr. B. S. Grewal.
Reference Books	
1	Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.
2	Advanced Engineering Mathematics by H. K. Dass, S. Chand, New Delhi.
3	A text book of Engineering Mathematics Volume I by Peter V. O'Neil and Santosh K. Sengar, Cengage Learning.
4	Mathematical methods of Science and Engineering by Kanti B. Datta, Cengage Learning.
5	A text book of Engineering Mathematics by N. P. Bali, Iyengar, Laxmi Publications (P) Ltd., New Delhi

Second Year B.Tech. Sem. III
ELL202: ELECTRONIC DEVICES AND CIRCUITS

Teaching Scheme	
Lectures	4 Hrs. /Week
Practical	2 Hrs/week
Total Credits	5

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	**100**

Prerequisites-Basic Electronics. Engineering Mathematics I, Engineering Mathematics II

Course Objectives	
1.	Provide an introduction and basic understanding of Semiconductor Devices viz. diodes and bipolar junction transistors.
2.	Develop student's ability to apply basic engineering sciences to understand the operation & analysis of electronic circuits using bipolar junction transistors and field effect transistor.
3.	Provide basic analog electronic circuit design techniques using bipolar junction transistors and FET to develop analytical skills.
4.	Encourage students to design electronic circuits to meet the desired specifications.

Course Outcomes At the end of the course students will be able to	
1.	Analyze different types of semiconductor devices, their operation and characteristics.
2.	Design and analyze the DC bias circuitry of BJT and FET.
3.	Analyze and model BJT and FET for small signal.
4.	Design fixed and variable voltage regulator.
5.	Design circuits using the BJT and FET.

	Course Contents	
Unit No.	**Topics**	**Hrs**
Unit 1.	**Bipolar Junction Transistor:** Input and Output Characteristics in CE, CB and CC configuration, Comparison of transistor configurations. BJT biasing, Stability factor. Ratings and specifications of BJT from data sheet.	**7 Hrs.**
Unit 2.	**FET & MOSFET:** JFET- structure, operation, characteristics and Biasing, Drain and Transfer Characteristics (Shockley's Equation). Types of biasing of JFET, Biasing	**9 Hrs.**

	against device variation, biasing for zero current drift. Ratings and specifications of JFET from data sheet MOSFET: Structure, Symbol, Basic operation, Drain and Transfer Characteristics.Finite output resistance, body effect, sub threshold conduction, breakdown effects and temperature effects. MOSFET Biasing. N-MOS, P-MOS andCMOS devices. Handling precautions for CMOS devices. Comparison of BJT and FET.	
Unit 3.	**Single Stage Amplifiers:** BJT small signal model – Analysis and Design of CE amplifiers, FET small signal model– Analysis and Design of CS amplifiers. Concept of frequency response, Square wave testing of amplifiers, Miller's theorem, Effect of coupling, bypass, junction and stray capacitances on frequency response for BJT and FET amplifiers.	**9 Hrs.**
Unit 4.	**Power Supply:** Analysis of Full wave rectifier(Bridge, Center-tap) with and without capacitor filter, Design IC based regulators using 78XX, 79XX and LM317. Introduction to SMPS (IC LM324).	**8 Hrs.**
Unit 5.	**Multistage & Power Amplifiers:** Need for multistage amplifiers, block diagram, selection of configurations in multistage amplifiers, analysis of multistage amplifier (Using FET), Concept of power amplifier.	**9 Hrs.**
Unit 6.	**Feedback Amplifiers & Oscillators:** Feedback Concept, Classification of amplifiers basedon feedback topology, (Voltage, Current amplifiers), Effect of negative feedback on various performance parameters of an amplifier, Analysis of one circuit for each feedback topology.Oscillators: - Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators(Using FET).	**9 Hrs**

Text Books	
1.	Millman&Halkies, "Electronic Device and Circuits", Second Edition, Tata McGraw Hill.
2.	Boylestead&Nashelsky, "Electronic devices and Circuits Theory" Eighth edition, PHI
Reference Books	
1	MillmanHalkies, "Integrated Electronics", Tata McGraw Hill.
2	David A. Bell," Electronic Device and Circuits", Fourth Edition, PHI.
3	Floyd," Electronic Devices", Seventh Edition, Pearson.

Second Year B.Tech. Sem. III
ELP202: ELECTRONIC DEVICES AND CIRCUITS.

Teaching Scheme	
Practical	2 Hrs. /Week
Total Credits	1

Evaluation Scheme	
CIE	50
SEE	50
Total	**100**

Sr. No.	List of Experiments of Electronic Devices & Circuits
1	Input and Output Characteristics of BJT in CE configuration.(Find h parametersfrom characteristics.)
2	Transfer and Drain Characteristics of JFET. (Find gm, rd and μ from characteristics.)
3	Design Single stage JFET CS amplifier and observe its frequency response
4	Design Single stage BJT CE amplifier and observe its frequency response.
5	Analyze full wave rectifier with and without capacitor filter.
6	Design fixed voltage regulator using 78XX and 79XX for given load current conditions.
7	Design variable voltage regulator using LM317 for given load current conditions.
8	Design and simulate Voltage Series Feedback Amplifiers.(Using appropriate simulation package)
9	Design and simulate LC and RC oscillators.(Using appropriate simulation package)
10	Build and test RC oscillator.

	List of Experiments of Linear Circuit
1	Verification of superposition theorem using DC source
2	Verification of star-delta transformation
3	Verification of Thevenin theorem using DC source
4	Verification of Norton theorem using DC/AC source
5	Verification of Source Transformation
6	Make the suitable TWO-port network and find Z-parameters
7	Make the suitable TWO-port network and find h-parameters

8	Find the RC time constant
9	Find the RL time constant
10	To study the response of series RLC resonance circuit
11	To study transient response of RL/RC/RLC circuits

Second Year B.Tech. Sem. III
ELL203: LINEAR CIRCUITS

Teaching Scheme	
Lectures	4 Hrs. /Week
Practical	-
Total Credits	4

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	**100**

Prerequisites- Basic Electrical and Electronics Engineering Partial fraction expansion, matrices, determinants calculus and differential equations

Course Objectives	
1	To analyze the circuits using various circuit analysis methods
2	To study network functions, inter relationship among various circuit parameters, solve more complex network using these parameters.
3	To study time and frequency domain response of RL, RC and RLC circuits.
4.	To study the synthesis of RL, RC and RLC circuits.

Course Outcomes : At the end of the course students will be able to	
1	Analyze the linear A.C & D.C circuits using KVL, KCL, and network theorem
2	Interpret response of series & parallel RLC circuits under resonant condition
3	Derive two port network parameters.
4	Describe network function and significance of poles and zeros.
5	Do the analysis of RL,RC and RLC circuits in time domain
6	Synthesize RC,RL and RLC circuits.

	Course Contents	
Unit No.	**Topics**	**Hrs**
Unit 1	**Analysis of Electrical Circuits** **AC and DC circuits:** Representation of voltage & current sources.(Ideal & practical),source transformation, series & parallel connection of passive elements(R,L,C), Star- Delta transformation, Mesh analysis, Node analysis. **Network Theorems on D.C circuits** Superposition Theorem, Norton's Theorem, Thevenin's Theorem, Maximum Power Transfer Theorem. **Coupled circuits:** Self and mutual inductances, coefficient of coupling, Dot Convention, equivalent circuit, solution using loop analysis. Graph Theory: Fundamental definitions, Incidence Matrix, Loop Matrix, Cut-set Matrix (Numerical not expected)	**12 Hrs**

Unit 2	**Resonance** **Definition, Types**: Series & parallel resonance. **Series resonance**-resonant frequency, Impedance and phase angle of series resonant circuit, current & voltage across L & C w.r.t. frequency, Effect of resistance on frequency response, Bandwidth and Selectivity, Quality factor and its effect on bandwidth, Magnification **Parallel resonance** – Anti resonance frequency, variation of impedance & admittance with frequency, Q factor and reactance curves, Magnification	**08 Hrs**
Unit 3	**Two Port Networks** **Parameters:** Open Circuit, Short Circuit, Transmission and Hybrid parameters, relationships among parameters, reciprocity and symmetry conditions **Series/parallel connection:** T and Pi representations, interconnection of Two-Port networks. Introduction to Attenuators and Equalizers	**09 Hrs**
Unit 4	**Network Function:** Concept of complex frequency, Network functions for one port & two port networks, significance of poles & zeros. Properties and necessary condition for driving point functions, Properties and necessary condition for Transfer functions, Time domain response from pole and zero plot	**07 Hrs**
Unit 5	**Transient Response** Steady state & transient response (Voltage & Current) DC response of RL circuit DC response of RC circuit DC response of RLC circuit Sinusoidal response of RL, RC & RLC	**09 Hrs**
Unit 6	**Synthesis of RLC Circuits** **Positive real functions:** Concept of positive real function, testing for Hurwitz Polynomials, testing for necessary and sufficient conditions for positive real functions. **Synthesis of RC, RL, LC circuits:** Concepts of synthesis of RC, RL, LC driving point functions (numerical problems not expected)	**07 Hrs**

Text Books	
1	Franklin F Kuo, *"Network Analysis and Synthesis",* Wiley Toppan
2	M E Van Valkenburg, *"Network Analysis",* Prentice-Hall of India Pvt Ltd, New Delhi
Reference Books	
1	K V V Murty and M S Kamth*, "Basic Circuit Analysis",* Jaico Publishing house, London
2	A. Chakrabarti*, "Circuit Theory",* Dhanpat Rai and Co.,New Delhi
3	Reinhold Ludwig and Pavel Bretchko, "*RF Circuit Design"*, Pearson Education, Asia
4	Joseph J. Carr, "*Secrets of RF Circuit Design"*, Tata McGraw-Hill, New Delhi

Second Year B.Tech. Sem. III
ELL 204: ANALOG COMMUNICATION

Teaching Scheme	
Lectures	3 Hrs. /Week
Practical	2 Hrs/week
Total Credits	4

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	**100**

Prerequisites-Fundamentals Electronics, Trigonometry

Course Objectives The objectives of this course is to	
1	Introduce Analog communication system and the role of modulation in communication.
2	Mathematically describe AM & FM modulation types with their analysis and demodulation techniques of the same.
3	Expose students to different pulse modulation techniques.
4	Introduce wave propagation and Antenna basics.
5	Demonstrate modulation & demodulation technique through lab session.
6	Arrange industrial visit to get practical knowledge of Radio station.

Course Outcomes At the end of the course students will	
1	Understand fundamental concepts of analog communication and identify various modules.
2	Analyse various analog modulation schemes like Amplitude & Angle Modulation & Demodulation.
3	Compare various pulse modulation techniques.
4	Explain types of noise, wave propagation and antenna basics.
5	Get experience of actual AM/FM transmission during Industrial visit.

	Course Contents	
Unit No.	**Topics**	**Hrs**
Unit 1.	**Introduction :** Block schematic of communication system, base band signals, RF bands, Radio frequency spectrum, Necessity of modulation, Different Terms: Modulating Signal, Carrier signal, Modulated signal, Noise types and Noise figure. Propagation: Sky, Ground, Space. Antenna: introduction and Basics of operation.	**5 Hrs**

Unit 2.	**Amplitude Modulation** Amplitude Modulation principles, AM envelope, frequency spectrum & BW, Modulation index, % modulation ,Trapezoidal patterns, Power equation for AM, Current Equation of AM, AM modulating circuits: Low, medium level, high level (diode and transistor circuits), DSBSC: Suppression of carrier using balanced modulator, SSBSC: Suppression of unwanted sideband methods: Filter system, phase shift & third method, Concept of Vestigial sideband(VSB) in television system. (Numerical expected on Modulation index, spectrum, Power, Current)	**7 Hrs.**
Unit 3.	**AM Receiver** Block diagram of AM Receiver, Receiver parameters: Sensitivity, Selectivity, BW, dynamic range, Tracking, fidelity. Types of AM receiver: TRF and super heterodyne (block diagram), AM detection types: using diode, practical diode detector. Automatic Gain Control (AGC). Distortion in diode detector: Negative peak clipping & Diagonal clipping, Demodulation of SSB using: product demodulator & diode balanced modulator.	**7 Hrs.**
Unit 4.	**Angle Modulation** Theory of frequency and phase modulation, mathematical analysis, Narrow band & Wide band FM, deviation sensitivity, FM and PM waveforms, phase deviation and modulation index, frequency deviation and percentage modulation, Generation of FM direct & Indirect method, Frequency analysis of angle modulated wave using Bessel function, BW requirements, deviation ratio , Noise triangle, pre-emphasis and de-emphasis. (Numerical expected)	**7 Hrs.**
Unit 5.	**FM Receiver** Double conversion FM receiver block diagram, FM demodulator, tuned circuit frequency discriminators, slope detectors, fosters seeley discriminator, ratio detectors, PLL-FM demodulators, Limiter Circuit.	**6 Hrs.**
Unit 6.	**Pulse Modulation** Pulse amplitude modulation, Sampling theorem & type: Natural & flat top, PAM modulation circuit, PAM demodulation circuit, TDM and FDM, generation of PTM signals (direct-indirect method), Study of IC 555, PWM modulator & PPM modulator using IC 555, demodulation of PTM (transistorized circuit) Industrial applications of PPM/PWM.	**7 Hrs**

Text Books	
1	George Kennedy 'Electronics Communication System'- IVth Edition-Tata McGraw Hill Publication.
2	Wayne Tomasi 'Electronics Communication System' -Fundamentals through Advanced.-Vth Edition- Pearson Education.
Referance Books	
1	Louis E. Frenzel, ' Principles of Electronics Communication Systems' 3rd edition-Tata McGraw Hill Publication.
2	Dennis Roddy, John Coolen. 'Electronics Communications 'IVth Edition-Pearson Education
3	V. Chandra Sekar, 'Analog Communication', Oxford university.
4	R P Singh, S D Sapre 'Communication System-Analog &Digital'IInd Edition –Tata McGraw Hill Publication
5	B. P. Lathi, Zhi Ding, 'Modern Digital and Analog Communication Systems' 4th edition, Oxford university.
6	Blake, 'Electronics Communication Systems' 2nd edition, cengage Learning.

Second Year B.Tech. Sem. III
ELP204:ANALOG COMMUNICATION

Teaching Scheme	
Practical	2 Hrs. /Week
Total Credits	1

Evaluation Scheme	
CIE	50
SEE	50
Total	**100**

	List of Experiments
1.	Experiment on Amplitude Modulation and Demodulation
2.	Experiment on Calculation of Modulation Index Using AM Wave and Pattern See effect of change in modulation Index on Amplitude Modulated Wave.
3.	Experiment on Calculation of Modulation Index Using trapezoidal Pattern See effect of change in modulation Index on the Pattern.
4.	Experiment on Double Side Band Modulation and Demodulation
5.	Experiment on Single Side band modulation & Demodulation
6.	Experiment on Frequency Modulation
7.	Experiment on Sampling and Reconstruction
8.	Experiment on Pulse width Modulation and Demodulation
9.	Experiment on Pulse Position Modulation and Demodulation
10.	Experiment on Pulse Amplitude Modulation-Time Division Multiplexing PAM-TDM
11.	Report of Visit to AIR station
12.	Matlab based experiment on AM
13.	Matlab based experiment on PTM
14.	Matlab based experiment on FM

Second Year B.Tech. Sem. III
ELL206: Structured Programming

Teaching Scheme	
Lectures	3 Hrs. /Week
Practical	2 Hrs/week
Total Credits	4

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	**100**

Prerequisites-Computer Basics, Digital Logic

Course Objectives	
1.	To impart adequate knowledge on the need of programming languages and problem solving techniques.
2.	To develop programming skills using the fundamentals and basics of C Language.
3.	To develop programs using the basic elements like control statements, Arrays and Strings
4.	To enable effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.
5.	To understand the issues in file organization and the usage of file systems.
6.	To understand the uses of preprocessors and various header file directives.

Course Outcome	
1.	Ability to write a program for given algorithm using the syntactical structures of C language.
2.	Ability to develop, execute and document computerized solution for various problems using the features of C language.
3.	To debug C program that uses pointers, structures and files.
4.	Use development environment features including make processors, editors, debuggers, compilers, linkers, and libraries..

	Course Contents	
Unit 1.	**An Overview of C** Compilers vs. Interpreters, The structure of a C Program, The Library and Linking, Separate Compilation, Compiling a C Program, Basic Data Types, Type conversion in C, Identifiers Names, Variables, Type Qualifiers-const, Storage Class specifiers ,Operators and expressions.	**4 Hrs.**
Unit 2.	**Input , Output and control statement:** Reading and Writing Characters, Formatted Console I/O, printf(), scanf(), Suppressing Input, control statement- if , if –else , nested if –else, while, do –while , switch case, for , nested for loop, goto statement	**6 Hrs.**

Unit 3.	**Functions and Pointers:** Functions -Introduction to function, passing values between functions, scope rules of function, calling convention, advanced features of function return type of function, call by value & call by reference, recursion Pointers-Introduction to pointers, address operator (&),pointer notation, declaration of pointer, initializing pointer ,void pointer, null pointer, use of pointers, pointer to pointer, dynamic memory allocation.	**8 Hrs.**
Unit 4.	**Array and Strings :** Arrays -Introduction, Declaration and Initialization of array, types of arrays-two dimensional array, multi dimensional array Strings- Array Initialization, Arrays of Strings, Arrays, Manipulating Strings, string functions.	**7 Hrs.**
Unit 5.	**Structures, Unions, Enumerations, and typedef :** Structures, Arrays of Structures, Passing Structures to Functions, Structure Pointers, Arrays and Structures Within Structures, Unions, BitFields, Enumerations, Using sizeof to Ensure Portability, typedef	**7 Hrs.**
Unit 6.	**File handling & Study of Graphics design:** Concept of file – text, binary, files and streams, opening and closing of files, modes of files read, write operations, Graphics drawing, Filling different patterns,	**7 Hrs**

Text Books	
1.	Programming With C - 2nd Edition - Byron Gottfried , Schaum's Outline Series Mcgraw –Hill
2.	Programming in ANSI C - E Balgurusamy, Vth Edition- Tata Mc- Graw Hill Publication
3.	Pradip Dey,Manas Ghosh-'Programming in C'-II edition-OXFORD University Press
4.	Brian W. Kernighan ,Dennis M. Ritchie-'The C Programming Language' –IInd EditionPrentice Hall of India
5.	C The Complete Reference – Herbert Schildt (Tata McGraw-Hill Edition)
6.	Computer Concept and C Programming – Vikas Gupta (Wiley- Dreamtech)
Reference Books	
1.	Pradip Dey,Manas Ghosh-'Programming in C'-II edition-OXFORD University Press
2.	Brian W. Kernighan ,Dennis M. Ritchie-'The C Programming Language' –IInd EditionPrentice Hall of India
3.	C The Complete Reference – Herbert Schildt (Tata McGraw-Hill Edition)
4.	Computer Concept and C Programming – Vikas Gupta (Wiley- Dreamtech)

SecondYear B.Tech. Sem. III
ELP206:Structured Programming Lab.

Teaching Scheme	
Practical	2 Hrs. /Week
Total Credits	1

Evaluation Scheme	
CIE	50
SEE	50
Total	**100**

	List of Experiments
1.	Introduction to Procedure Oriented Programming Language (C Programming)
2.	Program to Study of Decision Control Statement: A) Program to find Even or Odd number B) Program to perform addition, subtraction, multiplication and division. C) Program to display the student result according to class distinction, first class or second class. *D)* Program to find greatest number among three numbers using ternary operator
3.	Program to study of loop control statement: A) Program to find Factorial of number B) Program to check entered year is leap year or not? C) Program to find sum of first 100 numbers. D) Write a C program to find average of maximum of *n* positive numbers entered by user. But, if the input is negative, display the average(excluding the average of negative input) and end the program.
4.	Program to study of Switch –Case statement: A) Program to perform addition, subtraction, Multiplication and division by using switch case. B) Program to calculate area of Circle, rectangle, square and triangle by using switch case. C) Program to check input character is vowel or not using switch case?
5.	Program to study of Array A) Program to arrange the numbers in ascending order. B) Program to arrange the numbers in descending order.
6.	Program to study multidimensional Array A) Program for two dimensional 3x3 matrix addition B) Program for transpose of matrix.
7.	Program for study of Functions: A) Function without arguments without return type B) Function without arguments with return type C) Function with arguments without return type D) Function with arguments with return type

8.	Program to study of structure: A) Program to receive marks of three subjects and check the eligibility of engineering admission using structure.
9.	Program to study of string A) Program to compare two strings. B) Program to concatenate two strings.
10.	Program to study Pointers A) Program to add the numbers using pointers. B) Program to access an array using pointes.
11.	Program to study of sorting technique A) Program to implement linear search algorithm.
12.	Program to study of File handling A) Write a C program to read name and marks of n number of students from user and store them in a file.
13	Program to study of Graphics A) Write a program to draw different shapes using graphics.
14	Mini Project using file handling / pointers / structures / functions using C Programming Language, and preparation of short report.

Additional Experiment Programs

1. **C Programming for creating Pyramid**
   a. Program to print half pyramid using *
   b. Program to print half pyramid a using numbers
   c. Program to print half pyramid using alphabets
   d. Inverted half pyramid using *
   e. Program to print full pyramid using *
2. **C Programming using for loop**
   a. Multiplication Table Up to 10
   b. Multiplication Table Up to a range (entered by the user)
   c. C Program to Calculate the Sum of Natural Numbers
   d. C Program to Check Whether a Character is Vowel or Consonant
   e. C Program to Display Fibonacci Sequence
3. **C Programs by using functions**
   a. C Program to Display Prime Numbers Between Intervals Using Function
   b. C Program to Check Whether a Number can be Expressed as Sum of Two Prime Numbers
   c. C Program to Find the Sum of Natural Numbers using Recursion
   d. Calculate factorial of a number using recursion
   e. Reverse a sentence using recursion
   f. Calculate the power of a number using recursion
   g. Convert binary number to decimal and vice-versa
   h. Convert octal Number to decimal and vice-versa
   i. Convert binary number to octal and vice-versa

4. **C Programs by using array**
   a. C Program to Calculate Average Using Arrays
   b. C Program to Find Largest Element of an Array
   c. C Program to Calculate Standard Deviation
5. **C Programs by using Pointers**
   a. C Program to Calculate Average Using Arrays
   b. C Program to Find Largest Element of an Array
   c. C Program to Calculate Standard Deviation
6. **C programs by using File handling**
   a. Write a C program to read name and marks of n number of students from user and store them in a file.
   b. Write a C program to read name and marks of n number of students from user and store them in a file. If the file previously exits, add the information of n students.
   c. Write a C program to write all the members of an array of structures to a file using fwrite(). Read the array from the file and display on the screen.
7. **C programs by using Graphics**
   a. C Program to Draw Resistance using Graphics Function
   b. C Program to Draw PNP Transistor using Graphics Function
   c. C Program to Draw Eclipse using Graphics Function
   d. C Program to Draw NPN Transistor using Graphics Function
   e. C Program to Draw Capacitor using Graphics Function
   f. C Program to Draw a Triangle using Graphics Function
   g. C Program to draw Op-amp Symbol Using Graphics Function

Second Year B.Tech. Sem. III
ELL211:Mini-Project I

Teaching Scheme	
Lectures	2 Hrs. /Week
Practical	2 Hr/Batch
Total Credits	2

Evaluation Scheme	
CIE	50
SEE	--
Total	**50**

Prerequisites- Fundamentals of Electronics, Electronics Devices and Circuits,

Course Objectives	
1	To study the operation & applications of different testing & measuring instruments
2	To understand the working principle of sensors and transducers
3	To study the operation & design of bridge circuit
4	To provide knowledge and understanding of working of electronic circuits

Course Outcomes At the end of the course students will be able to	
1	Use testing & measuring instrument for measurement.
2	Understand principle of operation of different sensors and transducers &use them for measurement of physical parameters.
3	Design bridge circuits for measurement the R,L C
4	Design and analyse basic electronic circuits
5	Work in group to complete mini project within allocated time
6	Prepare action plan, project report and demonstrate project work orally

	Course Contents	
Unit No.	**Topics**	**Hrs**
Unit 1.	**Electronic Instruments:** **Analog Instruments: -** PMMC, Ohm meter, Ammeter, Voltmeter, CRO **Digital Instruments**: – DVM, DMM, Frequency Meter, Function Generator, DSO, Digital Tachometer.	**5 Hrs.**
Unit 2.	**Sensors and Transducers:** **Temperature Sensor:** RTD, Thermocouple, Thermostat, Thermistor , LM35 **Displacement Sensor:** LVDT, Capacitive, **Photo Sensor:** LDR, IR sensor, Photo diode, Laser sensor	**8 Hrs.**

	Pressure Sensor: Dia-fram, Bellows, Burdon Tube, Strain Gauge, Load Cell **Positioning Sensor:** Accelerometer, Gyroscope, Rotary encoders, **Other Sensor:** Limit Switches, PH Sensors, Soil Moisture Sensor, Rain detector Sensor	
Unit 3.	**Measurement of R, L, C (Bridge Circuits)** **DC Bridges:** Wheatstone bridge, Kelvin Bridge **AC Bridges:** Maxwell Bridge, Wein Bridge	**6 Hrs.**
Unit 4.	**Actuators:** DC Motors, AC Motors, Servo Motors, Stepper Motor, Induction Motor, BLDC Motors , Relays and contactors, SPST, SPDT Relays, SSR Solid State Relays, Solenoid Valves	**7 Hrs.**

Note:

1. Projects based on Basic Electronics components.
2. Circuit should be built on general purpose PCB.
3. Also refer EDC Syllabus for selection of project.
4. Project report with result should be submitted.
5. Maximum two students per group.

	List of Experiments
1.	To measure Phase, Frequency and Voltage of the unknown signals using CRO & Spectrum Analyser
2.	To measure unknown R,L and C using AC and DC Bridges.
3.	To plot transfer curve for various sensors like RTD, LM35, LVDT etc
4.	To Design simple transistor driven electromagnetic Relay Circuit
5.	Project based on basic electronics components.

Reference Books	
1	A.D. Helfik, W. N. Cooper, " Modern Electronic Instrumentation & Measurement Techniques", Pearson Education
2	A. K. Sawhney, "A course in electrical & Electronics Measurement & Instruments" Dhanpat Rai & sons Publications
3	H.S. Kalsi " Electronics Instrumentation" 2nd Edition Tata McGraw Hill Publication
4	Dvid Bell, "Electronics Instrumentation & Measurements" 3rd Edition Oxford Publication

Second Year UG Program in Electronics Engineering
Semester-IV

Sr. No.	Course Code	Name of the Course	Group	Teaching Scheme				Credits	Audit
				Theory Hrs/ Week	Tutorial Hrs/ Week	Practical Hrs/ Week	Total		
1	ELL209	Digital System Design	D	4	-	-	4	4	
2	ELL210	Signals And Systems	D	3	1	-	4	4	
3	ELL211	Linear Integrated Circuits	D	3	-	-	3	3	
4	ELL212	Data Structure And Algorithms	D	3	1	-	4	4	
5	ELL213	Object Oriented Programming	D	3	-	-	3	3	
6	ELP209	Digital System Design Lab	D		-	2	2	1	
7	ELP211	Linear Integrated Circuits	D		-	2	2	1	
8	ELP213	Object Oriented Programming	D			2	2	1	
9	ELP214	Mini Project II	F			2	2	2	
10	ELL208	Environmental Studies Part I (Mandatory Course)	C			2	2	Grade	
Total				**16**	**2**	**10**	**28**	**23**	

Second Year B.Tech. Sem. IV
ELL209: Digital System Design

Teaching Scheme	
Lectures	4 Hrs. /Week
Practical	2 Hrs /week
Total Credits	5

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	**100**

Prerequisites- Basic Electronics

Course Objectives	
1	Study of basic elements of combinational and sequential logic circuit.
2	Study of basic elements of Hardware Description Language
3	Study of different statements that infers hardware accordingly synchronization techniques.
4	Design of digital circuits using different approaches of synchronization techniques.
5	Study of FSM for designing sequential circuits
6	Study of architecture of FPGA
7	Downloading digital circuits on FPGA board

Course Outcomes	
1	Fundamental knowledge of combinational and sequential logic circuits.
2	Design of digital circuits using different modelling styles
3	Demonstrate the ability to apply HDL in modelling combinational and sequential circuits and to write a VERILOG test bench to test VERILOG modules.
4	Use of finite state machines in the design of complex sequential systems
5	Target and synthesize a VERILOG design to FPGA board.

	Course Contents	
Unit No.	**Topics**	**Hrs**
Unit 1.	**Boolean Algebra and Boolean Function Reduction Techniques** Boolean Laws and Expression using Logic Gates, Standard forms: SOP, POS, Simplification of Switching function & representation (Maxterm & Minterm), Karnaugh map: K-map Format up to 4 variables, mapping and minimization of SOP and POS expression, Don't care condition, conversion from SOP to POS and POS to SOP form using K-map, minimization of multiple output circuits.	**8 Hrs.**
Unit 2.	**Combinational Circuits and Sequential Circuits Elements:** Combinational Circuits: Adder & Subtractor (Half and Full), BCD Adder, MUX and DeMUX, Comparators, BCD to 7-segment Decoder ,Priority encoders.	**8 Hrs.**

	Sequential Circuits: Flip-flop & Timing Circuits: SR latch, Gated latch, Edge triggered flip-flop:- D, JK, T Flip-flop, Shit resistor, counters: up-down counter, Mod-n counter, synchronous counter.	
Unit 3.	**Finite State Machine:** Sequential circuit block diagram, Mealy Machine, Moore Machine, state Diagram, State assignment, state reduction. State table, design procedure synthesis using various flip flops, application of sequential circuits, synchronous counter design overlapped and non over lapped sequence detector, Worst case time estimation of sequential circuits.	**9 Hrs.**
Unit 4.	**Digital Design with Verilog HDL:** Evolution of computer aided digital design, Emergence of HDLs, Typical design flow, importance of HDLs, Verilog HDL and Design. Methodologies, modules, instances, components of simulation, example, basic concepts. Modules and ports: Modules, ports, Rules, Hierarchical Names. Gate Level modelling and Data flow modelling: Gate Types, Gate Delays, Examples, Continuous assignment, Delays, Expressions, Operators, Operands, Operator Types and Examples	**9 Hrs.**
Unit 5.	**Behavioural Modelling:** Structured procedures, Procedural assignments, Timing controls, conditional statement, Multi way branching, Loops, Sequential and parallel blocks, generate blocks, Examples. Tasks and Functions: Difference between Tasks and Functions, Tasks, Functions, Automatic Functions, Constant Function, Signed Functions.	**9 Hrs.**
Unit 6.	**Programmable Logic Devices** Introduction, basic concepts, Digital design with FPGAs, FPGA based system design. FPGA Fabrics: FPGA architectures, SRAM based FPGAs, Chip I/O and Circuit design of FPGA fabrics, Architecture of FPGA fabrics, SPARTAN III and above.	**9 Hrs**

Text Books	
1	Digital Design by "Morris Mano".
2	Digital Logic Design By "Anand Kumar".
3	Samir Palnitkar, "VERILOG HDL,A Guide to digital design and synthesis", 2nd edition, Pearson education, 2003.
4	Wayne Wolf, "FPGA based system design", Reprint 2005, Pearson Education
Reference Books	
1	K. C. Chang "Digital Systems Design with VHDL and Synthesis An Integrated Approach", 1stWiley- India.
2	Stephen Brown and ZvonkoVranesic, "Fundamentals of Digital logic with VERILOG design", Tata- McGraw Hill

Second Year B.Tech. Sem. IV
EEP209: Digital System Design LAB

Teaching Scheme	
Practical	2 Hrs. /Week
Total Credits	1

Evaluation Scheme	
CIE	50
SEE	50
Total	**100**

	List of Experiments
1	Realize the basic gates using universal "nand" gate.
2	Implementation of K-map by using equation $\sum m(0,1,4,5,6,7,9,11,15) + d(10,14)$
3	Study Of Decoder Using Ic 7442
4	Study Of F/F Using Ic 7474 & Ic 7476.
5	Design Mod 10 Binary Counter Using Ic 7493a.
6	Study of Multiplexer Using Ic 74151
7	Implementation of basic gates using Verilog.
8	Implementation of Half Adder and Full Adder using Verilog
9	Implementation of 4-bit Ripple Carry Adder using Verilog (use data flow and behavioural model) and analysis of delay report.
10	Implementation of D flip flop using Verilog
11	Implementation of 8 - bit synchronous and asynchronous shift-left Register with positive edge clock.
12	Implementation of FSM with single process using Verilog (Mealy and Moore)

Second Year B.Tech. Sem. IV
ELL210: Signals and Systems

Teaching Scheme	
Lectures	3 Hrs. /Week
Tutorial	1 Hr/Batch
Total Credits	4

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	**100**

Prerequisites- Engineering Mathematics-I, Engineering Mathematics-II, Engineering Mathematics-III

Course Objectives	
1	To introduce the concepts and techniques associated with the understanding of signals and systems.
2	To understand and apply sampling theorem, to avoid aliasing phenomena
3	To expose students to both time & frequency domain methods of analyzing signals & systems.
4	Understand the various properties of the transforms and exploit them to analyze and design signals and systems.
5	Use the z-transform to evaluate the transfer function of linear time-invariant systems and to identify the corresponding zeros and poles.
6	Understand realization of system

Course Outcomes At the end of the course students will be able to	
1	Represent CT & DT signals mathematically & perform various operations on the signals.
2	Compute response of LTI system using convolution.
3	Choose appropriate sampling rate for better reconstruction of signals and gain conceptual understanding of effects of under sampling.
4	Compute frequency spectrum of CT & DT signals by using appropriate Fourier tool.
5	Apply Z-Transform to analyze the DT signals
6	Realize the system using basic building block

	Course Contents	
Unit No.	**Topics**	**Hrs**
Unit 1.	**Introduction to Signals & Systems.** Definition of signals , classification of signals : continuous time signals & discrete time signals , even & odd signals , periodic & non-periodic , deterministic & non-deterministic , energy & Power, elementary signals: unit impulse, unit step, unit ramp, exponential & sinusoidal, basic operations on signals. System: Definition, Classification, Linear & Nonlinear, Time invariant & Time variant, Causal & Non causal, Static & Dynamic, Stability, Invertibility.	**7 Hrs.**
Unit 2.	**Time Domain Analysis of CT and DT systems** Impulse response representation, convolution integral , convolution sum, properties of convolution, Properties of LTI system.	**7 Hrs.**
Unit 3.	**Analysis of LTI System** Introduction of LTI System, Ideal LPF,HPF, and BPF characteristics, Filter characteristics of linear systems, Convolution in frequency domain, concept of filtering using convolution concept, Application: Extraction of signal from noise by filtering.	**5 Hrs.**
Unit 4.	**Sampling and Reconstruction** Sampling theorem reconstruction, effect of under sampling (Numerical based on Sampling theorem).	**4 Hrs.**
Unit 5.	**Fourier Transform.** Fourier Transform , Limitations of Fourier Transform , Properties of Fourier Transform, Discrete time Fourier Transform and its Properties, Discrete Fourier Transform, IDFT properties of Discrete Fourier Transform.	**7 Hrs.**
Unit 6.	**Z Transform** . Introduction of Z-Transform , ROC ,Properties of ROC , Unilateral Z-Transform. Properties of Z-Transform : linearity , time shifting, time reversal, time scaling , convolution , differentiation , multiplication, Perceval theorem, initial value & final value theorem. Inverse Z Transform : PFE method, long division method, convolution method.	**5 Hrs**
Unit 7.	**System Realization** Continuous time system representation by differential equation, Discrete time system representation by difference equation , and transfer function in Z-domain. Realization of discrete time systems by Direct from I and Direct Form II	**4 Hrs**

Text Books	
1	Simon Haykin, Barry Van Veen- 'Signals & Systems' - IInd Edition Wiley publication
2	Alan V. Oppenheim, Alan S. Wilsky, S. Hamid Nawab -'Signals & system' -IInd Edition –Pearson Education
Reference Books	
1	Smarajit Ghosh, 'Signals & system' Pearson Education.
2	P Ramkrishna Rao, 'Signals & system' Tata McGraw Hill
3	B P Lathi 'Linear Signals & system' Oxford Publication
4	Michael J. Roberts.-'Fundamentals of signals & systems'- Tata McGraw Hill, 2007

Second Year B.Tech. Sem. IV
ELL211: Linear Integrated Circuits

Teaching Scheme	
Lectures	3 Hrs. /Week
Practical	2 Hrs/week
Total Credits	4

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	**100**

Prerequisites- Electronic Devices & Circuit

Course Objectives	
1	To introduce the basic characteristic, construction, mathematical models, open loop & close loop operations of Op-Amp.
2	To analyze AC, DC circuits and find frequency response of Op-Amp.
3	To design & analyze different linear, non-linear & mathematical application circuits such as adder, Subtractor.
4	To build various active filter circuits using Op-Amp.
5	Study various applications of IC 555, IC 565, IC 566 and IC 8038.

Course Outcomes At the end of the course students will be able to	
1	Explain the internal operation, different characteristics and configurations of Op-amp
2	Select an appropriate Op-amp for a particular application by referring data sheets
3	Design op-amp based circuits using concepts of gain and frequency response.
4	Design linear and non-linear Op-Amp circuits for various industrial applications like filters, timers, waveform generators etc.

	Course Contents	
Unit No.	**Topics**	**Hrs**
Unit 1.	**Differential Amplifiers** Differential Amplifier- Configuration, DC & AC Analysis of Dual Input Balanced Output Configuration. Comparative study of other configuration of Differential amplifiers, Constant Current Bias, Current Mirror, DC coupling & Cascade differential stages, Level Translator & its need. (Numericals are expected).	**6 Hrs.**
Unit 2.	**OP-Amp Characteristics** Block Diagram of Op-Amp, Ideal & Practical Op-amp specifications,	**7 Hrs.**

	Transfer characteristics of Op-amp, Op-amp parameters & measurement: Input & output offset voltages, Input & output offset currents, Input Bias current, slew rate, CMRR, PSRR, Thermal drift. Comparative study of Data Sheets – μA 741, OP 07, LM 324, LM 311, LM 308, LM380. Study of TL082 Op-Amp.	
Unit 3.	**Op-Amps Configuration & Frequency Response** Open Loop & Closed Loop- Inverting, Non-Inverting and Differential (Using one op-amp). Analysis for Av, Ri, Ro, Bandwidth, and Total output offset voltage. AC & DC amplifiers – all configurations. Open loop frequency Response, Closed loop frequency response, (Numericals are expected).	**7 Hrs.**
Unit 4.	**Linear & Non-Linear Applications** Summing amplifier (Inverting & Non-Inverting), Sub tractor, Integrator, Differentiator, Instrumentation Amplifier (3 op-amps), Instrumentation amplifier using transducer bridge, I-V & V-I converter. Comparators, Zero Crossing Detector, Window detector, Schmitt trigger, peak detector, precision rectifier, sample and hold circuit. (Numericals are expected).	**6 Hrs.**
Unit 5.	**Active Filters** First & Second Order Butterworth Low Pass, High Pass, Band Pass, Band Reject, & All Pass Filters, (Analysis & Numericals are expected).	**6 Hrs.**
Unit 6.	**Monolithic IC Applications** Sine wave generator- RC phase Shift, Weins Bridge, & Quadrature oscillator. Square wave (Astable Multivibrator), Monostable Multivibrator, & Triangular Wave generator, IC 555 (Timer): Block Diagram, Multivibrators and Applications. IC 566 VCO, PLL-Introduction, Block Diagram, Principles & description of individual blocks, IC 565 PLL & Applications(Numericals are expected).	**7 Hrs**

Text Books	
1	National Analog & Interface products Data book—National Semiconductors
2	T.R Ganesh Babu, "Linear Integrated Circuits", 3rd Edition, SciTech Publication
Reference Books	
1	Sergio Franco, "Design with op-amp & Analog Integrated Circuits", 3rd Edition, Tata McGraw Hill
2	David. A. John & Ken Martin, "Analog Integrated Circuit Design", Student Edition, Wiley.
3	S.Salivahanan & Bhaaskaran, "Linear Integrated Circuits", 1st Edition, Tata McGraw
4	Ramakant. A. Gayakwad, "Op-Amps & Linear Integrated Circuits", 3rd Edition, PHI.

Second Year B.Tech. Sem. IV
ELP211: Linear Integrated circuits lab

Teaching Scheme	
Practical	2 Hrs. /Week
Total Credits	1

Evaluation Scheme	
CIE	50
SEE	50
Total	**100**

	List of Experiments
1	Study of Data sheets of following IC's (Compulsory) μA 741, OP 07, LM324, LM 308, LM380, LM 311.
2	Measurement of op-amp parameters Using IC 741 a) Input offset voltage b) Input offset current c) slew rate d) CMRR.
3	Study of Inverting amplifier for DC & AC inputs using IC 741
4	Study of Non-Inverting amplifier for DC & AC inputs using IC 741
5	Study of Frequency Response of Inverting & Non-Inverting amplifier using IC 741
6	Study of op-amp as Summing, Scaling, & Averaging amplifier in Inverting & Non-Inverting Configuration using IC LM 308
7	Study of Instrumentation Amplifier using LM 324
8	Study of V-I & I-V Converter using IC 741
9	Study of Schmitt Trigger using IC 741 & Window detector using LM 311
10	Study of Comparator & ZCD using LM324/OP 07
11	Study of Precision Rectifier using IC 741
12	Study of Butterworth Filter (Any Two) using IC 741
13	13. Study of Triangular & square wave generator using IC 741
14	14. Study of IC 555 Timer as Astable & Monostable Multivibrator (NE/SE 555)
15	Study of Weins Bridge Oscillator using IC 741
16	Study of RC phase shift Oscillator using IC 741

Second Year B.Tech. Sem. IV
ELL212:DATA STRUCTURES AND ALGORITHMS

Teaching Scheme	
Lectures	3 Hrs. /Week
Tutorial	1 Hrs/week
Total Credits	4

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	**100**

Prerequisites- Programming Lab

Course Objectives	
1	Summarize fundamental concepts of abstract data types, programming methods and basic concepts of algorithms.
2	Definitions and applicative differences in array and linked list.
3	To learn binary tree traversals and operations on binary search trees.
4	To discuss concepts of solving and developing codes for computing problems like shortest path, network flow, and minimum spanning using graph theory.

Course Outcomes At the end of the course students will be able to	
1	Understand different data structures and recommend data structures for an application
2	Arrange numerical and alphanumeric data in static and dynamic allocations with the help of modern tools of data structures such as stack, queue, trees, graphs
3	Analyze step by step and develop algorithms and code for computing data like shortest path, network flow, hashing.
4	Create and present algorithms for manipulating stacks, queues, linked lists, trees, graphs.
5	Demonstrate various methods of organizing large amounts of data.

	Course Contents	
Unit No.	**Topics**	**Hrs**
Unit 1.	**Introduction:** Data, Data types, Object, Data Structure and Abstract Data types (ADT), Concept of Linear and Non-linear data Structures, Characteristics of an algorithm, analyzing programs, frequency count, Time and Space Complexity, Big 'O' and Ω' notation, best, average and worst cases. Arrays: Representation of sparse matrix, addition and transpose of sparse matrix, Time and space complexity analysis for simple and fast transpose for sparse matrix.	**5 Hrs.**

Unit 2.	**Stacks and Queues :** Stack and Queue as ADT, Operations on stack and queue, circular queues, Application of stack for expression evaluation, expression conversion, Priority queue, Doubly Ended Queue	**5 Hrs.**
Unit 3.	**Linked Lists:** Concept of linked organization, Singly linked list, doubly linked list, circular linked list, Operations on linked list Computation of length, traversal on linked list, Representation & manipulations of polynomials using linked lists, Generalized linked list (GLL), Representation of polynomial/ set using generalized linked list, Dynamic memory management: Garbage collection and Compaction.	**7 Hrs.**
Unit 4.	**Trees** : Basic terminology, binary trees and its representation, binary tree traversals (recursive and non recursive), operations such as copy, equal on binary tree, binary tree representation of trees,	**6 Hrs.**
Unit 5.	**Graph**: Terminology and Representation of graphs using adjacency matrix, adjacency list, Traversals (Depth First and Breadth First), Connected components, spanning trees, Minimum spanning Trees, Kruskal's and Prim's algorithms for minimum spanning tree, Algorithm for shortest path (Single Source Shortest path)	**7 Hrs.**
Unit 6.	**Searching & Sorting :** Importance of searching, Sequential, Binary Search, **Sorting:** Quick sort, merge sort, heap sort, shell sort, Radix sort, need of external sorting.	**5 Hrs**
Unit 7.	**Hashing:** Hashing functions, chaining, overflow handling with and without chaining, open addressing: linear, quadratic probing	**4 Hrs**

Text Books	
1	Y. Langsam, M. Augenstin "Data Structures using C and C++", Pearson Education
2	S. Lipschutz, "Data Structures" Mc-Graw Hill International Editions
3	Ellis Horowitz, S. Sahni, D. Mehta "Fundamentals of Data Structures in C++"
Reference Books	
1	Mark Allen Weiss- 'Data structure & algorithm analysis in C'- 2nd edition –Pearson Education.
2	M.T. Goodrich, R. Tamassia, D. Mount- Data Structures & Algorithms in C++- Wiley Publication.
3	A.N. Kamthane-" Introduction to Data structures in C"- Pearson Education
4	Data structure – A programming Approach with C- D.S Kushawaha, A.K.Misra-PHI

Second Year B.Tech. Sem. IV
ELL213: OBJECT ORIENTED PROGRAMMING

Teaching Scheme	
Lectures	3 Hrs. /Week
Practical	2 Hrs/week
Total Credits	4

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	**100**

Prerequisites- Structured Programming

Course Objectives	
5.	To understand object-oriented concepts such as data abstraction, encapsulation, inheritance, dynamic binding, and polymorphism.
6.	To use the object-oriented paradigm in program design.
7.	To lay a foundation for advanced programming.
8.	Provide programming insight using OOP constructs

Course Outcomes At the end of the course students will be able to	
6.	Analyze the strengths of object oriented programming.
7.	Design and apply OOP principles for effective programming
8.	Develop programming application using object oriented programming language C++
9.	Percept the utility and applicability of OOP.

	Course Contents	
Unit No.	**Topics**	**Hrs**
Unit 1.	**Introduction :** What is object oriented programming? Why do we need object oriented. Programming characteristics of object-oriented languages. C and C++, Output using cout. Directives. Input with cin, Manipulator. Type conversions. Examples	**5 Hrs.**
Unit 2.	**Object and Classes :** **Functions :** Returning values from functions. Reference arguments. Overloaded function. Inline function. Default arguments. Returning by reference. **Object and Classes :** Making sense of core object concepts (Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces) Implementation of class in C++, C++ Objects as physical object, C++ object as data types	**8 Hrs.**

	constructor. Object as function arguments. The default copy constructor, returning object from function. Structures and classes. Classes objects and memory static class data. Const and classes , Arrays of object. Constructor & destructor, Different type of constructor with example.	
Unit 3.	**Operator overloading:** Overloading unary operations. Overloading binary operators, data conversion, Rules for operators overloading, conversion keywords. Overloading of extraction & insertion operator.	**6 Hrs.**
Unit 4.	**Inheritance:** Concept of inheritance. Derived class and based class. Derived class constructors, member function, inheritance in the English distance class, class hierarchies, inheritance and graphics shapes, public and private inheritance, aggregation : Classes within classes, inheritance and program development.	**6 Hrs.**
Unit 5.	**Pointer & Virtual Function:** Addresses and pointers. The address of operator and pointer and arrays. Pointer and Faction pointer and C-types string. Memory management : New and Delete, pointers to objects. Virtual Function, friend function, Static function, Assignment and copy initialization, this pointer, dynamic type information	**5 Hrs.**
Unit 6.	**Streams and Files :** Classes for file stream operation, Opening and closing of file , detecting end of file , Sequential input & output operation, Error handling during file operation & command line arguments, Examples	**5 Hrs**
Unit 7	**Templates :** Introduction , class template, function template , overloading of template function & member function template	**4 Hrs**

Text Books	
3.	Object Oriented Programming with C++ by E. Balagurusamy The McGraw Hill Publication
Reference Books	
1	Object Oriented Programming in C++ by Robert Lafore Techmedia Publication.
4.	The complete reference C – by Herbert shieldt Tata McGraw Hill Publication
5.	Object Oriented Programming in C++ Saurav Sahay Oxford University Press.
6.	Object Oriented Programming in C++ R Rajaram New Age International Publishers 2nd .

Second Year B.Tech. Sem. IV
ELP213: OBJECT ORIENTED PROGRAMMING LAB

Teaching Scheme	
Practical	2 Hrs. /Week
Total Credits	1

Evaluation Scheme	
CIE	50
SEE	50
Total	**100**

Sr. No.	List of Experiments
1	**Program using Functions** a) Functions with Default Arguments b) Implementation of Call by Value & call by reference
2	**Program for Class** **a)** Classes with Primitive Data Members b) Classes with Arrays as Data Members c) Classes with Pointers as Data Members d) Classes with Static Member Functions
3	**Program for Compile Time Polymorphism** **a)** Unary Operator Overloading b) Binary Operator Overloading c) Overloading of << & >> operator d) Function Overloading
4	**Program for Run Time Polymorphism** a) Hybrid Inheritance b) Virtual Functions c) Function & class Templates
5	**Program for File Handling** a) Sequential Access b) Random Access
6	Program using template class for implementation of stack.
7	Program using template class for implementation of queue.
8	Program using template class for implementation of Singly and doubly linked list.
9	Program using class to implement Radix, Merge & quick sort.
10	Program using class to construct Binary search tree and also perform different traversal operation.
11	Mini Project based on above topics.

Second Year B.Tech. Sem. IV
ELL214:Mini-Project II

Teaching Scheme	
Lectures	2 Hrs. /Week
Practical	2 Hr/Batch
Total Credits	2

Evaluation Scheme	
CIE	50
SEE	--
Total	**50**

Prerequisites- Fundamentals of Electronics,Electronics Devices and Circuits, Digital Electronics

Course Objectives	
1	To understand manufacturing process of PCB.
2	To study signal conditioning circuits.
3	To study the operation of various displays.

Course Outcomes At the end of the course students will be able to	
1	Design PCB layout using different software tools and build PCB
2	Describe & test performance of signal conditioning circuit used in project.
3	Explain different display devices and demonstrate interfacing of these devices.

	Course Contents	
Unit No.	**Topics**	**Hrs**
Unit 1.	**PCB Design:** Study of types of PCBs: Single sided, Double sided, Multilayer, PCB design procedure, PCB design considerations, Grounding and shielding, EMI and EMC considerations	**8 Hrs.**
Unit 2.	**Signal Conditioning Circuits:** V-I converter, I-V converter, ADC operation and IC description, DAC operation and IC description, F-V converter, V-F converter, Instrumentation Amplifier	**9 Hrs.**
Unit 3.	**Study of output devices (displays)** LED interfacing (current and power considerations), seven segment display operation and interfacing, multiple seven segment display interfacing, BCD to seven segment decoder, Alpha-numeric display interfacing, Touch screen Display, LCD display, DTMF decoder operation and interfacing with mobile.	**9 Hrs.**

Experiment List:

Any 6 experiments from the experiment list given below and mini project should be completed in the practical of Mini Project II.

Sr. No.	List of Experiments
1	PCB layout design and manufacturing using Orcad/Proteus.
2	Study of V-I converter using op-amp
3	Study of I-V converter using op-amp
4	Study of ADC using discrete components and using IC 0809
5	Study of DAC using discrete components and using IC 0808
6	Study of F-V converter using op-amp
7	Study of V-F converter using op-amp
8	Implementation of binary/BCD counter using digital counter IC and seven segment display.
9	Interfacing of DTMF decoder with mobile.
10	Study of characteristics of Touch Screen Sensor.
11	Project using Integrated Circuit.