

B.C.A.
Semester-II

L-2 T-0 P-0 C-2

A1-YOSC1F: Yoga and Meditation

Course Objectives

Course Outcomes (COs)

Articulation Matrix

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1								
CO2								
CO3								
CO4								
CO5								

High-3 Medium-2 Low-1

Unit-I

Introduction to Yoga and Yogic Practices

10 Hours

1. Yoga: Etymology, definitions, aim, objectives and misconceptions
2. Yoga: Its Origin, history and development
3. Rules and regulations to be followed by Yoga Practitioners
4. Introduction to Yoga practices
5. Shatkarma: meaning, purpose and their significance in 'Yoga Sadhana
6. Introduction to Yogic Loosening practices and Surya Narnaskar

Key Words: History and Development of Yoga, Shatkarma, Common Yogic Practices.

Unit-II

10 Hours

Breathing Practices and Pranayama

1. Sectional Breathing (Abdominal, Thoracic and Clavicular)
2. Yogic Deep Breathing
3. Concept of Puraka, Rechaka and Kum bhaka
4. Concept of Bandha and Mudra
5. Anulmoa Viloma/ NadiShodhana
6. Shitali
7. Bhramari

Key Words: Sectional breathing, Deep breathing, Bandha & Mudra, Shitali, Bhramari.

Unit-III

10 Hours

Practices leading to Meditation

1. Recitation of Pranava Mantra
2. Recitation of Hymns, in vocations and prayers
3. Anter Maun
4. Breath Meditation
5. Om Dhyana

Key Words: Pranav Mantra, Antermaun, Breath Meditation, Om Dhyana.

Total 30 Hours

Suggested Readings:

1. Singh S. P & Yogi Mukesh: Foundation of Yoga, Standard Publication, New Delhi, 2010.
2. Swami Dharendra Brahmchari: Yogasana Vijnana, Dharendra Yoga Publication, New Delhi, 1966.
3. Saraswati, Swami Satyanand: Asana, Pranayama, Mudra, Bandha (APMB), Yoga Publication Trust, Munger, 2013.
4. H. R. Nagendra: Asana, Pranayama, Mudra, Bandha, Swami Vivekananda YogPrakashan, Bangalore, 2002.
5. Ishwar Bhardwaj: SaralYogasana, Satyam Publishing House, New Delhi, 2018.
6. Shri Rai Singh Chouhan: Mudra Rahasya, Bhartiya Yog Sansthan, New Delhi, 2014.
7. Dr. Vishwanath Prasad Sanha: Dhyan Yoga, Bhartiya Yog Sansthan, New Delhi, 1987.
8. Shri Deshraj: Dhyan Sadhana, Bhartiya Yoga Sansthan, New Delhi, 2015.

**B.C.A.
Semester-II**

L-4 T-0 P-0 C-4

**S1-BCAA2T: Programming Methodology & Data
Structures**

Course Objectives

Course Outcomes (COs)

Articulation Matrix

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1								
CO2								
CO3								
CO4								
CO5								

High-3 Medium-2 Low-1

Unit-I

12 Hours

Introduction to Programming- Program Concept, Characteristics of Programming, Stages in Program Development, Algorithms, Notations, Design, Flowcharts, Types of Programming Methodologies.

Basics of C++: A Brief History of C++, Application of C-H-, Compiling & Linking, Tokens, Keywords, Identifiers & Constants, Basic Data Types, User-Defined Data Types, Symbolic Constant, Type Compatibility, Reference Variables, Operator in C++, Scope Resolution Operator, Member Dereferencing Operators, Memory Management Operators, Manipulators, Type Cast Operator.

Functions in C++: The Main Function, Function Prototyping, Call by Reference Call by Address, Call by Value, Return by Reference, Inline Function, Default Arguments, Constant Arguments, Function Overloading, Function with Array.

Unit-II

12 Hours

Classes & Objects: A Sample C++ Program with class, Defining Member Functions, Making an Outside Function Inline, Nesting of Member Functions, Private Member Functions, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member, Functions, Array of Objects, Object as Function Arguments, Friend Functions, Virtual functions, Returning Objects, Constant member functions, Pointer to Members, Local Classes.

Constructor & Destructor: Constructor, Parameterized Constructor, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Dynamic Constructor and Destructor.

Unit-III

12 Hours

Inheritance: Defining Derived Classes, Single Inheritance, Making a Private Member Inheritable, Multilevel Inheritance, Hierarchical Inheritance, Multiple Inheritance,

Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Constructor in Derived Classes, Nesting of Classes. Operator Overloading & Type Conversion, Polymorphism, Pointers, Pointers with Arrays C++, Streams, C++ Stream Classes, Unformatted I/O Operation, Formatted I/O Operation, Managing Output with Manipulators, Exception Handling.

Unit-IV

12 Hours

Data Structure: Basic concepts, Linear and Non-Linear data structures Algorithm Specification: Introduction, Recursive algorithms, Data Abstraction, Performance analysis.

Arrays: Representation of single, two-dimensional arrays, triangular arrays, sparse matrices-array and linked representations.

Stacks: Operations, Array and Linked Implementations, Applications- Infix to Postfix Conversion, Infix to Prefix Conversion, Postfix Expression Evaluation, Recursion Implementation.

Queues: Definition, Operations, Array and Linked Implementations. Circular Queue- Insertion and Deletion Operations, Dequeue (Double Ended Queue), Priority Queue- Implementation.

Unit-V

12 Hours

Linked Lists: Singly Linked Lists, Operations, Concatenating, circularly linked lists- Operations for Circularly linked lists, Doubly Linked Lists- Operations, Doubly Circular Linked List, Header Linked List

Trees: Representation of Trees, Binary tree, Properties of Binary Trees, Binary Tree Representations- Array and Linked Representations, Binary Tree Traversals, Threaded Binary Trees. Heap: Definition, Insertion, Deletion.

Unit-VI

12 Hours

Graphs: Graph ADT, Graph Representations, Graph Traversals, Searching. Hashing: Introduction, Hash tables, Hash functions, Overflow Handling. Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Comparison of Sorting Methods, Search Trees: Binary Search Trees, AVL Trees- Definition and Examples.

Total: 60 Hours

Text Book

- J. R. Rattly and E. 13. Koffman, "Problem SolVing and Program Design in C", Pearson, 2015
- E. Balguruswamy, "C++ ", TMH Publication ISBN 0-07-462038-X
- Herbert Schildt, "C++ The Complete Reference "TMH PUBlication ISBN 0-07-463880-7

Reference Books:

- R. Lafore, 'Object Oriented Programming 0+4"
- N. Dale and C. Weems, "Programming and problem solving with C++: brief edition", Jones & Bartlett Learning,

- Adam Drozdck, "Data Structures and algorithm in C++", Third Edition, Cengage Learning.
- Sartaj Sahani, "Data Structures, Algorithms and Applications with C++", McGraw Hill.
- Robert L. Kruse, "Data Structures and Program Design in C++", Pearson.
- D.S. Malik, "-Data Structure using C-H-", Second edition, Cengage Learning.
- M. A. Weiss, "Data structures and Algorithm Analysis in C", 2nd edition, Pearson.
- Lipschutz, "Schaum's outline series Data structures", Tata McGraw-Hill

**B.C.A.
Semester-II**

L-0 T-0 P-4 C-2

S1-BCAA2P: Programming Methodology & Data Structures Lab

Course Objectives

Course Outcomes (COs)

Articulation Matrix

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1								
CO2								
CO3								
CO4								
CO5								

High-3 Medium-2 Low-1

Given the problem statement, students are required to formulate problem, develop flowchart/algorithm, write code in C++, execute and test it. Students should be given assignments on following:

1. Write a program to swap. the contents of two variables.
2. Write a program for finding the roots of a Quadratic Equation.
3. Write a program to find area of a circle, rectangle, square using switch case.
4. Write a program to print table of any number.
5. Write a program to print Fibonacci series.
6. Write a program to find factorial of a given number using recursion.
7. Write a program to convert decimal number into integer equivalent binary number.
8. Write a program to check given string is palindrome or not.
9. Write a program to print digits of entered number in reverse order.
10. Write a program to print sum of two matrices.
11. Write a program to print multiplication of two matrices.
12. Write a program to generate even/odd series from 1 to 100.
13. Write a program whether a given number is prime or not.
14. Write a program for call by value and call by reference.
15. Write a program to create s pyramid structure

123

1234

16. Write a program to check entered number is Armstrong or not.
17. Write a program to input N numbers and find their average.
18. Write a program to find the area and volume of a rectangular box using constructor.
19. Write a program to design a class time with hours, minutes and seconds as data members. Use a data function to perform the addition of two-time objects in hours, minutes and seconds.
20. Write a program to implement single inheritance.
21. Write a program to find largest element from an array.
22. Write a program to implement push and pop operations on a stack using array.
23. Write a program to perform insert and delete operations on a queue using array.
24. Write a program for Linear search.
25. Write a program for Binary search.
26. Write a program for Bubble sort.
27. Write a program for Selection sort.
28. Write a program for Quick sort.
29. Write a program for Insertion sort.
30. Write a program to implement linked list.

Total 30 Hours

Text Books:

- J. R. Manly and E. B. Koffman, "Problem Solving and Program Design in C", Pearson, 2015
- E. Balguruswamy, "C++ ", TIVIH Publication ISBN 0-07-462038-X
- Herbert Shiidt, "C++ The Complete Reference "TMH Publication ISBN 0-07-463880-

Reference Books:

- R. Lafore, 'Object Oriented Programming C++'
- N. Dale and C. Weems, "Programming_ and problem solving with C++: brief edition", Jones & Bartlett Learning
- Adam Drozdck, "Data Structures and algorithm in C++", Third Edition, Cengage Learning.
- Sartaj Sahani, "Data Structures, Algorithms and Applications with C++", McGraw Hill.
- Robert L. Kruse, "Data Structures and Program Design in C++", Pearson.

- D.S. Malik, "-Data Structure using C-H-", Second edition, Cengage Learning.
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DEPARTMENT OF MATHEMATICS
S1-BCAC1G Computational Mathematics
Syllabus to be offered at B.C.A. Plain Sem - I

L	T	P	C
4	0	0	4

Course Objective:

- To give understanding of the theoretical and practical aspects of the use of trigonometric function and Matrices.
- To develop analytical ability to solve real-world problems using system of linear equations.
- To study the basics of logic set theory concepts with their application.
- To study the basics of set theory concepts with their application.

Course Outcomes:

On completion of course the students are able:		
COs	COs statements	Bloom's Level
CO1	Understand the concept of Trigonometric function and Matrices.	Understand
CO2	Understand the concept of Simultaneous linear equations and apply quadratic formula to evaluate quadratic equation.	Understand, Apply, Evaluate
CO3	Apply mean, median and mode for finding central value of a given data set.	Apply, Analyze, Evaluate
CO4	Analyze and apply the concept of Connectives to construct the truth table for Tautological implications, contradiction contingency.	Apply, Analyze, Evaluate
CO5	Understand the basic concepts of Sets, and construct Venn diagram for operations on sets.	Understand, Create

Articulation Matrix

(Program Articulation Matrix is formed by the strength of correlation of COs with POs and PSOs. The strength of correlation is indicated as 3 for substantial (high), 2 for moderate (medium) correlation, and 1 for slight (low) correlation).

CO/PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3	2	1	-	-	-	-	-	-	1	1	-	-	-	-	-	-
CO2	3	2	1	-	1	-	-	-	-	1	1	1	1	-	-	-	-
CO3	1	2	2	1	3	-	-	1	-	1	2	1	1	1	-	-	-
CO4	1	3	2	1	2	1	-	-	-	1	2	1	2	1	-	-	-
CO5	1	2	2	1	1	3	-	-	-	1	2	2	1	1	-	-	-

High-3 Medium-2 Low-1

Unit- I: Trigonometry

12 Hours

Angles & their Measurement, Values of Trigonometric Ratios, Height and Distances. Elementary Matrices and types of matrices.

Unit- II: Equations

12 Hours

Simultaneous linear equations, Methods of Solving Simultaneous equations, Quadratic equations.

Unit- III: Statistics

12 Hours

Frequency Distribution, Measure of Central Tendency: Mean, Mode, Median, Measures of variation: Mean deviation Standard Deviation.

Unit- IV: Mathematical Logic

12 Hours

Statements and notations, Connectives: Negation, Conjunction, And Disjunction. Statement formulas and truth tables. Tautologies, Tautological implications, contradiction contingency.

Unit- V: Set Theory

12 Hours

Basic concepts of set theory, notation, inclusion and equality of sets, the power set, types of sets, operations on set, Venn diagrams.



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Total: 60 Hours

Text Books:

1. Business Mathematics S.M. SHUKLA, Sahitya Bhawan Publications.
2. Business Mathematics D C Agrawal, Sree Sai Prakashan.
3. S. K. Sarkar: A Text Book of Discrete Mathematics, S Chand, 2005.
4. A text book of Discrete Mathematics, 9/E, Sarkar S.K, S. Chand New Delhi, 2016

Reference Books:

1. Fundamental of Statistics ELHANCE & ELHANCE, Kitab Mahal Publication.
2. Mathematical Statistics, 8/E RAY and SHARMA, Ram Prasad and Sons.
3. Business Mathematics, J, K Singh, Himalaya Publishing House 2017
4. Business Mathematics, 9/E, Sancheti and Kapoor, Sultan Chand 8, Sons, 2014
5. Discrete Mathematics structures with application to computer science", Indian Edition, J. P. Tremblay, R Manohar, McGraw Hill Education 2017
6. "Discrete Mathematical", 2/E, J.K 'Sharma, Macmillan publication, 2005

List of e-Learning Resources:

1. <https://nptel.ac.in/>
2. <https://www.coursera.org/>
3. <https://www.udemy.com/course/trig-by-krista-king/>
4. <https://www.udemy.com/course/statistics-for-data-science-and-business-analysis/>
5. https://www.udemy.com/course/statsml_x/
6. https://www.edx.org/course/fundamentals-of-statistics?index=product&queryID=2766bd0a0608c169631f58db206c994c&position=1&search_index=product&results_level=first-level-results&term=statistics&campaign=Fundamentals+of+Statistics&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Fsearch
7. https://www.edx.org/course/precalculus?index=product&queryID=e3c274000408d4939b01362a44d9a661&position=1&search_index=product&results_level=first-level-results&term=Trigonometry%09&campaign=Precalculus&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Fsearch



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DEPARTMENT OF MATHEMATICS
MAT 060 Mathematics and Statistics
Syllabus to be offered at B.C.A. (CC & SACS) Sem - I

L T P C
4 0 0 4

Course Objective:

- To give understanding of the theoretical and practical aspects of the use of trigonometric function and Matrices.
- To develop analytical ability to solve real-world problems using system of linear equations.
- To study the basics of logic set theory concepts with their application.
- To study the basics of set theory concepts with their application.
- To apply statistical concepts to real-world problems in computer application.

Course Outcomes:

On completion of course the students are able:		
COs	COs statements	Bloom's Level
CO1	Understand the basic concept of sequence and series.	Understand
CO2	Understand the concept of Trigonometric function and Matrices and quadratic equations and apply quadratic formula to evaluate quadratic equation.	Understand, Apply, Evaluate
CO3	Apply mean, median and mode for finding central value of a given data set.	Apply, Analyze, Evaluate
CO4	Analyze and apply the concept of Connectives to construct the truth table for Tautological implications, contradiction contingency.	Apply, Analyze, Evaluate
CO5	Understand the basic concepts of Sets, and construct Venn diagram for operations on sets.	Understand, Create

Articulation Matrix

(Program Articulation Matrix is formed by the strength of correlation of COs with POs and PSOs. The strength of correlation is indicated as 3 for substantial (high), 2 for moderate (medium) correlation, and 1 for slight (low) correlation).

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	2	1	-	-	-	-	-	-	1	1	-	-	-	-	-	-
CO2	3	2	1	-	1	-	-	-	-	1	1	1	1	-	-	-	-
CO3	1	2	2	1	3	-	-	1	-	1	2	1	1	1	-	-	-
CO4	1	3	2	1	2	1	-	-	-	1	2	1	2	1	-	-	-
CO5	1	2	2	1	1	3	-	-	-	1	2	2	1	1	-	-	-

High-3 Medium-2 Low-1

Unit- I: Sequence and series

12 Hours

Sequences, Arithmetic progression, Arithmetic means, Geometric Progression, Sum to infinity of a G.P., Arithmetic – geometric sequence, Sum to n terms of special Sequences. The Binomial Theorem, Some applications of Binomial theorem, Binomial theorem for any index. Exponential Series, Logarithmic Series.

Unit- II: Trigonometry , Matrices and Quadratic Equations

12 Hours

Angles & their Measurement, Values of Trigonometric Ratios, Height and Distances. Elementary Matrices and types of matrices. Solution of quadratic equations, Symmetric functions of roots, Graph of a



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quadratic polynomial, Applications.

Unit- III: Statistics

12 Hours

Frequency Distribution, Measure of Central Tendency: Mean, Mode, Median, Measures of variation: Mean deviation Standard Deviation.

Unit- IV: Mathematical Logic

12 Hours

Statements and notations, Connectives: Negation, Conjunction, And Disjunction. Statement formulas and truth tables. Tautologies, Tautological implications, contradiction contingency.

Unit- V: Set Theory

12 Hours

Basic concepts of set theory, notation, inclusion and equality of sets, the power set, types of sets, operations on set, Venn diagrams.

Total: 60 Hours

Text Books:

1. Business Mathematics S.M. SHUKLA, Sahitya Bhawan Publications.
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3. S. K. Sarkar: A Text Book of Discrete Mathematics, S Chand, 2005.
4. A text book of Discrete Mathematics, 9/E, Sarkar S.K, S. Chand New Delhi, 2016.
5. Mathematics by M. S. Rangachari.

Reference Books:

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6. "Discrete Mathematical", 2/E, J.K 'Sharma, Macmillan publication, 2005

List of e-Learning Resources:

8. <https://nptel.ac.in/>
 9. <https://www.coursera.org/>
 10. <https://www.udemy.com/course/trig-by-krista-king/>
 11. <https://www.udemy.com/course/statistics-for-data-science-and-business-analysis/>
 12. https://www.udemy.com/course/statsml_x/
 13. https://www.edx.org/course/fundamentals-of-statistics?index=product&queryID=2766bd0a0608c169631f58db206c994c&position=1&search_index=product&results_level=first-level-results&term=statistics&campaign=Fundamentals+of+Statistics&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Fsearch
- https://www.edx.org/course/precalculus?index=product&queryID=e3c274000408d4939b01362a44d9a661&position=1&search_index=product&results_level=first-level-results&term=Trigonometry%09&campaign=Precalculus&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Fsearch



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DEPARTMENT OF MATHEMATICS
MAT 110 Mathematical Foundation of Computer Science
Syllabus to be offered at MCA Sem – I

L T P C
3 1 0 4

Course Objective:

The objective of this course is to familiarize prospective engineers with techniques in Fourier transform, Laplace transform, Fourier series, sequence and series and complex variables. It aims to equip the students to deal with advanced levels of mathematics and applications that would be essential for their disciplines.

The students will learn:

- To gain knowledge about Sets, Relations and Functions.
- To study the basics of Proportions & Lattices concepts with their application.
- To provide students with an introduction to the group theory and fields .
- To study the basics of graph theory concepts with their application.
- To give understanding of the theoretical and practical aspects of the use of discrete numeric function and recurrence relation.
- To develop analytical ability to solve real-world problems using these methodologies.

Course Outcomes:

On completion of course the students are able:		
COs	COs statements	Bloom's Level
CO1	Understand sets, relations, functions and discrete structure and apply the concept to computer science	Understand, Apply
CO2	To develop understanding of Proportions & lattices	Remember, Understand, Apply
CO3	Analyze the concepts of set theory to apply the in group, field theory.	Apply, Analyze
CO4	Analyze the concepts of graph theory.	Remember, Analyze
CO5	Analyze the concepts of Recurrence Relation and find solution of discrete numeric function.	Apply, Analyze, Evaluate

Articulation Matrix

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CO/P O/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	P S O 1	P S O 2	P S O 3	P S O 4	P S O 5	P S O 6	P S O 7	P S O 8	P S O 9
CO1	3	2	1	-	-	-	-	-	-	-	1	-	1	1	-	-	-	-	-	-	-
CO2	1	3	2	1	-	-	1	1	1	-	1	1	2	1	1	-	-	-	-	-	-
CO3	1	3	2	1	-	-	1	1	-	-	1	1	1	2	1	1	-	-	-	-	-
CO4	1	2	3	1	-	-	1	1	-	-	1	1	1	2	2	1	-	1	-	-	-
CO5	1	3	2	1	-	-	-	-	-	-	1	1	1	2	1	-	1	-	1	-	1

High-3 Medium-2 Low-1

Unit-I: Sets theory, Relations and Functions

12 Hours

Sets, Subsets, Power sets, Complement, Union and Intersection, Demorgan's law Cartesian products. Relations: relational matrices, properties of relations, equivalence relation. Functions: Injection, Surjection and Bijective mapping, Composition of functions, the characteristic functions and Mathematical induction.

Unit-II: Proportions & Lattices

12 Hours

Proposition & prepositional functions, logical connections, truth-values and truth table, the algebra of prepositional functions, the algebra of truth values, applications (switching circuits, basic computer components). Partial order set, Hasse diagrams, upper bounds, lower bounds, maximal and minimal element, first and last element.

Lattices: Lattices, sub lattices, Isotonicity distributive inequality, Lattice homomorphism, lattice isomorphism, complete lattice, Complemented lattice distribution lattice .



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Unit-III: Group theory and Fields

12 Hours

Group axioms, permutation group, sub group, co-sets, normal subgroup, semi group, Lagrange theorem, fields, minimal polynomials, reducible polynomials, primitive polynomial, polynomial roots, applications.

Unit-IV: Graphs

12 Hours

Finite graphs, incidence and degree, isomorphism, sub graphs and union of graphs, connectedness, walk, paths, and circuits. Eulerian graphs, tree properties of trees, pendant vertices in tree, center of tree, spanning trees and cut vertices, binary tree, matrix representation of graph, incidence and adjacency matrix and their properties, applications of graphs in computer science.

Unit-V: Discrete Numeric function and Recurrence relation

12 Hours

Introduction to discrete numeric functions and generating functions, introduction to recurrence relations and recursive algorithms, linear recurrence relations with constant coefficients, homogeneous solutions, particular solutions and total solutions.

Total: 60 Hours

Books:

1. J. P. Trembley & R. P. Manohar, "Discrete Mathematical Structure with applications to Computer Science".
2. Kenneth H. Rosen-203, "Discrete Math & its Applications" 5th ed.
3. K. A. Ross and C. R. B. Writht, "Discrete Mathematics".
4. Bernard Kolman & Robert C. Busby, "Discrete Mathematical Structures for Computer Science".

List of e-Learning Resources:

1. <https://nptel.ac.in/>
2. <https://www.coursera.org/>
3. https://www.edx.org/course/advanced-algorithmics-and-graph-theory-with-python?index=product&queryID=106bd43f975a7c909005bc27e62f3c98&position=3&v=1&linked_from=autocomplete&c=autocomplete
4. https://www.edx.org/course/introduction-computer-science-harvardx-cs50x?index=product&search_index=product&results_level=first-level-results&term=Discrete+Numeric+function+&campaign=CS50%27s+Introduction+to+Computer+Science&source=edx&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Fsearch

B.C.A.
Semester-II

L-3 T-0 P-0 C-3

**S1-COSC1G: Data Analysis & Visualization through
spreadsheet**

Course Objectives

Course Outcomes (COs)

Articulation Matrix

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1								
CO2								
CO3								
CO4								
CO5								

High-3 Medium-2 Low-1

Unit-I

09 Hours

Introduction to Spreadsheet: What is Spreadsheet, History, Importance, Brands and platforms, Excel, Calc, and Google Sheets, User interface, Ribbon, Quick Access toolbar.

Basics of Spreadsheet: Overview of spreadsheet, opening new file and saving spreadsheet (through menu and keyboard shortcut), rows, columns, cells, workbooks and worksheets. Fundamentals of rows, columns and cell and navigation; various modes of selecting cells (shift arrow, ctrl shift arrow, mouse click and drag, mouse click and shift click); merging cells; Selecting rows and columns, Non-contiguous cells; How to enter data (numeric, text, date), Autofit, keyboard navigation, Autocomplete, navigating edges, Navigating first and last used cells. Working with multiple sheets, inserting and deleting sheets, renaming sheets.

Number formatting - Introduction, General and text, Number and fraction, Currency, Accounting, Percentage, Date, Time; Inserting and deleting rows, columns and cells.

Formatting cells - Introduction, Bold, Italics and Underline, Border, Fill and Font, Alignment, Format painter and clear format, Editing the cell content, entering multiple lines of text using Ctrl+Enter, auto fill, copy and paste, cut and paste, auto fill series, use of fill handle through mouse.

Unit-II

09 Hours

Printing worksheet: Select print area, see print preview, adjusting margin during print preview.

Page Formatting: Page layout — Orientation, size, margins; watermark, page colour, page borders; inserting headers and footer, inserting page numbers, date, path and filename.

Viewing: Easy view using freeze panes (freeze rows and columns), split windows, layout view (normal, page break and Print).

Saving and Sharing File: Embed, PDF, share workbooks through OneDrive, -Online.

Import and Export Data: Import Access Data, Microsoft Query, Import/Export Text Files,

XML.

Protecting/Securing using file properties: Protect Workbook, Protect Sheet, Lock Cells, Read-only Workbook.

Template: Creating worksheet thorough template - Budget, Calendar, Holidays, Meal Planner, Invoice, Automated Invoice, Default Templates, Time Sheet, BMI calculator. Saving worksheet as template.

Calculations: Entering formula, editing formula, copying formula, cell references (absolute, relative and mixed), paste formula (using keyboard shortcut and fill handle).

Data Validation: Reject Invalid Dates, Budget Limit, Prevent Duplicate Entries, Product Codes, Drop-down List, Dependent Drop-down Lists, Cm to inches, Kg to gm.

Unit-III

09 Hours

Introduction to Functions: What is function, entering functions, types of functions. Count and Sum: Countif, Count Blank/Nonblank Cells, Count Characters, Not Equal To, Count Cells with Text, Sum, Running Total, Sumif, Sumproduct.

Date & Time: DateDif, Today's Date, Date and Time Formats, Calculate Age, Time Difference, Weekdays, Days until Birthday, Last Day of the Month, Add or Subtract Time, Quarter, Day of the Year

Text: Separate Strings, Count Words, Text to Columns, Find, Search, Change Case, Remove Spaces, Compare Text, Substitute vs Replace, Text, Concatenate, Substring.

Lookup & Reference: Vlookup, Tax Rates, Index and Match, Two-way Lookup, Offset, Case-sensitive Lookup, Left Lookup, Locate Maximum Value, Indirect, Two-column Lookup, Closest Match, Compare Two Columns, Xlookup.

Financial: PMT, Loans with Different Durations, Investment or Annuity, Compound Interest, CAGR, Loan Amortization Schedule, NPV, IRR, Depreciation, Profit Margin.

Statistical: Average, Negative Numbers to Zero, Random Numbers, Rank, Percentiles and Quartiles, Box and Whisker Plot, AverageIf, Forecast, MaxIfs and MinIfs, Weighted Average, Mode, Standard Deviation, Frequency. **Round:** Chop off Decimals, Nearest Multiple, Even and Odd, Mod.

Unit-IV

09 Hours

Data Visualisation: Introduction to charts, various type of charts (Column, Bar, Pie, Area, XY Scatter, Bubble, Net, Stock, Column & Line); 3-D Shape (Bar, Cylinder, Cone, Pyramid); Chart elements (Title, Subtitle, X-axis, Y-axis, Z-axis, Display grids, Legends, Display data series); Creating a Chart: Selecting data series, select chart type, select chart components - labels, background, axes, format and design.

Conditional Formatting: Manage Rules, Formula based, Data Bars, Colour Scales, Icon Sets, Find Duplicates, Shade Alternate Rows, Compare Two Lists, Conflicting Rules, Heat Map

Unit-V

09 Hours

Data Analysis: Sort (Custom Sort Order, Sort by Color, Reverse List, Randomize List, SORT function). Filter (Number and Text Filters, Date Filters, Advanced Filter, Data Form, Remove Duplicates, Outlining Data, Subtotal, Unique Values, FILTER function).

Pivot Tables: Creating pivot table, Group pivot table items, pivot table summarization, multi-level pivot table, Frequency distribution, pivot chart, Slicers, update pivot table, calculated field/item, GetPivotData.

Tables: Structured References, Table Styles, Quick Analysis

What-If Analysis: Data Tables, Goal Seek, Quadratic Equation Solver: Transportation Problem, Assignment Problem, Capital Investment, Shortest Path Problem, Maximum Flow Problem, Sensitivity Analysis

Analysis ToolPak: Histogram, Descriptive Statistics, ANOVA, F-Test, t-Test, Moving Average, Exponential Smoothing, Correlation, Covariance, Regression.

Keywords/Tags: Excel, Calc, Formatting, protecting range, sheet, Functions, Sort, Filter, Freeze, Pivot, Goal, Seek, Analysis, Visualization, Charts. Graphs, Correlation, Regression.

Total 45 Hours

Suggested Readings:

- Jacek Artymiak, Beginning OpenOffice Calc: From Setting Up Simple Spreadsheets to Business Forecasting, 2011, Apress, ISBN: 9781430231592
- Jacek Artymiak, OpenOffice.org Calc Functions and Formulas Tips. Essential OpenOffice.org Calc Skills, 1st ed., 2011
- Michael Alexander, Richard Kusleika, John Walkenbach.; Microsoft Excel 2019 Bible: The Comprehensive Tutorial Resource; John Wiley & Sons Inc.
- Walkenbach J.; Microsoft Excel 2016 Bible: The Comprehensive Tutorial Resource; Wiley.
- Fischer W., Excel: Quick Start Guide from Beginner to Expert (Excel, Microsoft Office); CreateSpace Independent Publishing Platform.
- Harvey G., Excel 2016 for Dummies (Excel for Dummies); John Wiley & Sons.
- Kalmstrom P.; Excel 2016 from Scratch: Excel course with demos and exercises; CreateSpace Independent Publishing Platform.
- Walkenbach J.; Excel Charts; John Wiley & Sons.

Suggestive digital platform web links

- <https://wiki.documentfoundation.org/images/c/c2/CG62-CalcGuide.pdf>
- <http://www.openoffice.org/documentation/manuals/userguide3/0309CG3-DataAnalysis.pdf>
- <https://wiki.documentfoundation.org/images/c/c2/CG62-CalcGuide.pdf>
- <https://documentationlibreoffice.org/Wassets/Uploads/Documentation/en/CG4.1/PDF/C4109-DataAnalysis.pdf>
- <https://help.libreoffice.org/6.1/en-US/text/scalc/01/statistics.html?DbPAR=CA LC>

- <https://www.vfu.bg/en/e-LearninWMS-Office--excel.pdf>
- <https://guides.librarv.duke.edu/excel/visualization>

B.C.A.
Semester-II

L-3 T-0 P-0 C-3

**S1-COSC1R: Data Analysis & Visualization through
spreadsheet**

1. Simple data entry in a workbook in different sheet as given below.
 - a. Use the fill series method to fill the name as A-1, A-2 and RollNo. As 501, 502 to 550.
 - b. In Subject SI Pr, put the marks more than 50 (to be used in next practical).
 - c. Do not enter data in Total S1, Total S2 and Total S3 column.
 - d. Perform the operations:
 - i. inserting column and rows,
 - ii. deleting columns and rows, iii. selecting range of columns,
 - iii. change the width of column and height of rows,
 - iv. hiding the rows and columns,
 - v. show/unhide the rows and columns.
 - vi. Rename the worksheet as "UG1-Marks"
 - vii. Save the worksheet as "Marks".

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Name	Roll No	S1- Th. (Max. 50)	S1 Pr. (Max. 50)	Tot. S1 (Max. 100)	S2- Th. (Max. 50)	S2 Pr. (Max. 50)	Tot. S2 (Max. 100)	S3- Th. (Max. 50)	S3 Pr. (Max. 50)	Tot. S3 (Max. 100)	Total Marks (S1+S2+S3)	
2	A-1	501	36	40	=C2+D2	45	46		34	39			
3	A-2	502	27	32		34	38		23	40			
4	A-3	503	44	46		53	40		40	42			
5	A-4	504	24	30		34	39		33	40			
6	A-5	505	43	45		23	29		28	34			
7	.	.	.	.		.	.		.	.
8	.	.	.	.		.	.		.	.
9	.	.	.	.		.	.		.	.
51	A-50	550	39	45		42	40		32	42			
52													

2. Open the Workbook "Marks" as prepared in practical-1. Perform the following operations in this worksheet named "Marks".
 - a. add the formula in E2 cell as C2+D2 for subject Si total of theory and practical.
 - b. Copy formula from E2 cell and paste the formula to E3...E51 cells using keyboard and using fill handle with the help of mouse (press and drag and double click on fill handle both)
 - c. Repeat the process a and b for H2 cell (=F2+G2) cell and H3... H51.
 - d. Repeat the process a and b for K2 cell (=I2+J2) cell and K3... K51.
 - e. Find the total of P1+P2+P3 for all A-1 to A-51 students using formula and copy copy-paste method.
 - f. Save the file with keyboard shortcut CTRL+S.
3. In the sheet prepared in experiment-2, validate that any marks are more than 50 in the or greater than 100 in the Si, S2 and S3 theory or practical column and Total columns. If found correct it and see that totals are automatically calculated. (Hint: Use filter method to find it). Save the file.

4. Use the above file and
 - a. Calculate the percentage of all students in column M by using formula
say in M2 ($=L2/300\%$) and copy-paste for rest of the students.
 - b. Find the number of students having percentage more than 60%.
 - c. Find the number of students having percentage between 45% and 60%.
 - d. Find the number of students having percentage less than 45%.
 - e. Save the file
5. Use the above file (as saved in experiment-4).
 - a. Find the name of the student got highest marks in Si.
 - b. Find the name of the student got highest marks in S2.
 - c. Find the name of the student got highest marks in S3.
 - d. Find the name of the student who got highest marks in both Theory and practical in subject Si, S2 and S3.
6. Use the above file (as saved in experiment-4).
 - a. Sort the data on percentage and show only the top 10 highest rank students.
Save the file as "Marks-sorted".
 - b. Hide the marks details and show only the name of the student and percentage column.
 - c. Save/export the file as "Top 10 rank students.pdf" as pdf file.
 - d. Print the worksheet and save as pdf and share it to the instructor.
 - e. Show/unhide all the columns.
 - f. Export the file as "Marks.txt" as CSV file.
7. Open a blank worksheet.
 - a. Import the CSV file "Marks.txt" file into the worksheet.
 - b. Copy the whole content of this worksheet and paste it in the new worksheet in the same file/workbook. Rename this worksheet as "UG2-Marks".
 - c. Change the delete the students having percentage less than 45%. (Delete rows)
 - d. Allot the new Roll Nos. to the students from 601 onwards.
 - e. Change the marks of the students. Students will see that the totals automatically change.
 - f. Save the file as template with file name "UG-Marks".
 - g. Save and protect the file with password.
 - h. Save the file
8. Use of various existing template to create the worksheet.
 - a. Modify according to your need
 - b. Get the required result
 - c. Print it with setting of page.
 - d. Save the file
9. Experiment related to the data validation (Use of drop-down list, length conversion etc.)
10. Experiment related to the use of various functions sum, average, count, sumif, countif, autosum etc.
11. Experiments related to the financial and statistical functions and round of the number's functions.
12. Create worksheet related to crop production of various crops in Indian states in last five years (Wheat, Rice, Pulses, Soyabean, Cane-

sugar etc.).

- a. Make a bar graph
 - b. Make the Pie graph
13. Create worksheet related to sales of a business company having various products in last 4 quarters for 10 sales persons.
- a. Make a line graph to show the growth/decline of sales
 - b. Show the graph of each sales person's sales
 - c. Find the top 2 sales persons done in last 2 two quarters.
 - d. Find the sales person consistent in all 4 quarters.
 - e. Find the most popular product and the least popular product of the company.
14. Make all types of graphs available in the Calc/Excel using the required data with proper Title of the chart, X-axis and Y-axis title and legend titles.
15. Data analysis using Sort and Filters.
16. Data analysis using Pivot tables.
17. Use of conditional formatting.
18. Data analysis and forecasting using what-if-analysis.
19. Use of solver technique.
20. Experiment related to use of HLOOKUP and VLOOKUP.
21. Working with multiple sheets and linked data.

Keywords/Tags: Excel, Calc, Formatting, Protecting range, sheet, Functions, Formulaes, sum, count, average, min, max, if, sumif(s), countif(s), Hlookup, Vlookup, Linking, Sort, Filter, Freeze, Pivot, Goal, Seek, Analysis, Visualization, Charts, Graphs, Financial functions, Statistical functions, what-if-analysis.

B.C.A.
Semester-II

L-2 T-0 P-0 C-2

X1-FCAC1T: Environmental Education

Course Objectives

Course Outcomes (COs)

- To understand various aspects of life forms, ecological processes, and the impacts on them by the human during Anthropocene era.
- To build capabilities to identify relevant environmental issues, analyze the various underlying causes, evaluate the practices and policies, and develop framework to make informed decisions.
- To develop empathy for all life forms, awareness, and responsibility towards environmental protection and nature preservation.
- To develop the critical thinking for shaping strategies such as; scientific, social, economic, administrative & legal, environmental protection, conservation of biodiversity, environmental equity and sustainable development.
- To prepare for the competitive exams.

Articulation Matrix

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1								
CO2								
CO3								
CO4								
CO5								

High-3 Medium-2 Low-1

Unit-I

Environment and Natural Resources:

- Multidisciplinary nature, Scope and Importance of Environment
- Components of Environment: Atmosphere, Hydrosphere, Lithosphere, and Biosphere.
- Brief account of Natural Resources and associated problems: Land Resource, Water Resource, Energy Resource
 - Concept of Sustainability and Sustainable Development

Keywords: Environment, Forest, Mineral, Food, Land, Water, Energy, Sustainable development

Unit-II

Biome, Ecosystem and Biodiversity:

Major Biomes: Tropical, Temperate, Forest, Grassland, Desert, Tundra, Wetland, Estuarine and Marine

Ecosystem: Structure function and types their Preservation & Restoration

- Biodiversity and its conservation practices.

Keywords: Biome, Ecosystem, Biodiversity

Unit-III

Environmental Pollution, Management and Social Issues:

- Pollution: Types, Control measures, Management and associated problems.
- Environmental Law and Legislation: Protection and conservation Acts.
- International Agreement & Programme.
- Environmental Movements, communication and public awareness programme. National and International organizations related to environment conservation and monitoring.
- Role of information technology in environment and human health.
- Keywords: Pollution, Environmental Legislation, Environmental Movement, environmental programme and organization.

Suggested activities: (at least one)

1. Visit to an area to document environmental assets: rivers / forest / flora / fauna.
2. Visit to a local polluted site Urban / Rural/ Industrial / Agricultural
3. Study of simple ecosystem.

Reference Books:

- Singh; J.S., Singh S.P. and Gupta, S.R.; "Ecology; Environment Science and Conservation Chand publishing, New Delhi, (2018)
- Divan, S. and Rosencranz , A. , "Environmental Law and Policy in India :Cases, Material & and Status" Oxford University Press , India , (2002) 2 Edition .
- Odum , E.P. , "Fundamentals of Ecology " , Philadelphia Saundres , (1971)
- Bharucha, Erach, "Environmental studies " Universities Press India Pvt. Ltd. Hyderabad (2014) (Hindi Edition also available).
- Kaushik, Anubha , Kaushik , C.P. "Perspectives in Environmental Studies "New age International Publishers , (2018), 6th Edition .
- Asthana, D. K Asthana Meera, "A Textbook of Environmental Studies", S. Chand. Publishing, New Delhi, (2007) .
- National Digital Library (<https://ndl.iitkgp.ac.in/homestudy/science>)
- Epg- pathshala (<https://epgp.inflibnet.ac.in/Home/Download>)
- NPTEL (<https://nptel.ac.in/course.html>)
- Coursera (<https://www.coursera.org/search?query=environmental+science&page=1>)