Course code	Allied Theory - IA	T/P	C	H/W
22BCAA1	**DATA STRUCTURES AND C**	**T**	**3**	**3**

Objectives	➢ To understand basic concepts of C ➢ To develop C programs using arrays, functions. ➢ To develop modular applications using pointers and structures ➢ To do file handling in C
Unit -I	**C PROGRAMMING BASICS:** Structure of a C program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in C – Managing Input and Output operations – Decision Making and Branching – Looping statements. Arrays – Initialization – Declaration – One dimensional and Two-dimensional arrays. Strings- String operations – String Arrays. Simple programs- sorting-searching – matrix operations.
Unit-II	**FUNCTIONS, POINTERS, STRUCTURES AND UNIONS** Functions – Pass by value – Pass by reference – Recursion – Pointers – Definition – Initialization – Pointers arithmetic. Structures–Definition- Structure within a structure – Union — Storage classes, Pre-processor directives.
Unit-III	**LINEAR DATA STRUCTURES** Arrays and its representations – Stacks and Queues – Linked lists – Linked list-based implementation of Stacks and Queues – Evaluation of Expressions – Linked list based polynomial addition.
Unit-IV	**NON-LINEAR DATA STRUCTURES** Trees – Binary Trees – Binary tree representation and traversals –Binary Search Trees – Applications of trees. Graph and its representations – Graph Traversals.
Unit-V	**SEARCHING AND SORTING ALGORITHMS** Linear Search – Binary Search. Bubble Sort– Merge sort – Quick sort – Hash tables – Overflow handling.

Reema Thareja, *Introduction to C programming* from Oxford University press

Balagurusamy E, *Computing Fundamentals & C Programming*, Tata McGraw-Hill, Second Reprint 2008, ISBN 978-0-07-066909-3.

Ashok N Kamthane: *Programming with ANSI and Turbo C,* Pearson Edition Publ, 2002.

Horowitz, E., Sahni, S., & Anderson Freed, S. (2007). *Fundamentals of Data Structures in C* (2nd ed.). Universities Press.

Tanenbaum, A.S., Langsam, Y., & Augenstein, M.J. (2019). *Data Structures using C*.PHI/Pearson Education.

Reference Books:

Paul Deitel and Harvey Deitel, "*C How to Program with an Introduction to C++",* Eighth edition, Pearson Education, 2018.

Yashwant Kanetkar, *Let us C*, 17th Edition, BPB Publications, 2020.

Pradip Dey, Manas Ghosh, "*Computer Fundamentals and Programming in C*", Second Edition, Oxford University Press, 2013.

Anita Goel and Ajay Mittal, "*Computer Fundamentals and Programming in C*", 1st Edition,

<table>
<tr><td colspan="2">Pearson Education, 2013.

Gilberg, R. F., & Forouzan, B.A. (2005). Data Structures: A Pseudocode Approach with C (2nd ed.). Cengage Learning.</td></tr>
<tr><td>Outcomes</td><td>➢ Understand programming paradigms in C
➢ Understand and apply C programming concepts
➢ Implement linear and non-linear data structure operations using C
➢ Suggest appropriate linear / non-linear data structure for any given data set.
➢ Apply hashing concepts for a given problem
➢ Modify or suggest new data structure for an application</td></tr>
</table>

Course code 22BCAAP1	Allied Practical - IA	T/P	C	H/W
	Data Structures using C Lab	**P**	**2**	**2**
Objectives	➢ To cover various concepts of C programming language, searching and sorting algorithms ➢ It provides an understanding of data structures such as stacks and queues.			
Lab Programs	1. Find out the given number is perfect number or not using C program. 2. Write a C program to check whether the given number is Armstrong or not. 3. Write a C program to find the sum of individual digits of a positive integer. 4. Write a C program to print the Fibonacci series. 5. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user. 6. Write a C Program to find the grade of a student using else if ladder 7. Write a program to do arithmetic operations using Switch case 8. Write a program to sum the first hundred natural numbers using while, do while and For loop. 9. Write a C program to find both the largest and smallest number in a list of integers using function. 10. Write a C Program to add, subtract and multiply two matrices 11. Write a C Program to sort the numbers using function. 12. Write a program to perform various string operations. 13. Write a C Program to generate student mark list using array of structures 14. Write a program that uses functions to perform the following operations on singly linked list.: i) Creation ii) Insertion iii) Deletion iv) Traversal 15. Write a program that implement stack (its operations) using i) Arrays ii) Pointers 16. Write a program that implement Queue (its operations) using i) Arrays ii) Pointers 17. Write a program that implements the following sorting methods to sort a given list of integers in ascending order: i) Bubble sort ii) Insertion sort 18. Write a program that use both recursive and non-recursive functions to perform the following searching operations for a Key value in a given list of integers: i) Linear search ii) Binary search 19. Write a program to implement the tree traversal methods. Write a program to implement the graph traversal methods.			

Course code 22BCAA2	Allied Theory - IB	T/P	Credits	H/W
	Desktop Publishing	**T**	**3**	**3**

Objectives	➢ Students will learn of basics of Corel Draw drawing and coloring. ➢ Students will learn to working with Bitmap commands. ➢ Students will understand how to work with Photoshop, layers, Type and filters.
Unit -I	**Getting started with Corel Draw:-** Introduction to Corel Draw, Features of Corel Draw, Corel Draw Interface Tool Box, Moving from Adobe Illustrator to Corel Draw. **Common Tasks Drawing and Coloring:-** Introduction, Selecting Objects, Creating Basic Shapes, Reshaping Objects, Organizing objects, Applying Color Fills and Outlines
Unit-II	**Mastering with Text:-** Introduction Text Tool, Artistic and Paragraph Text, Formatting Text, Embedding Objects into text, Wrapping Text around Object Linking, Text to Objects. **Applying Effects**:- Introduction, Power of Blends, Distortion Contour Effects, Envelopes, Lens effects, Transparency, Creating Depth Effects, Power Clips.
Unit-III	**Working with Bitmap Commands**:- Introduction, Working with Bitmaps, Editing Bitmaps, Applying effects on Bitmaps Printing, Converting Objects to Bitmap, 3D Effect, Art Effect, Blur Effect, Color Transformation Effect, Contour Effect, Creative Effect, Distort Effect.
Unit-IV	**Getting Started with Photoshop:-** Exploring the Toolbox, The New CS4 Applications, Bar & the Options Bar, Exploring Panels & Menus, Creating & Viewing a New, Document, Customizing the Interface, Setting Preferences. **Introduction**:- Working with images, Making Selections, Resizing & Cropping Images.
Unit-V	**Getting Started with Layers**:– Layers Palette, Working with Layers, Hiding/Showing Layers, Flattening Images, Working with Adjustment Layers, Layer Effects, Painting in Photoshop, Photo Retouching. **Type:-** Creating Type, Type Tool, Moving the Text, Creating Paragraph Type, Resizing a bounding box, Changing the Type Settings, Converting Point Type to Paragraph Type, Converting Type Layers to Standard Layers, Type Masking. **Filters:-** The Filter Menu, Filter Gallery, Extract Filter, Liquefy Filter, Vanishing Point Filter, Artistic Filters, Blur Filters, Brush Stroke Filters, Distort Filters, Noise Filters, Pixelate.

Reference and Textbooks:

Text Books:

Soumya Ranjan Behera (2014). *Smart DTP Course*. BPB Publications

Xenakis, D., & Levisay, B. (2001). *Photoshop 6 In Depth*. New Delhi: DreamTech Press.

Book for Reference:

Bittu Kumar (2015). *Desktop Publishing.* V & S Publishers.

Outcomes	On Completion of this Course, the students can able to ➢ Draw, edit, format and develop graphics using CorelDRWA application software. ➢ Working with text and applying the effects using Corel Draw. ➢ Working with Bitmap Commands and 3D effects. ➢ Getting Started with Photoshop and working with images. ➢ Create, format, edit and develop images using Adobe Photoshop software.

Course code	Allied Practical - IB	T/P	Credits	H/W
22BCAAP2	**Desktop Publishing Lab**	**P**	**2**	**2**

Objectives	➢ The course has been designed for the participants intending to build their career in desktop publishing.
Lab Programs	**Corel DRAW** 1. Designing a Visiting Card in Corel Draw. 2. Designing a Notice in Corel Draw. 3. Designing a Certificate in Corel Draw. 4. Designing an Advertisement in Corel Draw. 5. Designing a house in Corel Draw using various Tools with a Scenery Back ground. 6. Create a design using freehand tool and its flyouts. 7. Apply some effects to the design created, using interactive blend tool. **Photo Shop** 1. Converting an Image in Gray scale into Color in Photo Shop. 2. Designing a visiting Card in Photo Shop. 3. Changing the background of an image in Photoshop. 4. Creating Wall poster using Photoshop. 5. Creating a Greeting Card in Photo shop. 6. Create multiple copies of Passport Size Photo.
Outcomes	On Completion of this Course, the students can able to ➢ Effectively & efficiently produce formatted text and graphics.

Course code	Allied Theory - IIA	T/P	C	H/W
22BCAA3	**Discrete Mathematics**	**T**	**3**	**3**

Objectives	➢ To understand the basic concepts of Discrete Mathematical Structure ➢ To gain knowledge about mathematical model, expression to solve real time problems
Unit -I	**Fundamental Structures:-** Set Theory, Sets, Venn Diagrams, Complements, Cartesian Products, Power Sets, Finite and Infinite Sets. **Functions:-** Surjections, Injections, Inverses, Composition. **Relations:-** Reflexivity, Symmetry, Transitivity, Equivalence Relations.
Unit-II	**Logic:-** TF Statements, Connective, Disjunction, Negation, Conditional Statements, Bi Conditional Statements, Atomic and Compound Statements, Well-formed Formulae, The Truth Table, Tautology, Tautological Implication Formulae with Distinct Truth Tables.
Unit-III	**Normal Forms:-** Principles of Normal Forms, Theory of Inference, Open Statements, Quantifiers, Valid Formulae and Equivalence, Theory of Inference for Predicate Calculus.
Unit-IV	**Graph Theory:-** Definition, Degrees, Sub Graph, Isomorphism, Complete Graph, Bipartite Graph, Paths, Cycles, Connectedness.
Unit-V	**Trees:** Spanning Tree – Kruskal's Algorithm, Prim's Algorithm, Dijkstra's Algorithm, Cut Set and Cut Vertices, Eulerian-Hamiltonian Graph. **Boolean Algebra:-** Boolean Algebra, Boolean Functions.

Reference and Textbooks:

Jean-Paul Trembly & Manohar, R. (2017). *Discrete Mathematics Structures with Applications to Computer Science.* Tata Mc Graw-Hill.

Venkataraman, M.K., Sridharan, N., & Chandrasekaran, N. (2009). *Discrete Mathematics*. National Publishing co.

Outcomes	➢ Students will able to understand the logical statements. ➢ Students will able to work with mathematical problems.

Course code 22BCAAP3	Allied Practical - IIA	T/P	C	H/W
	Excel & C++ Lab for Discrete Mathematics	**P**	**2**	**2**

Objectives	➢ To impart the knowledge about solving Logical problems ➢ To make Students to learn about implementing mathematical structures.

1. Create a truth table using spreadsheet for AND, OR and NOT functions.
2. Create a truth table using spreadsheet for XOR of two variables, using your spreadsheet's AND, OR, and NOT functions to calculate the truth value.
3. Create a truth table, using your spreadsheet's logical functions, for the expression:
   ((P ∧7Q**)** ∨ **(**7P ∧Q).
4. Create a truth table using your spreadsheet for demorgan's theorem.
5. Create a truth table using spreadsheet to check whether the given expression is tautology or not
   (P ∧Q) ∨ **(**7P ∧Q) ∨ **(**P∧7Q) ∨ **(**7P ∧7Q)
6. Write a C++ Program to implement various set operations (union, intersection, difference, symmetric difference).
7. Write a C++ Program to find power set of a set with size n.
8. Write a C++ program to perform following operation: a) is the given relation is reflexive? b) is the given relation is symmetric? c) is the given relation is Transitive?
9. Write C++ Program to implement Prim's Algorithm.
10. Write a C++ Program to check whether a given graph is bipartite or not.

Reference and Textbooks:

Venkataraman, M.K., Sridharan, N., & Chandrasekaran, N. *Discrete Mathematics.* National Publishing co.

Jean-Paul Trembly, & Manohar, R. (2017). *Discrete Mathematics Structures with Applications to Computer Science*. Tata Mc Graw-Hill.

Outcomes	➢ Students will able to understand the logical statements ➢ Students will able to work with mathematical problems..

Course code	Allied Theory - IIB	T/P	C	H/W
22BCAA4	**Computer-Oriented Statistical Methods**	**T**	**3**	**3**
Objectives	➢ Provide knowledge of various significant and fundamental concepts to inculcate in the students an adequate understanding of the application of Statistical Methods. ➢ Obtain an intuitive and working understanding of Statistical analysis.			
Unit -I	**Measures of Central Tendency:-** Arithmetic mean, The Arithmetic Mean Computed from Grouped Data-Median, Mode, Empirical Relation between the Mean, Median, and Mode, Geometric Mean, Harmonic Mean, The Relation between the Arithmetic, Geometric and Harmonic Means, Quartiles, Deciles, and Percentiles, Software, and Measures of Central Tendency. **Measures of Dispersion:-** Dispersion or Variation, Range, Mean Deviation, Semi-Interquartile Range, The 10-90 Percentile Range, Standard Deviation-properties and short methods, The Variance, Charlie's Check, Sheppard's Correction for Variance, Empirical Relations between Measures of Dispersion, Absolute, and Relative Dispersion; Coefficient of Variation, Standardized Variable; Standard Scores, Software, and Measures of Dispersion.			
Unit-II	**Probability:-** Definitions of Probability, Conditional Probability; Independent and Dependent Events, Mutually Exclusive and Events, Probability Distributions, Mathematical Expectation. Sample Space, Events, Counting sample points, probability of events, additive rules, conditional probability, Bayes Theorem. **Sampling Theory:-** Sampling Theory, Random Samples and Random Numbers Sampling with and Without Replacement, Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Differences and Sums, Standard Errors, Software Demonstration of Elementary Sampling Theory.			
Unit-III	**Estimation Theory:-** Estimation of Parameters, Unbiased Estimates, Efficient Estimates, Point Estimates, and Interval Estimates; Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error. **Mathematical Expectation:-** Mean of a Random Variable, Variance and covariance of a random variable, Chebyshev's theorem. **Decision Theory:-** Statistical Hypotheses, Tests of Hypotheses and Significance, Type I and Type II Errors, Level of Significance, Normal Distributions, Two-Tailed and One-Tailed Tests, Special Tests, Operating-Characteristic Curves; the Power of a Test, p-Values for Hypotheses Tests.			
Unit-IV	**Discrete probability distribution function:-** Introduction and motivation, binomial and multinomial distribution, Poisson distribution. **Continuous probability distribution function:-** Small Samples, Student's t Distribution, Confidence Intervals, Tests of Hypotheses and Significance, The Chi-Square Distribution, Confidence Intervals for Sigma, Degrees of Freedom, The F			

	Distribution. Observed and Theoretical Frequencies, Definition of chi-square, Significance Tests, The Chi-Square Test for Goodness of Fit, Contingency Tables.
Unit-V	**Simple Linear Regression and correlation:-** Introduction to Linear Regression, the Simple Linear Regression Model, Least Squares and the Fitted Model, Properties of the Least-Squares Estimators, Inference Concerning the Regression Coefficients, Predictions, Choice of a Regression Model. **Multiple linear regression and certain nonlinear regression models:** Introduction, Estimating the Coefficients, Linear Regression Models using Matrices, Properties of the Least Square Estimators, Inferences in Multiple Linear Regression.

Reference and Textbooks:

Goyal, M. (2008). *Computer-based Numerical & Statistical Techniques*. Laxmi Publications, Ltd.

Gupta, S. C., & Kapoor, V. K. (2020). *Fundamentals of Mathematical*. Sultan Chand Statistics & Sons.

Walpole, R. E., Myers, R. H., Myers, S. L., & Ye, K. (1993). *Probability and Statistics for Engineers and Scientists* (Vol. 5). New York: Macmillan.

Outcomes	➢ Understanding and learning statistical methods for computer analysis. ➢ Learning of application of Statistical methods.

Course code	Allied Practical - IIB	T/P	C	H/W
22BCAAP4	**Computer-Oriented Statistical Methods Lab**	**P**	**2**	**2**

Objectives	➢ To introduce the student to basic statistical methods for the analysis of significance differences in data using C++ programming Language through Excel. ➢ To introduce various statistical method such as regression, Skewness, etc.

1. Using C++ execute the basic commands, array, list, and frames.
2. Create a Matrix using C++ and Perform the operations addition, inverse, transpose, and multiplication operations.
3. Using C++ Execute the statistical functions: mean, median, mode, quartiles, range, interquartile range histogram.
4. Using C++ Execute the statistical functions: Standard Deviation,
5. Using C++ import the data from Excel / .CSV file and calculate the standard deviation, variance, and covariance.
6. Using C++ import the data from Excel / .CSV file and draw the skewness.
7. Using C++Import the data from Excel / .CSV and perform the hypothetical testing.
8. Using C++ Import the data from Excel / .CSV and perform the Chi-squared Test.
9. Using C++ perform the binomial and normal distribution on the data.
10. Perform the Linear Regression using C++.
11. Compute the Least squares means using C++.
12. Compute the Multi Regression using C++.

Reference and Textbooks:

Goyal, M. (2008). *Computer-based Numerical & Statistical Techniques*. Laxmi Publications, Ltd.

Gupta, S. C., & Kapoor, V. K. (2020). *Fundamentals of Mathematical*. Sultan Chand statistics & Sons.

Walpole, R. E., Myers, R. H., Myers, S. L., & Ye, K. (1993). *Probability and Statistics for Engineers and Scientists* (Vol. 5). New York: Mac-millan.

Outcomes	➢ Students will able to understand statistical methods for computer analysis. ➢ Students will able to programming with application of Statistical methods.