Paper Code:BCA 102	Paper: Applied Mathematics	L	T/P	C
		4	-	4

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instruction for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Understand the various approaches dealing the data using theory of Probability
CO2	Understand various numerical techniques and apply them to solve real life problems
CO3	Analyse and evaluate the accuracy of common Numerical Methods
CO4	Develop a mathematical model for real life situation and solving it Using Linear programming technique

Course Outcomes (CO to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	–	2	–	–	–	–	–	–	–	–	2
CO2	3	–	2	2	–	–	–	2	–	–	1	2
CO3	3	–	2	2	–	–	–	3	–	–	1	2
CO4	3	–	2	3	–	–	–	2	–	–	2	2

UNIT -I
No. of Hrs. 15 Chapter/Book Reference: TB2 [chapters 3, 4], TB3 [chapters 2, 3, 4, 5, 6]
PROBABILITY: Introduction, Axiomatic definition of Probability, Addition Theorem, Multiplication theorem, Conditional Probability, Baye's Theorem and its applications

PROBABILITY DISTRIBUTIONS: Random Variable, Probability Mass function, Probability density function, Mathematical   Expectations of a Random Variable, Binomial Distribution, Poisson distribution, Normal Distribution.

UNIT -II
No. of Hrs. 15 Chapter/Book Reference: TB1 [chapters 2, 3], TB3 [chapters 7, 8, 9]
INTERPOLATION: Operators: Shift; Forward Difference, Backward Difference Operators and their Inter-relation, Interpolation Formulae-Newton's Forward, Backward and Divided Difference Formulae: Lagrange's Formula

SOLUTIONS OF NON LINEAR EQUATIONS: Bisection Method, False Position Method, Newton – Raphson Method for Solving Equation Involving One Variable only.

UNIT -III

No. of Hrs. 15 Chapter/Book Reference: TB1 [chapters 5, 6], TB3 [chapters 10, 11]
SOLUTION OF LINEAR SIMULTANEOUS EQUATIONS: Gaussian Elimination Method with and without Row Interchange: LU Decomposition: Gauss - Jacobi and Gauss-Seidel Method; Gauss – Jordan Method and to find Inverse of a Matrix by this Method.
NUMERICAL DIFFERENTIATION: First and Second Order Derivatives at Tabular and Non-Tabular Points,
NUMERICAL INTEGRATION: Trapezoidal Rule, Simpsons 1/3 Rule: Error in Each Formula (without proof.)

UNIT -IV

No. of Hrs. 15 Chapter/Book Reference: TB4 [Chapters 2, 3, 4, 9, 10]

LINEAR PROGRAMMING: Formulation of linear Programming model, Graphical method of solving linear Programming problem, Simplex Method (Maximization and Minimization)
TRANSPORTATION & ASSIGNMENT PROBLEM: General structure of transportation problem, solution procedure for transportation problem, methods for finding initial solution, test for optimality. Maximization of transportation problem, unbalanced transportation problem, Assignment problem approach of the assignment model, solution methods of assignment problem, maximization in an assignment, unbalanced assignment problem, restriction on assignment

TEXT BOOKS:

TB1. S.S. Sastry, "Numerical Analysis"; Prentice Hall of India, 1998.
TB2. Johnson, R., Miller, I. and Freunds, J., Miller and Freund's "Probability and Statistics for Engineers, Pearson Education (2005) 7th Ed.
TB3. Singh J P "Probability and Numerical Methods" ANE Books, 4th Edition 2019
TB4. Sharma, J.K.; Operations Research: problems & solutions; Macmillan India

REFERENCE BOOKS:

RB1. Grewal B S "Numerical Methods in Engineering and Science" Khanna Publishers, 2012
RB2. Walpole, Ronald E., Myers, Raymond H., Myers, Sharon L. and, Keying Ye, Probability and Statistics for Engineers and Scientists, Pearson Education (2007) 8th Ed.
RB3. Gupta S C, Kapoor V K "Fundamental of Mathematical Statistics" Sultan Chand and Sons 11th edition 2002
RB4. Manmohan, Gupta, P K, Kanti Swarup "Introduction to Management science operations research" Sultan Chand and Sons

Paper Code:BCA 104	Paper: Web Based Programming	L	T/P	C
		3	-	3

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instruction for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Design and develop dynamic web pages with good aesthetic sense of designing and latest technical know-how's.
CO2	Have a good understanding of Web Application Terminologies
CO3	Design and develop dynamic web pages with good aesthetic sense of designing and latest technical know-how's.

Course Outcomes (CO to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	–	3	3	3	2	–	2	–	–	2	2
CO2	2	2	2	2	2	–	–	–	–	–	–	1
CO3	2	–	3	3	3	2	–	2	–	–	2	2

UNIT – I

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters 1-3, 5]

Introduction to web applications, Client Side Scripting Vs Server Side Scripting, Web Servers : Local Servers and Remote Servers, Installation Process - WAMP, LAMP, XAMPP & MAMP Server, Static website vs Dynamic website development.
Introduction to PHP: Data types, Variables, Super Global Variables, Constants, Comments, Operators and Expressions, Regular Expression, Advantages of PHP
Control statements: Conditional Statement -if else, if elseif else, nested if, switch case, PHP Loops – for, while, do while and foreach loop
Arrays: Indexed Array, Associate Array, Multi-dimensional Array, Array pre-defined Functions

UNIT – II

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapter 7]
Functions: Defining and Calling Functions, Passing by Value and passing by references, Inbuilt Functions, variable scope, Mail function, PHP Errors
Working with Forms: Get and Post Methods, HTML form controls and PHP, State Management: Cookies, Session, Query String, Hidden Field.

UNIT – III

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapter 6]

Working With Files: Opening and Closing Files, creating directories and files, Reading and Writing to Files, file inclusion, file uploading and downloading, Getting Information on Files.
Object Oriented Features: Classes and Objects, Building Classes, Access Modifiers, Reusability, Constructors, Destructor.

UNIT – IV

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapter 8]

PHP Database Connectivity: Using PHP to Access a Database, Relational Databases and SQL, PHP Data Objects, MySQLi Object Interface, SQLite, MongoDB
Introduction to MYSQL, Creating database and other operations on database, Querying a MySQL database with PHP database, connecting to a database, Parsing of the query results, Checking data errors.

TEXT BOOKS:

TB1. Programming PHP: Creating Dynamic Web Pages, Kevin Tatroe. Peter Macintyre, Rasmus Lerdorf, O'Reilly, Third Edition

REFERENCE BOOKS:

RB1. Professional PHP Programming,Jesus Castagnetto,Harish Rawat, Sascha Schumann,Chris Scollo,Deepak Veliath - Wrox Publications
RB2. PHP 5 Advanced, Larry Ullman, Peachpit Press
RB3. Core PHP Programming. Leon Atkinson (Prentice Hall, ISBN 0130463469).
RB4. Beginning PHP5 and MySQL: From Novice to Professional, W. Jason Gilmore, 2004,Apress, ISBN: 1-893115-51-8

Paper Code:BCA 106	Paper: Data Structure and Algorithms Using C	L	T/P	C
		4	-	4

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instruction for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Familiarize the basics of data structures and algorithms.
CO2	Understand and apply linear and nonlinear data structures and their operations.
CO3	Compare and implement searching, sorting and hashing techniques.
CO4	Appraise and determine the correct data structure for any given real world problem.

Course Outcomes (CO to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	–	2	–	–	–	–	–	–	–	1	2
CO2	3	–	3	2	–	–	–	–	–	–	–	2
CO3	2	–	3	2	–	–	–	–	–	–	–	2
CO4	2	–	3	3	–	–	–	2	–	–	1	2

UNIT – I

No. of Hours: 11
Linear Data Structures- Static: Introduction to Algorithms- Attributes, Design Techniques, Time Space Trade Off, Data Structures, Classification and Operations of Data Structures. Growth of functions, Masters Theorem
 Arrays: Single Dimension, Two-Dimension and Introduction to Multi Dimensions, Memory Representation, Address Calculation, Sparse Matrices- Types, Representation.
Introduction: Dynamic Memory Allocation**,** Dynamic Memory versus Static Memory Allocation.
Linked List Types: Singly Linked List, Doubly Linked List, Header Linked List, Circular Linked List**.**
Operations: Creation, Insertion, Deletion, Modification, Searching, Sorting, Reversing, and Merging.

UNIT – II

No. of Hours: 11
Searching and Sorting: Linear and Binary Search, Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, quicksort, Elementary Comparison of Searching and Sorting Algorithms.

Stacks: Introduction, Static and Dynamic Implementation, Operations, Applications- Evaluation and Conversion between Polish and Reverse Polish Notations.

Queues: Introduction, Static and Dynamic Implementation, Operations, Types- Linear Queue, Circular Queue, Doubly Ended Queue, Priority Queue.

Hashing: Hash Table, Hash Functions, and Collision Resolution by chaining and double hashing.

UNIT – III

No. of Hours: 10

Trees: Notations & Terminologies, Memory Representation, Binary Trees Types- Complete, Full, Strict, Expression Binary Tree, Evaluation of arithmetic expressions using expression binary trees. Tree Traversals (Recursive and non-recursive) , Binary Search Tree, AVL Tree. M-Way trees, B-Trees.

UNIT – IV

No. of Hours: 10

Introduction to Graphs: Notations & Terminologies, Representation of Graphs- Adjacency Matrix, Incidence Matrix and Linked Representation. Graph Traversal (Breadth First and Depth First), Prim's Algorithm, Kruskal's algorithm, Dijkstra's Algorithm, Bellman-Ford algorithm, Warshall's Algorithm.

TEXT BOOKS:

TB1.   Y. Langsam, M. J. Augenstein and A.M. Tanenebaum, "Data Structures using C and C++", Pearson Education India, Second Edition, 2015.
TB2.   E. Horowitz and S. Sahni, "Fundamentals of Data Structures in C". Universities Press, Second edition, 2008.

REFERENCE BOOKS:

RB1.   Schaum's Outline Series, "Data Structures", TMH, Special Indian Ed., Seventeenth Reprint, 2014.
RB2.   Ashok N kamthane "Introduction to Data Structures in C", Pearson**,** Third Edition, 2009.
RB3.   D. Samanta, "Classic Data Structures", PHI, Second Edition, 2009.
RB4.   D. Malhotra and N. Malhotra, "Data Structures and Program Design using C", Laxmi Publications, Indian adapted edition from Mercury Learning and Information-USA, First edition, 2018.
RB5.   Y. Kanetkar " Data Structures through C", BPB Publication, Third Edition, 2019.
RB6.   R.F Gilberg, and B A Frouzan- "Data Structures: A Pseudocode Approach with C", Thomson Learning, Second Edition, 2004.
RB7.   A. K. Rath, and A.K. Jagadev, "Data Structures and Program Design Using C", Scitech Publications, Second Edition, 2011.

Paper Code:BCA 108	Paper: Database Management System	L	T/P	C
		4	-	4

Marking Scheme:
3. Teachers Continuous Evaluation: 40 marks
4. Term end Theory Examinations: 60 marks

Instruction for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Understand the DBMS concepts with detailed architecture, characteristics.Describe different database languages and environment and learn various data models, along with the related terminologies
CO2	Explore Structure Query Language, a brief on NOSQL, Query By Example.Also understand the overview of SQL, and try to implement DDL, DML and DCL along with operators, use of joins, nested query, use of views and Indexes Discuss Integrity Constraints
CO3	Describe Relational Data Model, explain Codd's Rules, Relational Algebra, Set theory operations and the concept of functional dependencies and normalization
CO4	Acquire Knowledge about Transaction Processing, concurrency problems, and its controlling techniques, Database backup and recovery and security.

Course Outcomes (CO to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	–	2	–	–	–	–	–	–	–	–	2
CO2	2	–	3	2	2	–	–	–	–	–	–	2
CO3	3	–	3	2	–	–	–	–	–	–	–	2
CO4	2	–	2	2	–	–	–	2	–	–	1	2

UNIT-I

[No. of Hrs.: 10] Chapter/Book Reference: TB1 [Chapter 2]; TB2 [Chapter 1]

Introduction: An overview of database management system, Characteristics of database approach, DBMS architecture, client/server, data Models, Introduction to Distributed Data processing, schema and instances, data independence,
Data Modelling using Entity Relationship Model: Basic introduction about the terminologies like Entity, Entity types, entity set, notation for ER diagram, attributes and keys, Types of attributes (composite, derived and

multivalued attributes) and keys (Super Key, candidate key, primary key), relationships, relation types, weak entities, enhanced E-R, specialization and generalization.

UNIT – II

[No. of Hrs.: 10] Chapter/Book Reference: TB1 [Chapter 8]; TB2 [Chapter 2];

Introduction to SQL: Overview, Characteristics of SQL. Advantage of SQL, SQL data types and literals.
Types of SQL commands: DDL, DML, DCL. Basic SQL Queries.
Logical operators: BETWEEN, IN, AND, OR and NOT
Null Values: Disallowing Null Values, Comparisons Using Null Values
Integrity constraints: Primary Key, Not NULL, Unique, Check, Referential key
Introduction to Nested Queries, Correlated Nested Queries, Set-Comparison Operators, Aggregate Operators: The GROUP BY and HAVING Clauses,
Joins: Inner joins, Outer Joins, Left outer, Right outer, full outer joins.
Overview of other SQL Objects: Views, Sequences, Indexes, Triggers and stored procedure.

UNIT – III

[No. of Hrs.: 11] Chapter/Book Reference: TB1 [Chapter 7 & 15]; TB2 [Chapter 3];

Relational Data Models: Relational model terminology domains, Attributes, Tuples, Relations, characteristics of relations, relational constraints domain constraints, key constraints and constraints on null, relational DB schema. Codd's Rules
Relational algebra: Basic operations selection and projection,
Set Theoretic operations: Union, Intersection, set difference and division (Order, Relational calculus: Domain, Tuple, Well Formed Formula, specification, quantifiers)
Join operations: Inner, Outer, Left outer, Right outer, and full outer join
ER to relational mapping: Steps to map ER diagram to relational schema
Data Normalization: Functional dependencies, Armstrong's inference rule, & Normalization (Upto BCNF)

UNIT – IV

[No. of Hrs.: 11] Chapter/Book Reference: TB1 [Chapter 19 & 20]; TB2 [Chapter 5];

Transaction Processing: Definition of Transaction, Desirable ACID properties
Database recovery and Database Security: System failure, Backup & recovery Techniques, Authentication, Authorization.
Overview of Query by Language, NoSql databses

TEXT BOOKS:

TB1. R. Elmarsi and SB Navathe, "Fundamentals of Database Systems", Pearson, 5th Ed.
TB2. Singh S.K., "Database System Concepts, design and application", Pearson Education [TB3] **TB3.** Ramakrishnan and Gherke, "Database Management Systems", TMH.
TB4. Bipin Desai, "An Introduction to Database Systems", Galgotia Publications, 1991.

REFERENCE BOOKS:
RB1. Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database Systems Concepts", 6th Edition, McGraw Hill, 2010.
RB2. Jim Melton, Alan Simon, "Understanding the new SQL: A complete Guide", Morgan Kaufmann Publishers, 1993.
RB3. A. K. Majumdar, P. Battacharya, "Database Management Systems', TMH, 2017.

Paper Code: BCA 110	Paper: Environmental Studies	L	P	C
		2	-	2

Marking Scheme:
1.   Teachers Continuous Evaluation: 100 marks
2.   This is NUES, All evaluations to be conducted by the concerned teacher.

Course Outcomes (CO):

CO1	Gain in-depth knowledge on natural processes and resources that sustain life and govern economy.
CO2	Understand the consequences of human actions on the web of life, global economy, and quality of human life.
CO3	Develop critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.
CO4	Acquire values and attitudes towards understanding complex environmental economic-social challenges, and active participation in solving current environmental problems and preventing the future ones. And, adopt sustainability as a practice in life, society, and industry.

Course Outcomes (CO to Programme Outcomes (PO)) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	–	–	–	–	–	–	2	–	–	3	2	2
CO2	–	–	–	–	–	–	2	–	–	3	2	2
CO3	–	–	–	1	–	–	3	–	2	3	3	2
CO4	–	–	–	–	–	–	3	–	2	3	3	3

UNIT–I

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters 1, 6]; TB2 [Chapters 8, 11, 25]; TB3 [Chapters 1, 35]

Introduction to Environmental Studies
*   Multidisciplinary nature of environmental studies; components of environment: atmosphere, hydrosphere, lithosphere, and biosphere.
*   Scope and importance; Concept of sustainability and sustainable development
*   Emergence of environmental issues: Climate change, Global warming, Ozone layer depletion, Acid rain etc.
*   International agreements and programmer: Earth Summit, UNFCCC, Montreal and Kyoto protocols, Convention on Biological Diversity(CBD), Ramsar convention, The Chemical Weapons Convention (CWC), UNEP, CITES, etc

UNIT–II

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters 2, 3]; TB2 [Chapters 2, 15, 16, 17]; TB3 [Chapters 2, 7, 11, 12]

Ecosystems and Natural Resources
*   Definition and concept of Ecosystem
*   Structure of ecosystem (biotic and abiotic components); Functions of Ecosystem: Physical (energy flow), Biological (food chains, food web, ecological succession), ecological pyramids and homeostasis.
*   Types of Ecosystems: Tundra, Forest, Grassland, Desert, Aquatic (ponds, streams, lakes, rivers, oceans, estuaries); importance and threats with relevant examples from India

- Ecosystem services (Provisioning, Regulating, Cultural, and Supporting); Ecosystem preservation and conservation strategies; Basics of Ecosystem restoration
- Energy resources: Renewable and non-renewable energy sources; Use of alternate energy sources; Growing energy needs; Energy contents of coal, petroleum, natural gas and bio gas; Agro-residues as a biomass energy source

UNIT–III

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapter 4]; TB2 [Chapters 4, 5, 6]; TB3 [Chapters 22, 23, 24]

Biodiversity and Conservation

- Definition of Biodiversity; Levels of biological diversity: genetic, species and ecosystem diversity
- India as a mega-biodiversity nation; Biogeographic zones of India; Biodiversity hotspots; Endemic and endangered species of India; IUCN Red list criteria and categories
- Value of biodiversity: Ecological, economic, social, ethical, aesthetic, and informational values of biodiversity with examples.
- Threats to biodiversity: Habitat loss, degradation, and fragmentation; Poaching of wildlife; Man-wildlife conflicts; Biological invasion with emphasis on Indian biodiversity; Current mass extinction crisis
- Biodiversity conservation strategies: in-situ and ex-situ methods of conservation (National Parks, Wildlife Sanctuaries, and Biosphere reserves.
- Case studies: Contemporary Indian wildlife and biodiversity issues, movements, and projects (e.g., Project Tiger, Project Elephant, Vulture breeding program, Project Great Indian Bustard, Crocodile conservation project, Silent Valley movement, Save Western Ghats movement, etc)

UNIT–IV

No. of Hours: 9 + 5 for field visit Chapter/Book Reference: TB1 [Chapter 5]; TB2 [Chapters 7, 20, 21, 23]; TB3 [Chapters 25, 26, 27, 28, 30, 31]

Environmental Pollution and Control Measures

- Environmental pollution (Air, water, soil, thermal, and noise): causes, effects, and controls; Primary and secondary air pollutants; Air and water quality standards
- Nuclear hazards and human health risks
- Solid waste management: Control measures for various types of urban, industrial waste, Hazardous waste, E-waste, etc.; Waste segregation and disposal
- Environmental Impact Assessment and Environmental Management System
- **Field work/ Practical's (any one)**
- Field visit to any of the ecosystems found in Delhi like Delhi Ridge/ Sanjay lake/Yamuna river and its floodplains etc., or any nearby lake or pond, explaining the theoretical aspects taught in the class room
- Visit to any biodiversity park/ reserve forest/ protected area/ zoo/ nursery/ natural history museum in and around Delhi, such as Okhla bird sanctuary/ Asola Bhatti Wildlife Sanctuary/ Yamuna Biodiversity Park/ Sultanpur National Park, explaining the theoretical aspects taught in the classroom
- Visit to a local polluted site (urban/rural/industrial/agricultural), wastewater treatment plants, or landfill sites, etc

TEXT BOOKS:

TB1. Sanjay Kumar Batra , Kanchan Batra ,Harpreet Kaur; Environmental Studies; Taxmann's, Fifth Edition.
TB2. M.M. Sulphey; Introduction to Environment Management; PHI Learning, 2019
TB3. S.P. Mishra, S.N. Pandey; Essential Environmental Studies; Ane Books Pvt. Ltd. ; Sixth Edition.

REFERENCE BOOKS:

RB1. Asthana, D. K. (2006).Text Book of Environmental Studies. S. Chand Publishing.
RB2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India
RB3. Bharucha, E. (2013). Textbook of Environmental Studies for Undergraduate Courses. Universities Press.
RB4. Mahapatra, R., Jeevan, S.S., Das, S. (Eds) (2017). Environment Reader for Universities, Centre for

Science and Environment, New Delhi.

RB5.   Masters, G. M., & Ela, W. P. (1991).Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.

RB6.   Odum, E. P., Odum, H. T., & Andrews, J. (1971).Fundamentals of ecology. Philadelphia: Saunders.

RB7.   Sharma, P. D., & Sharma, P. D. (2005).Ecology and environment. Rastogi Publications

Paper Code:BCA 114	Paper: Statistical Analysis using Excel	L	T/P	C
			2	1

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instruction for paper setter:

1. This is a practical paper

Course Outcomes (CO):

CO1	Understand the basic concepts of statistics and its application in the real life scenarios
CO2	Understand the means and mechanisms for applying the various skills used in the process of generating various statistical concepts by using MS Excel software
CO3	Developing the skills needed for understand the various features of MS Excel software which assist the user in the process of deriving statistical measures
CO4	Understand the skill needed to draw various forms of graphical representation based on statistical data
CO5	Understand the various features of MS Excel involved in the process of compilation and summarizing of Statistical data and the skills needed to interpret the statistical data
CO6	Understand the skills needed to ensure the process of integrating data from multiple in MS Excel

Course Outcomes (CO to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	–	–	–	–	–	–	–	–	–	–	2
CO2	3	–	2	2	2	–	–	–	–	–	–	2
CO3	2	–	2	2	2	–	–	–	–	–	–	2
CO4	2	–	–	2	2	–	–	–	–	–	–	2
CO5	2	–	2	2	2	–	–	–	–	–	–	2
CO6	2	–	–	2	2	–	–	–	–	–	–	2

UNIT – I

Chapter/Book Reference: TB1 [Chapters 1, 2]; TB2 [Chapters 1, 3];

Introduction to Statistics: Defining statistics, Importance of Statistics, application of statistics in real life scenarios. The skills and characteristics needed to deal with the data. The importance of IT tools in the usage of statistical data. MS Excel as the IT tool for dealing with statistical data. Features of MS Excel

UNIT – II

Chapter/Book Reference: TB1 [Chapter 6]; TB2 [Chapter 7]

Introduction to MS Excel. Basic structure of MS Excel. Cells, range, Tabs and the importance of formulae in MS Excel for dealing with statistical data. Introduction to Data analysis tab and the various statistical features available in data analysis tab. Installing Data analysis tab. using statistical functions of MS Excel for data analysis

UNIT – III

Chapter/Book Reference: TB1 [Chapter 7]; TB2 [Chapter 9]

The application of Measures of central tendency by using MS Excel. Frequency distribution, Graphical representation of data along with formatting features of various graphs. Measures of Central Tendency with its illustration in MS Excel

UNIT – IV

Chapter/Book Reference: TB1 [Chapter 8]; TB2 [Chapter 11]

The measures of Dispersion by using MS Excel. The consolidation of data by using Pivot table, The Data table, Scenarios and Goal seek functions by using data to predict future scenarios. The illustration of cro-relation and regression in predicting

TEXT BOOKS:

TB1. Understanding Educational Statistics Using Microsoft Excel and SPSS. Edition No. 1, Martin Lee Abbott, John Wiley and Sons. Ltd, 2011
TB2. Statistics For Management Using Microsoft Excel, Ash Narain Sah, John Wiley, 2018

REFERENCE BOOKS:
RB1. Statistics with Microsoft Excel by Dretzke, Beverly Jean, Prentice Hall, 2019
RB2. Applied Statistics with Microsoft Excel, Gral Keller, Cengage, 2015

List of Practical

S . No.	Detailed Statement

1.	Enter the marks of 20 students in the given order
	• Serial number
	
	• Name of the student
	
	• Name of the college
	
	• Class
	
	• Subject-1
	
	• Subject -2
	
	• Subject -3
	
	• Subject -4
	
	In a separate columns, perform the following operations
	Calculate the following
	   a. Total marks of all the subjects
	
	   b. Percentage of marks for each of the students
	
	   c. Allotment of grades based on the criterion.
	
	      • If the marks are more than 75% then the result is "Pass" else "Fail"
	
	   d. Now in other column allot the grades based on the following criterion
	
	      • If the marks are more than 90% then grade is "A"
	
	      • If the marks are more than or equal to 75 and less than 90% then the grade is "B" else the grade if "C" provided that the result is "Pass"

2.	From the following table, calculate the following City Number of Schools Number of candidates New Delhi 300 30000 Mumbai 450 45000 Bengaluru 500 48000 Chennai 480 67000 Trivandrum 459 77000 • The average number of students in the entire distribution • The standard deviation of the distribution • The correlation coefficient between the number of schools and the number of candidates • The regression equation between number of students and number of candidates

| 3. | From the following data calculate the |

Base City	Department	Client	Location	Nationality
New Delhi	Marketing	Adidas	New York	American
Mumbai	Advertising	Hilfiger	London	English
Bengaluru	Human Resource	Woodland	Paris	Spanish
Chennai	Human Resource	Nike	Sydney	Dutch
Trivandrum	Advertising	Allen Solley	Frankfurt	Japanese
New Delhi	Quality Control	Adidas	New York	American
Mumbai	Advertising	Hilfiger	Seoul	Korean
Bengaluru	Human Resource	Woodland	Paris	Spanish
Chennai	Human Resource	Nike	Sydney	Dutch
Trivandrum	Advertising	Armani	Frankfurt	Russian
New Delhi	Marketing	Adidas	New York	American
Mumbai	Production	Hilfiger	Copenhagen	English
Bengaluru	Human Resource	Woodland	Paris	Spanish
Chennai	Human Resource	Nike	Sydney	Russian
Trivandrum	Advertising	Gucci	Frankfurt	Japanese
New Delhi	Quality Control	Adidas	New York	American
Mumbai	Advertising	Hilfiger	London	Korean
Bengaluru	Human Resource	Woodland	Paris	Spanish
Chennai	Human Resource	Nike	Sydney	Dutch
Trivandrum	Advertising	Allen Solley	Frankfurt	Japanese

Using Pivot table, determine
- The number of Nationality per Location

- The number of Department / location / client

- The number of client / location / nationality

| 4. | A finance company wants to publish the following table |

Qty ↓ / Price →	10	20	30	40
25	250	500	750	1000
35	350	700	1050	1400
45	450	900	1350	1800
55	550	1100	1650	2200
65	650	1300	1950	2600

Using Data table, prepare the above tabular distribution

| 5 | Using the Goal seek function of Excel, prepare the following table for calculating the amount based on the simple interest formula. |

Principle Amount	1000
Rate	0.02
Time	2
Amount	1040

Simulate the amount by differing values of
- Principle amount

- Rate

- Time

Paper Code(s): BCA-172	P : 2
Paper: Web Based Programming Lab	C : 1
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions:
1. The course objectives and course outcomes are identical to that of BCA 104 as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement.

List of Practicals	
S. No.	**Detailed Statement**
Core Practicals	
1.	Write regular expressions including modifiers, operators, and metacharacters.
2.	Write a program to show the usage of nested if statement.
3.	Write a Program in PHP for type Casting Of a Variables
4.	Write a program to create a menu driven program and show the usage of switch-case.
5.	Write a program to show the usage of for/while/do while loop
6.	Write a program to perform all four types of sorting
7.	Write a program to implement Array-pad(),aaray_slice(),array_splice(),list() functions.(use foreach wherever applicable)
8.	Write a program to show the application of user defined functions.
9.	Write a program that Passes control to another page (include, require, exit and die functions)
10.	Write a program to validate the form data using Filter_var() function.
11.	Write a program to show the usage of Cookie.
12.	Write a program to show the usage of Session
13.	Write a program to implement oops concepts.
14.	Do Form handling In PHP Design a personal Information form , then Submit & Retrieve the Form Data Using $_GET(), $_POST() and $_REQUEST() Variables
15.	Design A Login Form and Validate that Form using PHP Programming
16.	Create Admin Login ,Logout form using session variables
17.	Write a program to create a file.
18.	Write a program that use various PHP library functions, and that manipulate files and directories.
19.	Write a program to read and display the content of previously created file.
20.	Write a program to modify the content of an existing file.

21.	Create a web page and which provides File uploading and downloading a file.
22.	Design a from which upload And Display Image in PHP
23.	Use phpMyAdmin and perform the following: import, review data and structure, run SQL statements, create users and privileges
24.	Write a program to create a mysql database.
25.	Write a program to create a table and insert few records into it using form.
26.	Write a program to select all the records and display it in table.
27.	Write a program to modify (delete/modify/add) a table.
28.	Write a PHP script, to check whether the page is called from 'https' or 'http'.
Application Based Practical	
29.	Write a program to verify text data as per the pattern.
30.	Create a dynamic website by incorporating the following functionalities: • Implement a basic registration and login system, with styling, • Make the database connection • Make a connection to a MySQL database, and log in with valid credentials. • Create Dynamic, interactive and database - Driven web application using php & mysql • Perform some validation check. If any of these operations cause an error, stop execution and print the error message. The script should respond differently depending on the situation. Add a "Log Out" button to logout from the system

Note:
1. In total 15 practical's to be implemented. 2 additional practical may be given by the course instructor.
2. This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course

Paper Code(s): BCA-174	P : 4
Paper: Data Structure And Algorithm Using 'C' Lab	C : 2
Prerequisites: None	
Marking Scheme: 1. Teachers Continuous Evaluation: 40 marks 2. Term-End Semester Examinations: 60 Marks	
Instructions: 1. The course objectives and course outcomes are identical to that of BCA 106 as this is the practical component of the corresponding theory paper. 2. The practical list shall be notified by the teacher in the first week of the class commencement.	

List of Practical	
S. No.	**Detailed Statement**
Core Practicals (Implement minimum 8 out of 10 practicals)	
1.	WAP to implement following operation on one dimensional array (i) Insertion (ii) Deletion (iii) Traversal (iv) Reverse (v) Merge
2.	WAP to Sort an array using menu driven: (i) BUBBLE SORT (ii) MERGE SORT(iii) INSERTION SORT (iv) SELECTION SORT
3.	WAP to implement a Singly Linked List.
4.	WAP to implement a Circular Linked Lists
5.	WAP to implement Doubly Linked Lists
6.	Write a menu driven program to implement (i) Static Stack (ii) Dynamic Stack.
7.	WAP to implement a (i) Static (ii) Dynamic Circular Queue
8.	WAP to implement a (i) Static (ii) Dynamic De-Queue.
9.	Implement recursive algorithms for the following operations on Binary Search Tree a) Insertion b) Searching
10.	Implement recursive algorithms for BST traversal- Inorder, Preorder, Postorder.
Application Based Practical (Implement minimum 5 out of 10 practical)	
11.	WAP to search & display the location of an element specified by the user, in an array using (i) Linear Search (ii) Binary Search technique.
12.	WAP to accept a matrix from user, find out matrix is sparse or not and convert into triplex matrix.
13.	WAP to implement Polynomial addition operation using linked list.
14.	Write a C program to create two linked lists from a given list in following way INPUT List:- 1 2 3 4 5 6 7 8 9 10 OUTPUT:- First List:- 1 3 5 7 9 Second List:- 2 4 6 8 10

15.	WAP to implement Student Database using Linked List with the following structure • Name • Rollno • Marks of 5 subjects • Average • Result, If the average < 50, then print 'Fail', otherwise 'Pass'
16.	Write a program to convert Infix to equivalent (i) Prefix expression (ii) Postfix expression
17.	Write a program to evaluate (i) Prefix Expression (ii) Postfix Expression using stack.
18.	Let us assume a Patient's coupon generator for the Doctors' clinic. The patients are given the coupons on first-come-first-serve basis. After the visit of a patient, patient-ID is kept stack-wise. At the end of the day, the count is generated from the stack. Construct a menu-based program for patients' coupons generator using an appropriate data structure.
19.	WAP to implement an expression tree. (For example: (a + b / (c * d) – e))
20.	Sometimes a program requires two stacks containing the same type of items. Suppose two stacks are stored in separate arrays, then one stack might overflow while there is considerable unused space in the other. A neat way to avoid this problem is to put all spaces in one stack and let this stack grow from one end of the array, and the other stack starts from the other end and grows in the opposite direction, i.e., toward the first stack. In this way, if one stack turns out to be large and the other small, then they will still both fit, and there will be no overflow until all space is used. Declare a new structure that includes these two stacks and perform various stack operations.

Note:
1. In total 15 practical's to be implemented. 2 additional practical may be given by the course instructor.
2. This is a suggestive list of programs. However, the instructor may add programs as per the
requirement of the course.

Paper Code(s): BCA-176	P : 2
Paper: Database Management System Lab	C : 1
Prerequisites: None	
Marking Scheme: 1. Teachers Continuous Evaluation: 40 marks 2. Term-End Semester Examinations: 60 Marks	
Instructions: 1. The course objectives and course outcomes are identical to that of BCA 108 as this is the practical component of the corresponding theory paper. 2. The practical list shall be notified by the teacher in the first week of the class commencement.	

List of Practicals	
S. No.	**Detailed Statement**
Core Practicals (Implement All the mentioned practicals)

The following are two suggestive databases. The students may use any one or both databases for their core practicals. However, the instructor may provide any other databases for executing these practical.
1. COLLEGE DATABASE: STUDENT (USN, SName, Address, Phone, Gender) SEMSEC (SSID, Sem, Sec) CLASS (USN, SSID) SUBJECT (Subcode, Title, Sem, Credits) IAMARKS (USN, Subcode, SSID, Test1, Test2, Test3, FinalIA) **2.COMPANY DATABASE:** EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN, DNo) DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate) DLOCATION (DNo,DLoc) PROJECT (PNo, PName, PLocation, DNo) WORKS_ON (SSN, PNo, Hours)

S.No.	Detailed Statement
1	Draw an E-R diagram from given entities and their attributes
2	Convert the E-R diagram into a Relational model with proper constraints.

3	Write queries to execute following DDL commands :
	CREATE :Create the structure of a table with at least five columns
	ALTER:Change the size of a particular column.
	        Add a new column to the existing table.
	        Remove a column from the table.
	DROP: Destroy the table along with its data.

4	Write queries to execute following DML commands : INSERT: Insert five records in each table. UPDATE: Modify data in single and multiple columns in a table DELETE: Delete selective and all records from a table

5	Write queries to execute following DML command : SELECT: Retrieve the entire contents of the table. Retrieve the selective contents (based on provided conditions) from a table. Retrieve contents from a table based on various operators i.e. string operators, logical operators and conditional operators,Boolean operators. Sort the data in ascending and descending order in a table on the basis of one column or more than one column.
6	Create table using following integrity constraints: Primary Key Unique Key Not Null Check Default Foreign Key
7	Write queries to execute following Aggregate functions Sum,Avg,Count,Minimum and Maximum value of a numeric column of a table using aggregate function
8	Retrieve data from a table using alias names .
9	Retrieve data of a table using nested queries.
10	Retrieve data from more than one table using inner join, left outer, right outer and full outer joins
11	Create view from one table and more than one table.
12	Create index on a column of a table.
Application Based Practicals	
13	Consider the Insurance company's Database given below. The primary keys are underlined and the data typesare specified. PERSON(driver_id# : string, name : string, address : string) CAR(regno : string, model : string, year : int) ACCIDENT(report_number : int, acc_date : date, location : string) OWNS(driver_id# : string, regno : string) PARTICIPATED(driver_id# : string, regno : string, report_number : int, damage_amount :number(10,2)) (i) Create the above tables by properly specified the primary key and the foreign key (ii) Enter at least five tuples for each relation (iii) Demonstrate how you can a. Update the damage amount for the car with a specific regno, the accident with report number 12 to 25000. b. Add a new accident to the database. (iv) Find the total number of people who owned cars that were involved in accident in2002. (iv) Find the number of accident in which cars belonging to a specific models were involved

14	Consider the following schema of a library management system.Write the SQL queries for the questions given below;
	Student(Stud_no : integer, Stud_name: string)
	Membership(Mem_no: integer, Stud_no: integer)
	Book_(book_no: integer, book_name:string, author: string)
	lss_rec_(iss_no:integer, iss_date: date, Mem_no: integer, book_no: integer)
	    (i) Create the tables with the appropriate integrity constraints
	    (ii) Insert around 10 records in each of the tables
	    (iii) Display all records for all tables
	    (iv) List all the student names with their membership numbers
	    (v) List all the issues for the current date with student and Book names
	    (vi) List the details of students who borrowed book whose author is Elmarsi & Navathe
	    (vii)Give a count of how many books have been bought by each student
	    (viii) Give a list of books taken by student with stud_no as 1005
	    (ix) Delete the List of books details which are issued as of today
	    (x) Create a view which lists out the iss_no, iss _date, stud_name, book name

Use the relations below to write SQL queries to solve the business problems specified.
CLIENT (clientno#,name, client_referred_by#)
ORDER (orderno#, clientno#, order_date, empid#)
ORDER_LINE (orderno#, order line number#, item_number#, no_of_items, item_cost,shipping_date)
ITEM (item_number#, item_type, cost)
EMPLOYEE (empid#, emp_type#, deptno, salary, firstname, lastname)
Notes:
  a. Column followed by # is the primary key of the table.

  b. Each client may be referred by another client. If so, the client number of the referring client is stored in referred_by.

  c. The total cost for a particular order line = no_of_items * item_cost.c.

Write queries for the following
  (i)   Create all the above tables.

  (ii)   Insert at least five records.

  (iii)   Display all the rows and columns in the CLIENT table. Sort by client name in reverse alphabetical order.

  (iv) Display the item number and total cost for each order line (total cost = no of items X item cost). Name the calculated column TOTAL COST.

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  (v) Display all the client numbers in the ORDER table. Remove duplicates.

  (vi) Display the order number and client number from the ORDER table.   Output the result in the format. Client <clientno> ordered <orderno>

  (vii) Display full details from the ORDER_LINE table where the item number is (first condition) between 1 and 200 (no > or < operators) OR the item number is greater than1000 AND (second condition) the item cost is not in the list 1000, 2000, 3000 OR the order number is not equal to 1000.

  (viii)   Display the client name and order date for all orders.

  (ix)   Repeat query (6) but also display all clients who have never ordered anything.

  (x)   Display the client name and order date for all orders using the join keywords.

  (xi)   Display the client name and order date for all orders using the JOIN method.

  (xii)   Display the client number, order date and shipping date for all orders where the shipping date is between three and six months after the order date.

  (xiii)   Display the client number and name and the client number and name of the person who referred that client.

  (xiv) Display the client name in upper case only and in lower case only.

  (xv) Display the second to fifth characters in each client name.