Autonomous Program Structure of Second Year B. Tech. Third Semester (Electronics and Telecommunication Engineering)

Academic Year: 2021-2022 Onwards

Course Code	Course Title	Teaching Scheme Hours /Week			Examination Scheme				Total Marks	Credit
		Lecture	Tutorial	Practical	In Sem	End Sem	Oral	Practical		
20BSEC301	Calculus and Probability	3	1	0	50	50	0	0	100	4
20EC301	Electronic Circuits and Applications	3	1	0	50	50	0	0	100	4
20EC302	Signals and Systems	3	1	0	50	50	0	0	100	4
20EC303	Data Structures and Algorithms	3	0	0	50	50	0	0	100	3
20HS301	Universal Human Values-II	2	1	0	50	50	0	0	100	3
20EC301L	Electronic Circuits and Applications Lab	0	0	4	25	0	0	25	50	2
20EC303L	Data Structures and Algorithms Lab	0	0	2	25	0	0	25	50	1
20AC301	Audit Course	0	0	1	0	0	0	0	0	No Credit
	Total	14	4	7	300	250	0	50	600	21
	Grand Total	25			550		50			

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20BSEC301 CALCULUS AND PROBABILITY

Teaching Scheme
Lectures: 3 Hours / Week
Tutorial: 1 Hour / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 4

Prerequisite: 20BS01 Linear Algebra and Univariate Calculus, 20BS03 Multivariate Calculus

Course Objectives:
1. To familiarize the students with various techniques in Calculus and Probability
2. To equip the students to deal with advanced level of Mathematics and applications that would be essential for their disciplines
3. To introduce concept of Probability and Probability distribution to analyze problems

Course Outcomes:
After completion of the course, students will be able to

CO1 Obtain the probability of random events using probability distribution
CO2 Find the Solution of Higher order Linear differential equation
CO3 Find the complex form of Fourier series of periodic function, Compute amplitude and phase spectrum
CO4 Obtain the mathematical transform of given function, Use transform technique to solve differential equation
CO5 Apply the concepts of vector calculus to find vector differentiation and vector integration

Unit I: Probability and Probability Distributions (08)
Theorems on Probability, Conditional Probability, Baye's theorem, Random Variables: Discrete and continuous, Probability density function, Mathematical expectations, Variance, Probability Distributions: Binomial, Poisson, Normal.

Unit II: Higher Order Linear Differential Equation and Applications (07)
Higher order Linear Differential Equation with constant coefficients, Complementary function, Particular integral, General method, Short cut methods, Method of variation of parameter, Cauchy's and Legendre's Differential Equation, Applications to L-R-C circuit, Forced response, Natural response.

Unit III: Complex Fourier series and Fourier Transform (08)
Periodic functions, Dirichlet's conditions, Complex form of Fourier series, Parseval's Identity, Fourier Transform, Fourier Transform of special functions, Inverse Fourier Transform, Fourier integral theorem, Properties of Fourier Transform: Linearity, Change of Scale, Shifting, Modulation theorem, Convolution theorem.

Unit IV: Laplace Transform (08)
Definition of Laplace and Inverse Laplace transform, Properties and Theorems, Laplace Transform of standard functions, Laplace Transform of some special functions viz.

Periodic, Heaviside unit step, Unit impulse and Ramp function, Inverse Laplace Transform, Initial value problems.

Unit V: Vector Differential Calculus **(05)**
Physical interpretation of vector differentiation, Vector differential operator, Gradient, Divergence, Curl, Directional derivative, Scalar potential, Vector identities.

Unit VI: Vector Integral calculus **(06)**
Line integral, Surface integral, Work done, Green's Lemma, Gauss' Divergence Theorem, Stokes Theorem.

Text Books:

1. B. V. Ramana, **"Higher Engineering Mathematics"**, *Tata McGraw Hill Educations*,(26th Reprint 2016).
2. B. S. Grewal, **"Higher Engineering Mathematics"**, *Khanna publishers, Delhi*, (40th Edition), (2008).

Reference Books:

1. Erwin Kreyszig, **"Advanced Engineering Mathematics",** *Wiley Eastern Ltd.*, (8th Student Edition), (2004).
2. Peter V. O'Neil, **"Advanced Engineering Mathematics"**, *Thomson Brooks / Cole, Singapore*, (5th Edition), (2007).
3. S.C. Gupta, V. K. Kapoor, **"Fundamental of Mathematical Statistics"**, *S. Chand & Sons*, (10th Edition), (2002).
4. C. R. Wylie, L.C. Barrette, **"Advanced Engineering Mathematics",** *McGraw Hill Publications, New Delhi*, (6th Edition), (2003).
5. Joel Hass, Christopher Heil, Maurice Weir, **"Thomas' Calculus"**, *Pearson India*, (13th Edition), (2016).

Online Resources:

1. NPTEL Course **"Transform Calculus and its Applications in Differential Equations"**
   https://nptel.ac.in/courses/111/105/111105123/
2. NPTEL Course **"Probability Theory and Applications"**
   https://nptel.ac.in/courses/111/104/111104079/

20EC301 ELECTRONIC CIRCUITS AND APPLICATIONS

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours / Week	In Semester: 50 Marks
Tutorial: 1 Hours / Week	End Semester: 50 Marks
	Credits: 4

Prerequisite: 20ES01: Basic Electrical and Electronics Engineering

Course Objectives:

1. To understand semiconductor devices such as JFET and MOSFET, Its characteristics, Parameters and its applications
2. To understand Operational amplifier, Concept, Parameters and applications
3. To understand Linear and non-linear applications of Op-Amp
4. To understand Characteristics of Active filters and Operating principles of PLL

Course Outcomes:

After completion of the course, students will be able to

CO1 Interpret the characteristics of JFET and MOSFET

CO2 Analyze parameters of JFET and MOSFET towards its application as an Amplifier

CO3 Illustrate the significance of internal stages of Op-Amp, Interpret and calculate performance parameters of Op Amp and PLL

CO4 Design and Analyze Linear and Nonlinear applications of Op Amp and Butterworth filters

Unit I: JFET (07)

Introduction, Types, Construction of JFET, Characteristics (Transfer and Drain) and working of JFET, Schockley's equation, JFET biasing and DC analysis, JFET as an amplifier and its configurations (CS/CD/CG), CS amplifier analysis.

Unit II: MOSFET (07)

Two terminal MOS structure, EMOSFET-construction, Symbols, Ideal EMOSFET V-I characteristics, Additional MOSFET structures (DMOSFET and CMOS), Non-ideal V-I characteristics of EMOSFET (Finite output resistance, Body effect, Breakdown effect, Temperature effect, Subthreshold conduction), MOSFET biasing and DC circuit analysis, MOSFET small signal amplifier (CS configuration).

Unit III: Op-Amp Basics (07)

Block diagram of Op-Amp, Differential amplifier configurations, Symbol and ideal equivalent circuit of Op-Amp, Differential amplifier analysis for dual-input balanced-output configuration, DC and AC characteristics of Op-Amp, Methods for improving CMRR of differential amplifier.

Unit IV: Linear Applications of Op-Amp (08)

Inverting and Non-inverting amplifier, Voltage follower, Summing amplifier, Difference amplifier, Instrumentation amplifier, Ideal integrator, Errors in ideal integrator, Practical integrator, Ideal differentiator, Errors in ideal differentiator, Practical differentiator.

Unit V: Non-Linear Applications of Op-Amp (07)

Comparator, Characteristics of comparator, Applications of Comparator, Schmitt trigger, Square wave generator, Triangular wave generator, Need of precision rectifier, Half wave and Full wave precision rectifiers.

Unit VI: Active Filters and PLL (06)

First order and second order active LP Butterworth filter, Filter design and frequency scaling, Block diagram of PLL, Characteristics of PLL, Applications of PLL.

Text Books:

1. R. L Boylestad, L. Nashlesky, **"Electronic Devices and Circuits Theory"**, *Prentice Hall of India*, (11th Edition), (2013).
2. Donald Neaman, **"Electronic Circuit Analysis and Design"**, *Tata McGraw Hill*, (3rd Edition), (2007).
3. Ramakant A. Gaikwad, **"Op Amps and Linear Integrated Circuits"**, *Prentice Hall*, (4th Edition), (2000).
4. Salivahanan and Kanchanabhaskaran, **"Linear Integrated Circuits"**, Tata *McGraw Hill Education*, (1st Reprint 2008).

Reference Books:

1. Sergio Franco, **"Design with Operational Amplifiers and Analog Integrated Circuits"**, McGraw Hill Education, (3rd Edition), (2002).
2. Sedra Smith, **"Microelectronic Circuits"**, Oxford Publications, (5th Edition), (2004).
3. David A. Bell, **"Electronic Devices and Circuits"**, Oxford, (5th Edition) (2008).
4. Millman Halkias, **"Integrated Electronics- Analog and Digital Circuits and Systems"**, *Tata McGraw Hill*, (2nd Edition) (2010).

Online Resources:

1. https://www.ti.com
2. NPTEL Course **"Analog Electronic Circuits"**
   https://nptel.ac.in/courses/108/105/108105158/
3. NPTEL Course on **"Analog Circuits"**
   https://nptel.ac.in/courses/108/101/108101094/

20EC302 SIGNALS AND SYSTEMS

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours / Week	In Semester: 50 Marks
Tutorial:1 Hour/Week	End Semester: 50 Marks
	Credits: 4

Prerequisite: 20BS01 Linear Algebra and Univariate Calculus, 20BS03 Multivariate Calculus

Course Objectives:

1. To represent continuous and discrete time signals and systems mathematically
2. To classify signals and systems into different categories
3. To analyze Linear Time Invariant (LTI) systems in time and transform domains
4. To make students familiar with the concept of Correlation and Spectral Density

Course Outcomes:

After completion of the course, students will be able to

CO1	Classify basic Signals and Systems on the basis of characteristics
CO2	Perform operations on Signals and identify Systems
CO3	Apply convolution theorem to find the response of the Linear Time Invariant (LTI) system
CO4	Analyze signals and systems using Fourier Transform and Z Transform
CO5	Apply the concepts of correlation and spectral density on Continuous Time and Discrete Time signals

Unit I: Introduction to Signals (11)

Definition of Signals and Systems, Conversion of analog signal to digital signal, Classification of signals: Continuous Time (CT) and Discrete Time (DT), Even, Odd, Periodic and aperiodic, Deterministic and random, Energy and power, Operations on signals: Amplitude scaling, Time scaling, Time shifting and Folding, Precedence rule, Addition, Multiplication, Differentiation, Integration, Elementary signals: Impulse and its properties, Step, Ramp, Exponential, Sine, Rectangular, Triangular, Signum and Sinc.

Unit II: System Classification (10)

System: Definition, Classification: linear and nonlinear, Time variant and invariant, Causal and non-causal, Static and dynamic, Stable and unstable, Invertible and non-invertible, System modelling: Input output relation, Impulse response, Definition of impulse response, Convolution integral, Convolution sum, Properties of convolution, System interconnection, System properties in terms of impulse response, Step response in terms of impulse response.

Unit III: Fourier Transform (07)

Overview of CTFS and CTFT, Introduction to DTFT and properties, Inverse Fourier transform, Applications of FT.

Unit IV: Z Transform (07)

Need of Transform, Definition of unilateral and bilateral Z transform, Properties of Z transform, Inverse Z transform, Analysis of LTI DT System, Stability and Causality considerations of LTI system.

Unit V: Correlation and Spectral Density (06)

Definition of Correlation and Spectral Density, Correlogram, Analogy between correlation and convolution, Auto-correlation and Cross correlation for CT and DT signals and their relationship with energy / power spectral densities.

Text Books:

1. Simon Haykins and Barry Van Veen, **"Signals and Systems"**, *Wiley India*, (2^{nd} Edition), (2004).
2. Lathi B. P, **"Signals, Systems and Communication"**, *BS Publication, (*1^{st}Edition*),* (2009).
3. Rao Ganesh, **"Signals and Systems: A Simplified Approach"** *Pearson Education India, (*4^{th} Edition),(2010).
4. Simon Haykins, **"An Introduction to Analog and Digital Communications"**, *Wiley India*, (2^{nd} Edition), (2008).

Reference Books:

1. Alan V Oppenheim,S. Willsky, S. Hamid, **"Signals and Systems"**, *Pearson Education*, (2^{nd} Edition), (2015).
2. Charles Phillips, **"Signals, Systems and Transforms"**, *Pearson Education,* (4^{th}Edition), (2004).
3. Mrinal Mandal and Amir Asif, **"Continuous and Discrete Time Signals and Systems"**, *Cambridge University Press*, (1^{st} Edition), (2007).

Online Resources:

1. NPTEL Course **"Signals and Systems"**
   https://nptel.ac.in/courses/117101055/

20EC303 DATA STRUCTURES AND ALGORITHMS

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours / Week	In Semester: 50 Marks
	End Semester: 50 Marks
	Credits: 3

Prerequisite: 20ES02 Fundamentals of Programming Language I

Course Objectives:
1. To recall the primitive data types, concepts of logic building and problem solving
2. To understand data representation, implementation and applications of linear and non-linear data structures
3. To learn and apply different algorithms on different types of data structures
4. To learn the concept and understand the importance of time and space complexity

Course Outcomes:
After completion of the course, students will be able to

CO1	Classify and categorize data structures that make up for a programming language
CO2	Infer to the modelled data structures from the premise of the baseline models
CO3	Apply algorithms on linear and non-linear data structures for performing different operations on data
CO4	Categorize the choice of data structures and its memory allocation on the basis of data definition, data access and manipulation

Unit I: Introduction to Data and Data Structures (07)
Concepts and definition of Data, Data type, Data object, Data structures, Searching Methods: Algorithms for Sequential Search, Indexed Sequential Search and Binary Search, Sorting Methods: Algorithms for Selection sort, Bubble sort, Insertion sort, Quick sort, Merge sort, Introduction to Time complexity and Space complexity, Brief overview of the Big Oh and other notations as performance metrics for the algorithms.

Unit II: Pointers, Structures and Functions in C (07)
Pointers: Basic concepts, Pointer declaration and initialization, Scale factor, Pointer to a pointer, Pointers and arrays, Structures in C: Concept, Comparison with arrays as a data structure, Array of Structures, Pointers and Structures, Concept of ordered list and polynomial representation using array of structures.
Functions: Type of functions and their categories, Parameter passing by value, Parameter passing by reference, Recursive functions, Bitwise Operators.

Unit III: Linked Lists (07)
Concept of Lists, Single linked list: algorithms for Creation, Insertion, Deletion and traversals of above data structure, Concept of Doubly Linked List and Circular Linked List, Applications of Linked lists, Abstract Data Type (ADT), List as an ADT, Generalized Linked List (GLL): Concept, Parenthesized enumeration, Representation of multivariable polynomials using GLL.

Unit IV: Modeled Data Structures - Linear (07)

Stacks: Definition and example, Representation using arrays and linked list, Applications of Stacks: Concept of infix, Postfix and Prefix expressions, Algorithm to convert infix expression to a postfix expression, Algorithm to evaluate a postfix expression, Queues: Definition and example, Representation of queue using array and linked list, Concept of Circular queue, Concept of priority queue, Applications of Queue.

Unit V: Modeled Data Structures – Non Linear (Trees) (07)

Difference between Linear and Non-linear data structures, Binary Trees (BT): Basic terminology, Types of Binary Trees, Binary Search Tree (BST): Difference between BST and BT. Representation of BST(Static and Dynamic), Algorithms for BST traversals: Preorder, Inorder and Postorder (recursive), Primitive operations on BST: Create, Insert, Delete, Algorithm for Non-recursive in-order traversals for BST.

Unit VI: Modeled Data Structures – Non Linear (Graphs) (07)

Graphs: Concepts and terminology, Types of graphs: Directed graph, Undirected graph, Planar graph, Representation of graph using adjacency matrix, Adjacency list, Traversals: Depth First Search (DFS) and Breadth First Search (BFS). Minimal Spanning Tree (MST): Kruskal's algorithm, Prim's algorithm, Algorithm to find the shortest path: Dijktras algorithm.

Text Books:

1 Seymour Lipschutz, **"Data Structures with C",** Schaum's Outlines, *McGrawHill Education (India) Pvt. Ltd*, (1st Edition), (2017).
2 E Balgurusamy, **"Programming in ANSI C"**, *McGraw-Hill*, (8th Edition), (2019).

Reference Books:

1 Yedidyah Langsam, Moshe J. Augenstein, Aaron M.Tenenbaum, **"Data structures using C and C++"**, *PHI Publications*, (2nd Edition), (2004).
2 Ellis Horowitz, Sartaj Sahni, "**Fundamentals of Data Structures in C"**, *Universities Press*, (2nd Edition), (2008).

Online Resources:

1 NPTEL Course **"Programming, Data Structures and Algorithms using C"**
https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs25/

20HS301 UNIVERSAL HUMAN VALUES II: UNDERSTANDING HARMONY

Teaching Scheme	**Examination Scheme**
Lectures: 2 Hours / Week	In Semester: 50 Marks
Tutorial: 1Hour/Week	End Semester: 50 Marks
	Credits: 3

Prerequisite: Nil

Course Objectives:

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Course Outcomes:

After completion of the course, students will be able to

CO1	Understand human values which is only the solution of most of the present-day problems and a sustained solution could emerge only through understanding of value-based living
CO2	Compare desires of 'I' and 'Body' distinctly. If any desire appears related to both, students are able to see that the feeling is related to I while the physical facility is related to the body
CO3	Develop Natural acceptance (intention) which is always for living in harmony which leads to fulfillment in relationships.
CO4	Understand the whole existence to see the interconnectedness in the Nature
CO5	Make use of sustainable solutions to the problems in the society and the Nature

Module 1 Introduction to Value Education (06)

Understanding Value Education: Self-exploration as the Process for Value Education - Continuous Happiness and Prosperity – the Basic Human Aspirations - Right Understanding, Relationship and Physical Facility : Happiness and Prosperity – Current Scenario : Method to Fulfill the Basic Human Aspirations.

Module 2 Harmony in the Human Being (06)

Understanding Human being as the Co-existence of the Self and the Body - Distinguishing between the Needs of the Self and the Body - The Body as an Instrument of the Self - Understanding Harmony in the Self - Harmony of the Self with the Body - Programme to ensure self-regulation and Health.

Module 3 Harmony in the Family and Society (06)

Harmony in the Family – the Basic Unit of Human Interaction: Values in Human-to-Human Relationship - 'Trust' the Foundational Value in Relationship, -'Respect' as the Right Evaluation - Understanding Harmony in the Society - Vision for the Universal Human Order.

Module 4 Harmony in the Nature/Existence (04)

Understanding Harmony in the Nature - Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature - Realizing Existence as Coexistence at All Levels - The Holistic Perception of Harmony in Existence.

Module 5 Implications of the Holistic Understanding – a Look at Professional Ethics (06)

Natural Acceptance of Human Values - Definitiveness of (Ethical) Human Conduct - A Basis for Humanistic Education, Humanistic Constitution and Universal Human order - Competence in Professional Ethics - Holistic Technologies, Production Systems and Management Models-Typical Case Studies - Strategies for Transition towards Value-based Life and Profession.

Text Books:

1. R. R. Gaur, R. Asthana, G. P. Bagaria, **"The Textbook A Foundation Course in Human Values and Professional Ethics"**, *Excel Books, New Delhi*, (2nd Revised Edition), (2019).
2. R. R. Gaur, R. Asthana, G. P. Bagaria, **"Teachers' Manual for A Foundation Course in Human Values and Professional Ethics",** *Excel Books, New Delhi,* (2nd Revised Edition), (2019).

Reference Books:

1. A. Nagaraj,**"Jeevan Vidya: EkParichaya"**, *Jeevan Vidya Prakashan, Amarkantak,* (1999).
2. A.N. Tripathi, **"Human Values"**, *New Age Intl. Publishers, New Delhi*, (2004).
3. Mohandas Karamchand Gandhi, **"The Story of My Experiments with Truth",** *Prakash books Publishers, Daryaganj, New Delhi.*
4. E. F. Schumacher, **"Small is Beautiful"**, *Harper Collins Publishers, Noida, Uttar Pradesh*, (2010).
5. Cecile Andrews, **"Slow is Beautiful"**, *New Society Publishers, Canada.*
6. J. C. Kumarappa, **"Economy of Permanence",** *Sarva Seva Sangh Prakashan, Wardha, Sevagram*, (2017).
7. Pandit Sunderlal, "**Bharat Mein Angreji Raj",** *Prabhat Prakashan, New Delhi* (2018).
8. Dharampal, **"Rediscovering India",** Society for Integrated Development of Himalayas, (2003).
9. Mohandas Karamchand Gandhi, **"Hind Swaraj or Indian Home Rule",** *Navajivan Publication House, Ahemadabad.*
10. Maulana Abdul Kalam Azad**, "India Wins Freedom",** *Orient BlackSwan,*(1989).
11. Romain Rolland**,"Swami Vivekananda",** *Advaita Ashrama Publication, Ramkrishna Math,* (2nd Edition), (2010).
12. Romain Rolland, "**Gandhi",** *Srishti Publishers & Distributor,* (2002).

20EC301L ELECTRONICS CIRCUITS AND APPLICATIONS LAB

Teaching Scheme
Practical: 4 Hours / Week

Examination Scheme
In Semester: 25 Marks
Practical:25 Marks
Credits: 2

Course Objectives:

1. To identify and characterize the device such as JFET and MOSFET.
2. To measure Op-Amp performance parameters and understand the difference between ideal and practical values for different ICs.
3. To design and implement linear and non-linear applications of Op-Amp and verify the functionality

Course Outcomes:

After completion of the course, students will be able to

CO1 Interpret characteristics of JFET and MOSFET
CO2 Design biasing circuits for JFET amplifier and analyze performance of JFET amplifier
CO3 Select an appropriate Op-Amp IC for given application and analyze their performance
CO4 Design Op-Amp based circuits and analyze their performance

List of Experiments:

1. Plot V-I characteristics of JFET.
2. Implement biasing circuits for JFET and verify DC operating point.
3. Implement JFET CS amplifier and calculate A_V, R_i **and** R_o.
4. Plot V-I characteristics of MOSFET.
5. Measure Op-Amp parameters and compare with the ideal specifications:
   - Input bias current,
   - Input offset current,
   - Input offset voltage,
   - Slew rate,
   - CMRR.
6. Design, Build and Test Integrator for given frequency f_a.
7. Design, Build and Test three Op-Amp Instrumentation amplifier for typical application.
8. Design, Build and Test Schmitt trigger and plot transfer characteristics.
9. Design, Build and Test Square and Triangular waveform generator.
10. Build and Test half and full wave precision rectifier.
11. Simulate JFET CG and CD amplifier.
12. Simulate and verify virtual ground and virtual short concept in inverting and non-inverting configuration of Op-Amp.
13. Simulate and verify the response of Differentiator for given frequency f_a.
14. Simulate and verify the response of I^{st} and II^{nd} order Butterworth low pass filter.
15. Build and Test a small project using Op-Amp IC or suitable discrete components.

20EC303L DATA STRUCTURES AND ALGORITHMS LAB

Teaching Scheme
Lectures: 2 Hours / Week

Examination Scheme
In Semester: 25 Marks
Practical:25 Marks
Credits: 1

Course Objectives

1. To recall the concepts of procedural programming language paradigm
2. To understand the significance of data structures and its use
3. To understand and implement data searching and sorting methods
4. To understand and implement algorithms for solving given problems

Course Outcomes

After completion of the course, students will be able to

CO1 Utilize the principal algorithms of sorting and searching on the given data
CO2 Implement basic linear data structures like arrays, records and linked lists
CO3 Analyze the requirement and implement stacks and queues from the base models
CO4 Build, represent and traverse non-linear data structures

List of Experiments:

1. Write a program to reorder the data using sorting techniques like: bubble, selection, insertion, quick and merge sort.
2. Write a program to locate data using sequential and binary search techniques.
3. Create a database of students using an array of structures with attributes; roll no., name, program, course, marks obtained for different subjects with their total and average. Implement the following operations on the database:
   a) Display the database in a tabular form.
   b) Modify (should be able to modify each field of the database).
   c) Append (add a new record to the existing database).
   d) Search for a particular record from the database.
   e) Sort the records in the database.
4. Write a program to add two polynomials using array of structures. The display should include the polynomials that are added and the resultant polynomial in descending order of the exponents.
5. Write a program to create a singly linked list using dynamic memory allocation functions. Implement the following operations on the linked list:
   a) Display.
   b) Insert a node in the linked list (at front, at end, in the middle).
   c) Delete a node from the linked list (at front, at end, in the middle).
   d) Display the linked list in reverse.
   e) Revert the linked list.
6. Write a program to model an array as a stack (Static implementation of Stack) and perform the following operations on it:
   a) Push
   b) Pop
   c) Display

7. Write a program to model a singly linked list as a stack (Dynamic implementation of Stack) and perform the following operations on it:
   a) Push
   b) Pop
   c) Display
8. Write a program to evaluate a postfix expression using a stack. The input expression should be a postfix one.
9. Write a program to model an array as a queue (Static implementation of Queue) and perform the following operations on it:
   a) Add
   b) Delete
   c) Display
10. Write a program to model a linked list as a queue (Dynamic implementation of Queue) and perform the following operations on it:
    a) Add
    b) Delete
    c) Display
11. Create a Binary Search Tree and perform the following operations on it:
    a) Recursive traversals on the tree (display elements of the tree).
    b) Search a node in the tree.
12. Create a graph and represent it using an adjacency matrix.
    Implement BFS and DFS traversals.