SCHEME OF EXAMINATION

&

SYLLABI

for

Bachelor of Computer Applications Programmes of Studies under the aegis of University School of Information Communication and Technology offered at Affiliated Institutions of the University

(1st Year Common Scheme and Syllabus, and 2nd year onwards framework)

Applicable to

1. **Bachelor of Computer Applications**
2. **Bachelor of Computer Applications – Data Science**

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

University School of Information Communication and Technology

Sector 16C, Dwarka, Delhi – 110 078 [INDIA]

www.ipu.ac.in

Approval History:

1. 1st year scheme and syllabus (1st and 2nd semester) and Framework for higher semesters (3rd to 8th) implemented from 2025-26 batch approved by Board of Studies of USICT on 28/07/2025.

2. 1st year scheme and syllabus (1st and 2nd semester) and Framework for higher semesters (3rd to 8th) implemented from 2025-26 batch approved by Academic Council Sub-committee on 01/08/2025 .

Provision for Smooth Implementation

This document describes the curriculum of the Bachelor of Computer Applications Programmes that are (or allowed to be) offered at the affiliated institutions of Guru Gobind Indraprastha University, Delhi, under the aegis of the University School of Information, Communication and Technology. In the event of any difficulty of implementation, and / or interpretation of any clause of the document, the same may be brought to the notice of Dean of the University School of Information Communication and Technology. The decision of the Dean, University School of Information Communication and Technology shall be final and implemented to resolve the issue. The same shall be put up in the subsequent meeting of the Board of Studies of the University School of Information Communication and Technology for its approval. If the decision of the Board of Studies of the University School of Information Communication and Technology is at variance with the decision taken earlier by the Dean of the School, the decision of the Board shall from the date of the approval by the Board of Studies. In the interim period, the decision taken shall stand.

Programme Outcomes

Programme Objectives (POs)	Description
PO1	Understand the fundamental concepts of Computers, Software hardware and peripheral devices and evolution of computer technologies.
PO2	Familiarized with Business environment and Information Technology and its Applications in different domains.
PO3	Gain knowledge to identify, explain and apply functional programming and object-oriented programming techniques and use of databases to develop computer programs.
PO4	Analyze, design, implement and evaluate computerized solutions to real life problems, using appropriate computing methods including web applications.
PO5	Understand the front end and backend of software applications.
PO6	Gain expertise in at least one emerging technology.
PO7	Acquire knowledge about computer networks, network devices and their configuration protocols, security concepts at various level etc.
PO8	Apply techniques of software validation and reliability analysis to the development of computer programs.
PO9	Acquire Technical, Communication and management Skills to convey or present information, applications, instructions, policies, procedures, decisions, documentations etc. verbally as well as in writing.
PO10	Recognize the various issues related to society, environment, health and vivid cultures and understand the responsibilities to contribute in providing the solutions.
PO11	Acquire technical skills to lead a productive life in the society as a professional or as an entrepreneur.
PO12	Capability for life long learning

Acronyms for Core Disciplines:

BCA : Bachelor of Computer Applications

Acronyms for Emerging Area Disciplines:

BCADS : Bachelor of Computer Applications – Data Science

Acronyms for Minor Specializations*(Applicable only for Core Disciplines)*:

AI : Artificial Intelligence and Machine Learning
DS : Data Science
Net : Networks and Cyber Security
SE : Software Engineering
FSD : Full Stack Development
SD : Software Development

Definitions:

Batch: The batch of the student shall mean the year of the first time enrolment of the students in the programme of study in the first semester. Lateral entry students admitted in the 3rd semester / 2nd year shall be designated as students admitted in the previous batch as they are admitted one year later. A student re-admitted in a programme of study in a lower / later batch shall be considered as the student of the original batch for the purpose calculation of duration of study (lateral entry o readmission due to academic break).

Programme of study shall mean Bachelor of Computer Applications.

Major / Primary specialization / discipline shall mean the discipline in which the student is admitted..

Minor specialization shall mean the specializations earned through the EAE or OAE route subject to fulfilment of requirements specified in the scheme of study for the concerned minor specialization.

Paper / Course shall be treated as synonyms. A paper is one unit of curriculum taught, in general, in one particular semester.

The document is prepared after extensive discussion among the stakeholders. The following has been guiding principles for the design of this document:

1. AICTE Handbook 2024-25 applicable till 2026-27
2. Minor specializations shall be offered. This allows the students to study not only the core foundational papers / subjects in the discipline but also subjects in the focus areas and emerging areas of technology that are relevant to the discipline and of related disciplines in the Core Discipline Degrees.
3. Multiple Exit and re-entry after completion of every academic year of study.
4. Value Added Course on "Environment Studies" of 2 credits
5. Value Added Course on "Human Values and Ethics"
6. The Value Added Courses shall total for 6 credits
7. Inter-disciplinary Courses of 9 Credits to be studied by students from other discipline than their own.
8. Maximum Credits: 176
9. Minimum Credits 160
10. Every year of teaching shall be of approximately 40 to 48 credits

Note:

A. The document currently specifies the following:
   1. The scheme framework for the 4 year Bachelor of Computer Applications
   2. The scheme and syllabus of the first year.
   3. The regulation for exit and re-entry into the programme after completion of one academic year at a time.
   4. The regulation for the award of the degree.

B. The document only provides for the framework for the following (the detailed and finalization of these shall occur in subsequent meeting of the Board of Studies of the School):
   1. The final scheme and syllabus of the second to fourth year of study. The minor specializations that may be offered to the students.

Other Acronyms:

PCC	:	Programme Coordination Committee
APC	:	Academic Programme Committee comprising of all faculty of the department / institutions and as defined in the implementation rules and the Ordinance 11 of the University.
L	:	Number of Lecture hours per week
T/P	:	Number of Tutorial / Practical Hours per week
C	:	Number of credits assigned to a course / paper
COE	:	Controller of Examinations of the Examinations Division of the University.
SGPA/CGPA	:	Semester/Cumulative Grade Point Average.
NUES	:	Non University Examination System - No term end examination shall be held. The evaluation shall be conducted as per the scheme of examinations as described in the scheme of study.
PC	:	Program Core Paper / course
VAC	:	Value Added Course / Paper
BC	:	Bridge Course / paper
SEC	:	Skill Enhancement Course / Paper

Eligibility Criteria: The eligibility criteria for BCA programme for an academic session will be provided in the admission brochure (as for Academic Session (AS) 2021-22. The eligibility criteria of BCA programme for academic session 2022-23 onwards shall be as follows:
"Pass in 12th Class of 10+2 of CBSE or equivalent with a minimum of 50% marks in aggregate* with pass in English (core or elective or functional). Mathematics or (Computer Science / Informatics Practice / Computer Applications / Multimedia & Web Technology / Data Management Application / Web Application as compulsory subject of non-vocational stream with 50 theory and 50 practical ratio) or equivalent."
OR
"Three year Diploma in a branch of Engineering from a polytechnic duly approved by All India Council for Technical Education and affiliated to a recognized examining body with a minimum of 50% marks in aggregate."

Admission Criteria: Admission shall be based on the merit of the written test / Common Entrance Test Conducted by the University and any other mode specified by the University.

Programme Objectives:

Programme Objectives (POs)	Description
PO1	Understand the fundamental concepts of Computers, Software hardware and peripheral devices and evolution of computer technologies.
PO2	Familiarized with Business environment and Information Technology and its Applications in different domains.
PO3	Gain knowledge to identify, explain and apply functional programming and object-oriented programming techniques and use of databases to develop computer programs.
PO4	Analyze, design, implement and evaluate computerized solutions to real life problems, using appropriate computing methods including web applications.
PO5	Understand the front end and backend of software applications.
PO6	Gain expertise in at least one emerging technology.
PO7	Acquire knowledge about computer networks, network devices and their configuration protocols, security concepts at various level etc.
PO8	Capability to learn new techniques, methods and technology as developed (life long learning)
PO9	Apply techniques of software validation and reliability analysis to the development of computer programs.
PO10	Acquire Technical, Communication and management Skills to convey or present information, applications, instructions, policies, procedures, decisions, documentations etc. verbally as well as in writing.
PO11	Recognize the various issues related to society, environment, health and vivid cultures and understand the responsibilities to contribute in providing the solutions.
PO12	Acquire technical skills to lead a productive life in the society as a professional or as an entrepreneur.

FIRST YEAR

Common Scheme and Syllabus for All

Bachelor of Computer Applications of Study under the aegis of University School of Information Communication and Technology offered at Affiliated Institutions of the University

First Semester						
Group	**Code**	**Paper**	**L**	**P**	**Credits**	**Mode**
[1]PC	BCA 101	Discrete Mathematics	4	-	4	Theory
[1]SEC	BCA 103	Programming Using 'C' Language	3	-	3	Theory
PC	BCA 105**#**	Fundamentals of Computers & IT	3	-	3	Theory
SEC	BCA 107#	Web Technologies	3	-	3	Theory
AEC	BCA 109	Technical Communication	3	-	3	Theory
VAC	BCA 111[+]	Human Values and Ethics	2	-	2	Theory
[1]SEC	BCA 171	Programming Using 'C' Language Lab	-	4	2	Practical
[1]PC	BCA 173	Fundamentals of Computers & IT Lab	-	3	1	Practical
SEC	BCA 175	Web Technologies Lab	-	3	1	Practical
Total			18	10	22	
Bridge Course (Mandatory for Students from Non Mathematics background)						
BC	BCA 181[+]	Bridge Course in Mathematics	4	0	0	

+ Non Credit subject mandatory for the students who do not have mathematics in 12th Std. The student has to obtain at least 40 marks. The examination of this paper shall be conducted by the concerned teacher teaching the course / paper as Teacher's Continuous Evaluation for total 100 marks. Only the pass or fail status is to be specified on the marksheet of examination and the result of the student. Passing in this paper is mandatory for the student.
# Generic Elective (GE) for other undergraduate programmes
[1]Mandatory paper to be passed for the award of the degree.

Group	Code	Paper	L	P	Credits
HS/MS	HS-352	NSS / NCC / Cultural Clubs / Technical Society / Technical Club*			2

***NUES:** Comprehensive evaluation of the students by the concerned coordinator of NCC / NSS / Cultural Clubs / Technical Society / Technical Clubs, out of 100 as per the evaluation schemes worked out by these activity societies, organizations; the co-ordinators shall be responsible for the evaluation of the same. These activities shall start from the 1st semester and the evaluation shall be conducted at the end of the 6th semester for students admitted in the first semester. Students admitted in the 2nd year (3rd semester) as lateral entry shall be for the period of 3rd semester to 6th semester only

Second Semester						
Group	**Code**	**Paper**	**L**	**P**	**Credits**	**Mode**
PC	BCA 102	Applied Mathematics	4	-	4	Theory
SEC	BCA 104	Web based Programming	3	-	3	Theory
[1]PC	BCA 106**#**	Data Structure And Algorithms Using 'C'	4	-	4	Theory
[1]PC	BCA 108#	Database Management System	4	-	4	Theory
VAC	BCA 110	Environment Studies	2	-	2	Theory

SEC	BCA 112 BCA 114 BCA 116	Choose any one (Skill Enhancement Course) Front End Design Tool VB.Net Lab Statistical Analysis using Excel Design Laboratory using Photoshop	-	2	1	Practical
SEC	BCA 172	Web based Programming Lab	-	2	1	Practical
[1]PC	BCA 174	Data Structure And Algorithm Using 'C' Lab	-	4	2	Practical
[1]PC	BCA 176	Database Management System Lab	-	2	1	Practical
Total			17	10	22	

Generic Elective (GE) for other undergraduate programmes
[1]Mandatory paper to be passed for the award of the degree.

Paper Code: BCA 101	**Paper: Discrete Mathematics**	**L**	**T/P**	**C**
		4	**-**	**4**

Marking Scheme:

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

Instructions 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 Objectives:

Course Outcomes (CO):

CO1	Understand the basics conceptual math and relations.
CO2	Understand and apply partial order and recurrence relation and their operations.
CO3	Compare and design, sorting and hashing techniques.
CO4	Appraise and determine the correct logic and solutions 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	–	–	–	–	–	–	–	–	2
CO2	3	–	3	2	–	–	–	–	–	–	–	2
CO3	2	–	3	2	–	–	–	–	–	–	–	2
CO4	2	–	2	3	–	–	–	2	–	–	1	2

UNIT I

No. of Hours: 15 Chapter/Book Reference: TB1 [chapters 1, 2, 7], TB2 [chapters 1, 2, 4, 5], TB3 [chapters 1, 4]

SETS: Sets, Subsets, Equal Sets, Universal Sets, Finite and Infinite Sets, Operations on Sets: Union, Intersection difference and Complements of Sets, Algebra of sets, Cartesian product, Simple applications.

RELATION AND FUNCTIONS: Properties of Relations, Equivalence Relation, Partial Order Relation, Composition of relations, and Representation of relations using digraph and Matrix, Function: Domain and Range, onto, into and One to One Functions, Composite and Inverse Functions, Hashing functions, Recursive function.

PROPOSITIONAL LOGIC: Introduction, Proposition, First order logic, Basic logical operations, truth tables, tautologies, contradictions, Algebra of Propositions, logical implications, logical equivalence, predicates, Universal and existential quantifiers.

UNIT II

No. of Hours: 15 Chapter/Book Reference: TB2 [chapter 6] TB 3 [Chapter 6]

PARTIAL ORDER RELATIONS AND LATTICES: Partial Order Sets, Totally ordered set, Representation of POSETS using Hasse diagram, Chains, Maximal and Minimal elements, Greatest lower bound, least upper bound, Lattices and Algebraic Structure, Principle of Duality, Elementary Properties of Lattices, Atoms. Sub lattices, Bounded lattice, Distributed & Complemented Lattices, Isomorphic lattices. Boolean lattice.

UNIT- III

No. of Hours: 15 Chapter/Book Reference: TB1 [chapters 5, 6], TB2 [chapter 3], TB3 [chapters 2, 3],

COMBINATORICS: Introduction, Basic Counting Principles, Permutations, Permutations of things not all different, Circular Permutations, Combinations, Restricted Permutations and Combinations, Derangement, Pascal's Triangle, Binomial Theorem (only for natural Numbers)

RECURRENCE RELATIONS: Introduction, Order of Recurrence Relations, Degree of Recurrence Relations, Linear Homogeneous Recurrence Relations, Non Homogeneous Recurrence Relations, Solution of linear homogeneous and non-non homogeneous recurrence relations.

UNIT -IV

No. of Hours: 15 Chapter/Book Reference: TB1 [chapter 8], TB2 [chapter 8], TB3 [chapter 8]

GRAPHS: Introduction, Degree of a vertex of a graph, Handshaking Theorem, types of Graphs, sub graph, Matrix representation of a graph: adjacent and incidence matrices, Isomorphic graphs, path and circuit (Floyd's and Warshall algorithms), Connected graph, Hamiltonian graph, Euler graph, Graph coloring (Vertex, Edges and Map).

TEXT BOOKS:

TB1. Rosen, K.H., Discrete Mathematics and its Applications, McGraw Hill Education, 8th edition 2021,

TB2. Kolman, Busby and Ross, ''Discrete Mathematical Structures", Pearson, 10th edition 2015

TB3. Babu Ram, ''Discrete Mathematics", Pearson Education, 1st edition 2010

REFERENCE BOOKS:

RB1. D. S. Malik, M. K. Sen, ''Discrete Mathematics" Cengage Learning, 2012

RB2. S.K. Sarkar ''A Text Book of Discrete Mathematics" S. Chand Publications, 9th edition 2019

RB3. Singh J. P. ''Discrete Mathematics for Undergraduates" ANE Books, 1st edition, 2013

RB4. Tremblay J.P. and Manohar, R., ''Discrete Mathematical Structures with Applications to Computer Science" Tata McGraw Hill

Paper Code: BCA103	**Paper: Programming Using 'C' Language**	**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	Develop programming skills by learning the fundamentals of structured programming using C Language.
CO2	Design and develop programs using arrays, storage classes, functions and to understand memory management through pointers
CO3	Critically analyze real world problems using structures, unions and develop applications for handling text and binary files.
CO4	Explore the use of command line arguments, string manipulation and standard libraries.

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	–	–	–	–	–	–	2
CO3	2	–	3	3	2	–	–	2	–	–	1	2
CO4	2	–	2	2	2	–	–	–	–	–	–	2

UNIT – I

No. of Hours: 15 Chapter/Book Reference: TB1 [1,2,3,4,5,6,7]; TB2 [1,2,3,4,5,6,7]; TB3 [1,2,3,4,5,6]

C basics: C character set, Identifiers and keywords, Data types, constants, symbolic constants, variable declarations, structure of basic C program, writing and executing the first C program, #include Preprocessor directive, expression statements, compound statements, operators: Arithmetic, Unary, Relational, logical, assignment, shorthand assignment, conditional and bitwise, comma operator.

C control structures: if statement, if….else statement, else if ladder, while, do….while, for, and switch statement, nested control structure, break, labelled break, continue, labelled continue statement, exit statement, goto statement.

UNIT II

No. of Hours: 135 Chapter/Book Reference: TB1 [8,9,10,13,14]; TB2 [8,9,10,12]; TB3 [7,8, 9,10,11,12]
C Functions: Functions: declaration, definition & scope, recursion, call by value, call by reference. Preprocessor directive: #define, macros with arguments, nested macros, # and ## operators, conditional compilation.
Storage Classes: automatic, external (global), static & registers. Arrays: Arrays (1D, 2D), strings, pointers, array & pointer relationship, pointer arithmetic, dynamic memory allocation, pointer to arrays, array of pointers, pointers to functions, array of pointers to functions.

UNIT – III

No. of Hours: 15 Chapter/Book Reference: TB1 [17,19,20,21]; TB2 [11,13,14]; TB3 [13,14,16]
Structures: Structures, unions, Enumeration, passing structure to functions, arrays and structures, typed of, difference between structure and union, self-referential structure, bit fields.
File handling [text (ASCII), binary]: file input output operations, file access modes, file pointers, file Positioning functions (fseek, ftell, rewind etc.)

UNIT – IV

No. of Hours: 15 Chapter/Book Reference: TB1 [15,22]; TB2 [9]; TB3 [8]

Standard library functions from stdio.h, stdlib.h, conio.h, ctype.h, math.h, string.h, process.h., Usage of command line arguments. C99 extensions.

TEXT BOOKS:

TB1. Yashwant Kanetkar, ‘‘Let us C” 17th edition, 2020.
TB2. E. Bala Guruswamy, ‘‘Programming in ANSI C”, 8th edition, 2019.
TB3. Ashok N. Kamthane, ‘‘Programming in C”, Pearson Education, 3rd Edition, 2015

REFERENCE BOOKS:

RB1. K R Venugopal, Sudeep R Prasad, "Mastering C", McGraw Hill Education; 2nd edition, 2017
RB2. V Rajaraman , ‘‘Computer Programming in C”, 2nd Edition, 2019
RB3. Kernighan and d. Ritchie, ‘‘The ANSI C Programming Language”, 2015
RB4. Stephen Prata, ‘‘C Primer Plus” 6th Edition, 2014
RB5. Schaum’s Outline Series, ‘‘Programming with C”, 4th Edition, 2018
RB6. Reema Thareja, Programming In C" , Oxford University Press, September 2018

Paper Code: BCA 105	**Paper: Fundamentals of Computers and IT**	**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	Describe computer with its characteristics, its usage, limitations and benefits, Computer Memories and its type, Software and its type
CO2	Acquire knowledge about Number Systems, various computer languages and operating system DOS
CO3	Attain skills in Application Software used for word processing, spreadsheet and presentation
CO4	Understand network fundamentals and various communication network, Advance trends in IT

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	–	–	–	–	–	–	–	–	–	–	1
CO2	3	–	2	–	–	–	–	–	–	–	–	1
CO3	2	2	2	2	2	–	–	–	2	–	1	1
CO4	2	–	–	–	–	2	3	–	–	2	–	2

UNIT – I

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters:1,2,7,8,9], TB2: [Chapters:1,2,3,4];RB1[Chapters:6,7], RB3[Chapters:1a,1b,2a,2b,4a,5a],

Fundamentals of Computers:

Definition and Characteristics of Computer System. Computer Generation from First Generation to Fifth Generation. Classifications of Computers: Micro, Mini, Mainframe and super computers.

Computer Hardware: Major Components of a digital computer, Block Diagram of a computer, Input-output devices, Description of Computer Input Units, Output Units, CPU.

Computer Memory: Memory Hierarchy, Primary Memory – RAM and its types, ROM and its types, Secondary Memory, Cache memory. Secondary Storage Devices - Hard Disk, Compact Disk, DVD, Flash memory.

UNIT – II

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters: 10,12,14]; TB2 [Chapters:6,7]; RB1[Chapters:6A, 6B, 12A,12B], RB3 [Chapters: 8, 9]

Interaction with Computers:

Computer Software: System software: Assemblers, Compilers, Interpreters, linkers, loaders. Application Software: Introduction to MS Office (MS-Word, MS Power point, MS-Excel).

Operating Systems: Elementary Operating System concepts, Different types of Operating Systems. **DOS:** Booting sequence; Concepts of File and Directory, Types of DOS commands.

Computer Languages: Introduction to Low-Level Languages and High-Level Languages.

UNIT – III

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters:3,5,4]; TB2 [Chapters:5]; RB1[Chapter:2]

Computer Number System: Positional and Non-positional number systems, Binary, Decimal, Octal and Hexadecimal Number Systems and their inter-conversion.

Binary Arithmetic: Addition, subtraction, multiplication and division. Use of complement method to represent negative binary numbers, 1's complement, 2's complement, subtraction using 1's complement and 2's complement. Introduction to Binary Coded Decimal (BCD), ASCII Codes, EBCDIC codes.

UNIT – IV

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters:17,18]; TB2 [Chapters:9,10]; RB3[7A,7B,8A,8B]

Computer Network & Internet: Basic elements of a communication system, Data transmission modes, Data Transmission speed, Data transmission media, Digital and Analog Transmission, Network topologies, Network Types (LAN, WAN and MAN), Basics of Internet and Intranet.

Internet: Terminologies related to Internet: Protocol, Domain name, Internet Connections, IP address, URL, World Wide Web. Introduction to Client-Server Model, Search Engine, Voice over Internet Protocol (VOIP), Repeater, Bridge, Hub, Switch, Router, Gateway, Firewall, Bluetooth technology.

Advanced Trends in IT Applications – Brief Introduction to Cloud Computing, Internet of Things, Data Analytics, AI and Machine Learning.

TEXT BOOKS:

TB1. P. K. Sinha & Priti Sinha, ''Computer Fundamentals", BPB Publications, 1992.

TB2. Anita Goel ''Computer Fundamentals", Pearson.

REFERENCE BOOKS:

RB1. B.Ram Computer fundamentals Architecture and Organization, New Age Intl.

RB2. Alex Leon & Mathews Leon, ''Introduction to Computers", Vikas Publishing.

RB3. Norton Peter, ''Introduction to computers", 4th Ed., TMH, 2001.

RB4. Vikas Gupta, ''Comdex Computer Kit", Wiley Dreamtech, Delhi, 2004.

Paper Code: BCA 107	Paper: Web Technologies	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	Develop static web pages through HTML, JavaScript, CSS and Bootstrap.
CO2	Implement different constructs and programming techniques provided by JavaScript.
CO3	Adapt HTML, Javascript, CSS and Bootstrap syntax and semantics to build web pages.
CO4	Develop Client-Side Scripts using JavaScript to display the contents dynamically

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

CO/PO	*PO01*	*P O 0 2*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	2	–	2	2	3	–	–	–	–	–	–	2
CO2	2	–	3	2	2	–	–	–	–	–	–	2
CO3	2	–	3	2	3	–	–	–	–	–	–	2
CO4	2	–	3	3	3	–	–	–	–	–	–	2

UNIT – I

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters: 1-3]; TB2 [Chapters: 2]; TB3 [Chapters: 1-4]

World Wide Web: Introduction, Web page, Home page, Web site, Static and Dynamic website, Client Server computing concepts. Web Client and Web Server, Web Browser, Client Side and server side Scripting Languages. **HTML Overview**: Introduction to HTML, HTML Document structure tags, HTML comments, Text formatting, inserting special characters, anchor tag, adding images and Sound, lists types of lists, tables, frames and floating frames, Developing Forms, Image maps.

UNIT – II

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters: 4-5]; TB2 [Chapters: 3-5]; TB3 [Chapters: 5-12]; TB4 [Chapters 1-3]

Cascading Style Sheet: Types of Style Sheets – Internal, inline and External style sheets, creating styles, link tag, CSS Properties, CSS Styling, Style Selector- Id, class name and Pseudo Class.
BootStrap Basics: Introduction to Bootstrap, Responsive web design, Linking with Bootstrap, container class, grids, tables, images, buttons, typography classes, jumbotron, glyphicons,

UNIT – III

No. of Hours:11 Chapter/Book Reference: TB1 [Chapters: 4-5]; TB2 [Chapters: 3-5]; TB3 [Chapters: 5-12]

Introduction to Java Script: Data Types, Control Statements, operators, dialog boxes, Built in and User Defined Functions, Objects in Java Script, Handling Events, basic validations, Document Object Model, Browser Object Model.

UNIT – IV

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters]; TB2 [Chapter: 7, 9]; TB3 [Chapter: 1]

XML: Introduction, Features, XML Naming rules, Building block of XML Document, Difference between HTML & XML, XML Parser, DTDʾs Using XML with HTML and CSS.
Web Hosting Concepts: Concept of domain- Physical domain, virtual domain, registering a domain, need of IP addressing, Web Hosting and Publishing Concepts

TEXT BOOKS:

TB1. The complete reference HTML and CSS, by Thomas A powell, TMH publication.
TB2. Jeffrey C. Jackson, ‘‘Web Technologies: A Computer Science Perspective”, Pearson
TB3. Internet and World Wide Web Deitel HM, Deitel ,Goldberg , Third Edition.
TB4. Bootstrap: Responsive Web development, Jake Spurlock, Oʾreilly, First Edition

REFERENCE BOOKS:

RB1. HTML Black Book , Stephen Holzner, Wiley Dreamtech.
RB2. Rajkamal, ‘‘Web Technology”, Tata McGraw-Hill, 2001.
RB3. Jeffrey C. Jackson, ‘‘Web Technologies : A Computer Science Perspective”, Pearson.
RB4. XML How to Program by Deitel Deitel Nieto.

Paper Code: BCA 109	Paper: Technical Communication	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	The student will become familiar with the basics of communication and its importance in the organizational world.
CO2	To improve the business writing skills also will become well aware how to write effective resume to enter the global world.
CO3	To improve the listening skills by knowing well how to negotiate and give effective presentations.
CO4	To make use of effective business language and give a professional look to oneself.

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
CO2	–	2	–	–	–	–	–	–	–	3	–	2
CO3	–	1	–	–	–	–	–	–	–	3	–	1
CO4	–	–	–	–	–	–	–	–	–	3	–	2

UNIT – I

No. of Hours: 11 Chapter/Book Reference: TB1, TB2, TB3, TB4

Concepts and Fundamentals: Introduction to Technical Communication, Need and importance of communication, channel, Distinction between general and technical communication, nature and features of technical communication, Seven Cs of communication, Types of Technical communication, style in technical communication, technical communication skills, Language as a tool of Communication, History of development of Technical Communication, Computer Aided Technical Communication

UNIT-II

No. of Hours: 11 Chapter/Book Reference: TB1, TB2, TB3

Oral Communication: Principles of effective oral communication, Introduction of Self and others, Greetings, Handling Telephone Calls Interviews: Meaning & Purpose, Art of interviewing, Types of interview, Interview

styles, Essential, Techniques of interviewing, Guidelines for Interviewer, Guidelines for interviewee. Meetings**:** Definition, Kind of meetings, Agenda, Minutes of the Meeting, Advantages and disadvantages of meetings/ committees, Planning and organization of meetings. Project Presentations: Advantages & Disadvantages, Executive Summary, Charts, Distribution of time (presentation, questions & answers, summing up), Visual presentation, Guidelines for using visual aids, Electronic media (power-point presentation). The technique of conducting Group Discussion and JAM session.

UNIT-III

No. of Hours: 11 Chapter/Book Reference: TB1, TB2, TB3, TB4

Written Communication: Overview of Technical Writing: Definition and Nature of Technical Writing, Basic Principles of Technical Writing, Styles in Technical Writing,
Note – Making, Notice, E-mail Writing
Writing Letters: Business letters, Persuasive letters- Sales letters and complaint letters
Office memorandum, Good news and bad news letters
Report Writing**:** Definition & importance; categories of reports, Elements of a formal report, style and formatting in report
Special Technical Documents Writing: Project synopsis and report writing, Scientific Article and Research Paper writing, Dissertation writing: Features, Preparation and Elements
Proposal Writing: Purpose, Types, characteristics and structure
Job Application**:** Types of application, Form & Content of an application, drafting the application, Preparation of resume.

UNIT-IV

No. of Hours: 11 Chapter/Book Reference: TB3, RB1, RB3

Soft Skills: Business Etiquettes – Professional Personality, Workplace Protocols, Cubicle.
Non-Verbal Communication: Kinesics and Proxemics, Paralanguage
Interpersonal Skills
Language Skills: Improving command in English, improving vocabulary, choice of words, Common problems with verbs, adjectives, adverbs, pronouns, tenses, conjunctions, punctuations, prefix, suffix, idiomatic use of prepositions. Sentences and paragraph construction, improve spellings, common errors and misappropriation, Building advanced Vocabulary (Synonyms, Antonyms), introduction to Business English.

TEXTBOOKS:

TB1. Kavita Tyagi and Padma Misra , "Advanced Technical Communication", PHI, 2011
TB2. P.D.Chaturvedi and Mukesh Chaturvedi, ''Business Communication – Concepts, Cases and Applications", Pearson, second edition.
TB3. Rayudu, ''C.S- Communication", Himalaya Publishing House, 1994.
TB4. Asha Kaul , "Business Communication", PHI, second edition.

REFERENCES:

RB1. Raymond Murphy, ''Essential English Grammar- A self study reference and practice book for elementary students of English" , Cambridge University Press, second edition.
RB2. Manalo, E. & Fermin, V. (2007). Technical and Report Writing. ECC Graphics. Quezon City.
RB3. Kavita Tyagi and Padma Misra , "Basic Technical Communication", PHI, 2011.
RB4. Herta A Murphy, Herbert W Hildebrandt and Jane P Thomas, ''Effective Business Communication", McGraw Hill, seventh edition.

Paper Code:BCA 111	**Paper: Human Values and Ethics**	**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	To develop value-based understanding of self, relationships, and society.
CO2	To introduce ethical concepts and decision-making for responsible human
CO3	To instil professional ethics and responsibilities essential for ethical engineering practice.
CO4	To foster ethical awareness in global, social, and environmental contexts for responsible citizenship.

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	3	2
CO2	–	–	–	–	–	–	–	3	–	2	3	2
CO3	–	–	–	1	–	–	–	3	2	2	2	2
CO4	–	–	–	–	–	–	2	2	–	2	3	2

Unit I

Introduction to Value Education, What are Values?, Importance of Values in life, Distinction between Human Values and Skills, Value Spectrum, Types of Values (Universal Values, Personal Values, Social Values, Moral Values, Spiritual Values), Sources of Values (Family, Society, Culture, Education), Self-exploration as a process for Value Education, Harmony in the Individual (Understanding the self, Body and Self, Needs of Self and Body, Realization of Co-existence), Harmony in Family (Relationships, Trust, Respect, Care, Affection, Guidance, Reverence, Glory), Harmony in Society (Justice, Social Order, Role of Society in Value Inculcation).

Unit II

Introduction to Ethics, Definition of Ethics, Distinction between Ethics and Morality, Importance of Ethics in human conduct, Ethical Relativism vs. Universal Ethics, Sources of Ethical Principles (Law, Religion, Philosophy, Conscience, Culture), Ethical Theories (brief introduction to Utilitarianism, Deontology/Duty-based ethics, Virtue Ethics), Ethical Decision-Making Process (Identifying the ethical problem, Gathering information, Evaluating alternatives, Making a decision, Reflecting on the outcome), Conscience and its role in ethical judgment.

Unit III

Concept of Profession and Professional Ethics, Ethics in the Engineering Profession, Importance of Professional Ethics for Engineers, Codes of Ethics (overview of general principles), Core Values of Professional Ethics (Integrity, Honesty, Objectivity, Impartiality, Confidentiality, Diligence, Fairness), Professional Responsibility, Accountability, Conflict of Interest, Gifts and Kickbacks, Whistleblowing (meaning, importance, ethical considerations), Data Privacy and Confidentiality (general awareness), Social and Environmental Responsibility of Professionals.

Unit IV

Ethics in a Globalized World, Cross-Cultural Ethical Understanding, Challenges of Cultural Relativism, Social Justice and Equity, Human Rights (Universal Declaration of Human Rights - overview), Environmental Ethics (brief overview, moral responsibility towards nature), Sustainable Development Goals (SDGs) as a framework for ethical action, Ethical Leadership, Ethics in Governance, Role of Values and Ethics in Nation Building, Concept of a "Value-based Society", Individual's role in promoting ethical behavior and contributing to a harmonious society.

Textbooks:

1. A Foundation Course in Human Values and Professional Ethics, R.R. Gaur, R. Sangal, G.P. Bagaria, Excel Books, 2nd edition, 2010.

References:

1. *An Introduction to Ethics, William Lillie, Allied Publishers, reprint edition, 2008.*
2. *Ethics in Engineering, Mike W. Martin and Roland Schinzinger, McGraw-Hill Education, 4th edition, 2005.*
3. *Practical Ethics, Peter Singer, Cambridge University Press, 3rd edition, 2011.*
4. *Business Ethics: Concepts and Cases, Manuel G. Velasquez, Pearson, 8th edition, 2017.*

Paper Code(s): BCA-171	**P : 4**
Paper: Programming Using 'C' Language 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-103 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 minimum 8 out of 10 practical)	
	Write a program to convert temperature from Celsius to Fahrenheit by taking input from the user.
	Write a program to find the greatest number among 3 numbers given by the user.
	Write a program to check if a given number is a prime number or not.
	Write a program to display the following pattern upto N rows, taking the value of N from the user: 1 2 3 4 5 6
	Write a program to input marks of 50 students using an array and display the average marks of the class.
	Write a program to search for a number entered by the user in a given array and display the array in ascending order.
7.	Write a program to check if a string is palindrome or not.
8.	Write a program to add, subtract, multiply and divide two numbers using pointers.
9.	Write a program to create a structure for employees containing the following data members: Employee ID, Employee Name, Age, Address, Department and Salary. Input data for 10 employees and display the details of the employee from the employee ID given by the user.
10.	Write a program to create two files with names EvenFile and OddFile. Input 20 numbers from the user and save even numbers in EvenFile and odd numbers in OddFile.
Application Based Practicals (Implement minimum 5 out of 10 practical)	
11.	Write a menu driven program to construct a calculator for following arithmetic operations: addition, subtraction, multiplication, division, average and percentage.
12.	Write a menu driven program to perform the following operations: (i) Print armstrong numbers upto N, (ii) Display prime numbers between 1 to N, (iii) Reverse of an integer

13.	Write a program to convert a hexadecimal number into a binary number.
14.	Write a program to calculate factorial of a number and display fibonacci series upto N terms using recursive functions.
15.	Write a program to perform matrix addition, (ii) matrix multiplication, and (iii) Matrix transpose) on 2D arrays.
16.	Write a program to make use of arrays with structures in the following ways: (i) Use array as a structure data member (ii) Create array of structure variables
17.	Write a program to compare the contents of two files by taking names of the files through command line arguments.
18.	WAP to perform I/O and make use of file positioning functions on Binary files. (using fseek, ftell, rewind functions)
19.	Write a menu driven program to implement the following string operations: (i) Calculate length of a string (ii) Concatenate at the end of a given (iii) Copy one string to another (iv) Compare contents of two strings (v) Copy nth character string to another
20.	Write a program to read time in string format and extract hours, minutes and second also check time validity

Note:

1. **In total 15 practical to be implemented. 2 additional practical may be given by the course instructor.**
2. **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-173	**P : 3**
Paper: Fundamentals of Computers & IT Lab	**C : 1**
Prerequisites: None	
Marking Scheme: 1. Teachers Continuous Evaluation: 40 marks 2. Term-End Semester Examinations: 60 Marks	
Instructions: 2. The course objectives and course outcomes are identical to that of BCA 105 as this is the practical component of the corresponding theory paper. 3. 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 minimum 10 out of 15 practical)	
	To explore the System settings - Personalisation, System, Devices, Apps, Network & Internet.
	To practice basic DOS commands like cd, md, dir, erase, cls, copy, date etc.
	To explore Windows Explorer functionalities like create, rename, move, delete folder and files etc.
	To practice the use of basic formatting features - Format Painter, Indentation, Line spacing, background color, find, replace, dictate commands.
	To practice the use of Bullets, numbering, multilevel lists and use of Table Feature- Insert table with rows and columns, draw tables, excel spreadsheet and quick tables etc.
	To practice the use of Insert Features – add picture, Chart, SmartArt, WordArt, Equation, Symbols, Header and Footer, Page Numbering etc. and the use of Design Features – Watermark, Page color, Page Border, Themes implementation etc.
	To practice the use of Layout Features – Margins, Orientation, Size, Columns, Indent, Spacing etc.
	To practice the use of Mail Merge Feature to generate Envelops and Labels.
	To practice the use of Excel basic formatting features – Wrap Text, Insert and Delete (Cells, Sheet, Row or Column), Format – Cell Height, Cell Width, Hide, Un Hide Cell, Protection, Freeze and Unfreeze panes, Macros etc.
	To practice the use of Insert Features- Pivot Table, Pivot Chart, Picture, Chart and its formatting and Design and the use of Page Layout Features- Margins, Orientation, Page Break , Background, Height and Width of Cells.
	To practice the use of Formula Features – user defined function, predefined functions – Logical, Date, Time, Maths and the use of Data Manipulation Features – Sort, Filter, Advanced Filters, Whatif analysis.
	To practice the creation of Blank presentation and Selecting Themes and the use of the basic design features – Adding New Slides, Reuse slides, Slides layout etc.

	To practice the use of Insert Features – add pictures, screenshots, shapes, wordart, audio, video, date-time etc. and use of Design Features- Changing the theme of presentation, format background and design ideas.
	To practice the use of Transition features to be applied on Slides content, setting sound, duration etc. and the use of Animation Features to be applied on presentation of Slide, set animation timings and rehearse etc.
	To practice the use of Slide Show Features – Custom Slide Show, Rehearse Timing etc.
Application Based Practicals (Implement minimum 5 out of 8 practical)	
	Create a Folder by your name in your system, store all the work done in this semester inside that folder.
	Create your Resume using basic formatting features like : table, bullets, wordart etc
	Design an Invitation to Birthday Party using mail merge features send the invitation to 10 friends.
	Write an Article for Magazine with 3 columns and hyperlink.
	Create your own marksheet using basic formatting features.
	Create a list of marks of 10 students create charts and pivot table.
	Prepare a Sales summary and use features like sort, filter etc. to manipulate the data.
	Create a Power Point Presentation on any topic of your choice using animation and transition features.
Note: **1. In total 15 practical to be implemented. 2 additional practical may be given by the course instructor.** **2. 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-175	**P : 3**
Paper: Web Technologies 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 105 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	
	Make following five different web pages: i. Formatting Styles and Headings: Include Bold, italics, Underline, Strike, Subscript, superscript and all six type of headings ii. Font Styles and Image tag iii. Marquee: Move text, image and hyperlink iv. Other tags: br, hr, pre, p Include following specifications: ● In all these web pages only mention about use, attributes apply them. ● Insert a background image on home page ● Make all the topics as hyperlinks and go to some other page for description ● Insert a marquee showing HTML Tutorial as moving text. ● Use different font style for different topics ● On every page, make a hyperlink for going back to home page and internal link also.
	Create an unordered list nested inside ordered list and apply the following : ● Insert an image of Main item on top right corner of web page. ● Display heading as a marquee. ● Use different font styles and colors for different ordered list items. ● Insert horizontal line after each ordered item.
	Design a table with row span and column span and make use of attributes colspan, rowspan, width, height, cellpadding, cellspacing etc.
	Design following frame: MAIN MENU Topic 1 Topic 2 Topic 3 Explanation - View Example _____ Example
	Make an image map showing the usage of shape, coords, href attributes in map definition. Link each hotspot to their respective details. All the web pages should be designed with proper background color, images, font styles and headings.

	Design Student registration form for admission in college.
	Create a webpage and show the usage of inline and internal style sheet and external style sheet?
	Create a webpage containing a background image and apply all the background styling attributes?
	Create a web page showing the usage of font styling attributes
	Create a web page and apply all Text styling attributes use Id and class selector.
	Create a webpage and implement all list styling attributes.
	Create a Webpage with three equal columns.
	Create a webpage containing bootstrap table.
	Create a webpage containing various types of images.
	Create a webpage containing various types of buttons
	Create a webpage containing various, typography classes.
	Create a webpage containing to display the heading using. Jumbotron.
	Write a program to show the usage of inbuilt functions and dialog boxes.
	Write a program to show the usage of alert box and confirm box
	Write a program to implement event handling using onclick, onmouseover and onmouseout events.
	Write a program to show the usage of all the date, math and string object functions
	WAP to display the bookstore details in XML with CSS and internal DTD.
	WAP to format the Teacher details in XML with CSS using external DTD
Application Based Practical	
	Design the registration form for a web site and when the user clicks on submit button the login form should be appeared on the screen (use external javascript file).
	Design a website and apply all the features of HTML, css, javascript and bootstrap to make the website attractive.
	Write a JavaScript function that creates a table, accept row, column numbers from the user, and input row-column number as content (e.g. Row-0 Column-0) of a cell.
	Zebra-striped Tables: Setting different background colors for alternate rows is a popular technique to improve the readability of tables that has large amount of data. This is commonly known as zebra-striping a table. Make use of pseudo classes to create zebra stripped Table.
	Create a Questionnaire related to any topic of your choice by using Form Elements.
Note: **1. In total 15 practicals 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: BCA 181	**Paper: Bridge Course in Mathematics**	**L**	**T/P**	**C**
		4	**-**	**0**

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 matrices
CO2	Understand and apply the concepts of determinants
CO3	Understand the concept of calculus such as limit, continuity and differentiability.
CO4	Appraise and determine the correct logic and solutions for any given real world problem using application of integration& integral calculus.

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

CO/PO	***PO01***	***P O 0 2***	***PO03***	***PO04***	***PO05***	***PO06***	***PO07***	***PO08***	***PO09***	***PO10***	***PO11***	***PO12***
CO1	3	–	2	–	–	–	–	–	–	–	–	2
CO2	3	–	2	–	–	–	–	–	–	–	–	2
CO3	3	–	2	–	–	–	–	–	–	–	–	2
CO4	2	–	2	3	–	–	–	2	–	–	1	2

UNIT-I

No. of Hrs. 14

Real and complex numbers, algebraic expressions and identities, linear equations in two and three variables, quadratic equations and their roots, basic trigonometric ratios and identities, compound and double angles, heights and distances, Cartesian coordinate geometry, distance and section formulas, equation of a straight line, slope and intercept form, angle between lines, basic properties of parabola, ellipse, and hyperbola.

UNIT-II

No. of Hrs. 14

Functions and their types, domain and range, limits and continuity, derivatives and standard rules of differentiation, applications of derivatives in rates, tangents, normals, maxima and minima, indefinite integrals and standard formulas, definite integrals and interpretation as area, applications to motion, area under curves, and engineering problems.

UNIT-III

No. of Hrs. 14

Scalars and vectors, vector representation in 2D and 3D, vector addition and scalar multiplication, unit vector and direction cosines, dot product and its applications, cross product and its applications, equations of lines and planes in space, angle between lines and planes, gradient, divergence, and curl (introductory level), physical applications in mechanics and fields.

UNIT-IV

No. of Hrs. 14

Matrix types and operations, transpose and scalar multiplication, determinants of order 2 and 3, properties and evaluation of determinants, inverse of a matrix using adjoint method, solving systems of linear equations using matrices. introduction to data types and frequency distributions, mean, median, mode, variance, standard deviation, basic probability, permutations and combinations, applications in reliability and quality control.

TEXT BOOKS:

TB1. Mathur A B, Jaggi V P ‘‘A Textbook of Engineering Mathematics” Khanna Publishers, 3rd edition, 2000

TB2. Dass H K ‘‘Applied Mathematics for polytechnics” CBS publishers, 10th edition, 2010

TB3. Singh J P ‘‘Calculus” ANE Books, 2nd edition 2012

REFERENCE BOOKS:

RB1. Kresyig E., ‘‘Advanced Engineering Mathematics”, 5th Edition, John Wiley & Sons, 1999

RB2. H.K. Dass, ‘‘Advanced Engineering Mathematics”, S. Chand & Company, Latest Edition.

RB3. Grewal B S, ‘‘Elementary Engineering Mathematics”, 34th Edition. 1998.

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 112	**Paper: Front End Design Tool VB.Net Lab**	**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	Design Console application using basic programming concepts.
CO2	Design Windows application using control.
CO3	Understand and use of different Data Structures, Exception Handling
CO4	Learn basic concepts of OOPS. Design classes and interfaces.

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	–	–	–	–	–	2
CO2	2	–	3	2	3	2	–	–	–	–	1	2
CO3	3	–	3	2	–	–	–	2	–	–	–	2
CO4	3	–	3	2	–	–	–	–	–	–	–	2

SYLLABUS

UNIT I

Introduction to Visual Basic .Net Framework - .Net Architecture, Features of .Net, Advantages of .Net, .Net Framework, CLR, CTS, CLS, Assemblies, Memory management issues – Garbage Collector and collection process.

Introduction to Visual Basic.Net IDE: Creating a project, Types of project in .Net, Exploring and coding a project, Solution explorer, toolbox, properties window, Output window, Object Browser.

Programming Basics: Variable, Data Types, Conditional Constructs, Loop Statements, Creating Console Application.

UNIT II

Introduction to GUI Environment and understand the working of commonly used controls - their properties, methods and events.

UNIT III

Introduction to Data Structures: Array, ArrayList, Structure and Enumeration.

Introduction of Exception handling - structured and unstructured.

UNIT IV

Procedure and function. Introduction to Object Oriented Programming : OOPS Concepts, Creation of Class, Interface and Namespace.

List of Practicals	
S. No.	**Detailed Statement**

Core Practicals (Implement minimum 10 out of 15 practicals)	
	Create console application showing the use of conditional constructs - if, if-else, if-elseif-else, nested if, select case.
	Create console application showing the use of loops –Do While..Loop, Do Until … Loop, While... Wend, For … Next, For Each … Next.
	Create a simple windows application showing the use of TextBox, Button, Label Controls, Radio Button, Check Box, Combo Box and List Box Controls.
	Create a windows application showing the use of Image, Timer, Panel, Scroll bar, Status Bar Controls.
	Create an MDI application showing the use of multiple forms, toolbar, menu, status bar, RichText Box, Dialog Controls.
	Create console/windows application to showing the use of Structured Exception handling-try..end try, catch, finally.
	Create console/windows application to showing the use of Unstructured Exception handling-On Error, Resume Next etc.
	Create console/windows application showing the use of Array class - its methods and properties.
	Create console/windows application showing the use of Array List - its methods and properties.
	Create console/windows application showing the use of Enumeration, Constants and Structures.
	Create console/windows application showing the declaration and use of user defined functions.
	Create console/windows application showing the use of different argument passing mechanism – ByVal, ByRef, Optional and Paramarray.
	Create console/windows application showing the declaration and use of Class with Data members, Function Member, Constructor Member, Destructor Member, Event Member, Property Member, Shared Member, Type Member.
	Create console/windows application showing the implementation of Inheritance.
	Create console/windows application showing the use of Polymorphism.
Application Based Practicals (Implement minimum 5 out of 10 practicals)	
	Write a Program to find diameter, circumference and area of circle using procedure.
	Write a Program to find maximum between three numbers using select case and if--else.
	Create Basic calculator with all the functionalities.
	Create a basic Digital or Analog Clock using Timer, Image, Button, ComboBox and other relevant controls.
	Write a Program to find second largest element and second smallest element in an array.
	Write a program to create an arraylist of 10 elements. Create a procedure to add new element at the specific location in the arraylist and display the updated arraylist.

	Write a program to validate the username and password entered by user and create userdefined exception to prompt message on three consecutive wrong password entries.
	Create a Class Box with following private data members length, breadth, height and function getVolume, and public member functions input and output. Create an object of class and call appropriate functions.
	Create a class Rectangle, with protected members width and height, public procedure setWidth and setHeight, getArea. Inherit it in another Class ShrinkRectangle with a data member shrink factor. Create object of the class and call appropriate member functions. Create appropriate class to demonstrate overloading of function 'area' for finding area of a circle, square, rectangle and a triangle.
	Create a class Book with data members: BookId, BookName, Cost, Pages. Member property to add data to all its data members, function to find cost per page. Create five objects of 5 books and find total cost.

Note:

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

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

<table>
<tr><th>S . No.</th><th>Detailed Statement</th></tr>
<tr><td>1.</td><td>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”</td></tr>
<tr><td>2.</td><td>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</td></tr>
</table>

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:BCA 116	**Paper: Design Laboratory using Photoshop**	**L**	**T/P**	**C**
			2	**1**

Marking Scheme:

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

Instruction for paper setter:

1. This is a practical paper

Course Outcomes (CO):

CO1	Explain the basics of graphics designing & Adobe suite
CO2	Exploring the Raster designing tools in Adobe Photoshop.
CO3	Exploring the Vector designing tools in Adobe Photoshop.
CO4	Exploring the image filters & adjustments in Adobe Photoshop.

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	–	2	–	2	–	–	–	–	–	1	1
CO2	–	–	2	2	3	–	–	–	–	–	1	1
CO3	–	–	2	2	3	–	–	–	–	–	1	1
CO4	–	–	2	2	3	–	–	–	–	–	1	1

UNIT – I

Introduction to graphic designing, Input/Output Technologies, Color Coding: RGB, CMYK, Grayscale, Bitmap, Color Channel, Resolution, Printing Templates, Raster Images, Vector Images, Measurement Units & Conversion, Introduction to Adobe suite & Photoshop.

UNIT – II

Introduction to Layers, Groups & Smart Objects, Color Picker, Selection Tools & Marquee Tool, Crop Tool, Brush Tool, Clone & Patch Tools, Eraser Tools, Coloring Tools, Text Tools, Hand & Zoom Tools, Background & Foreground Colors, Image Mask, Alignment Controls, Transform Controls, Importing Images in Photoshop.

UNIT – III

Introduction to Shapes & Shape Tools, Path & Direct Selection Tools, Pen Tool, Image Editing Tools, Layers Style, Filters, Blend Modes, Image Adjustment Options, Window Menu Options, Layer Mask.

UNIT – IV

Introduction to Photoshop Filter: Blur, Distort, Noise, Render, Sharpen, Stylize, Exporting Images & PDF, Introduction to GIF & Timeline Window, Importing/Exporting CorelDraw Files from Photoshop.

TEXT BOOKS:

TB1. Faulkner Andrew (Author), Chavez Conrad (Author), ‘‘Adobe Photoshop CC Classroom in a Book” Adobe Press.

TB2. DT Editorial Services, ‘‘Photoshop CC in Simple Steps” Dream Tech. Press.

REFERENCE BOOKS:

RB1. Lisa DaNae Dayley, Brad Dayley, "Photoshop Bible", John Wiley & Sons, Inc.

RB2. Glyn Dewis, "The Photoshop Workbook: Professional Retouching and Compositing Tips, Tricks, and Techniques", Peachpit Press.

RB3. Peter Bauer, ''Adobe Photoshop CC For Dummies", John Wiley & Sons, Inc.

List of Practicals	
S. No.	**Detailed Statement**
Core Practicals (Implement minimum 8 out of 10 practicals)	
	Create a file to demonstrate the use of layers, groups & smart objects.
	Create a photo frame in Photoshop.
	Take an image of basic shape (square, triangle, circle, rectangle and parallelogram) in Photoshop & extract these shapes from the image to different layers using marquee tools.
	Create a custom brush preset in Photoshop.
	Create a custom pattern preset in Photoshop.
	Create a visiting card for yourself in Photoshop. (size=3.5 x 2 inch., color coding: CMYK)
	Create a file having two images (rename the layer as foreground & background image) in two different layers. Blur the background image & place the foreground image over the background image in a way both layers are visible.
	Create a border design using a brush tool.
	Create basic shapes (square, triangle, circle, rectangle and parallelogram) in Photoshop on a single layer using the shape tools.
	Create a simple GIF in Photoshop.
Application Based Practicals (Implement minimum 5 out of 10 practicals)	
	Create a digital invitation card in Photoshop and export it in PDF Format. Use the Photograph (Practical 7) or GIF (Practical 10) and border (Practical 8) along with other features of Photoshop as per your requirements. (size=A8 or A4, color coding: RGB)
	Create a custom Desktop background in Photoshop.
	Create a water drop and heart shape in Photoshop using the shapes tools or Pen Tool.
	Create a “Save Water” Poster from the shapes created in Practical 13. (size=A8 or A4, color coding: CMYK)
	Perform Digital Makeup on the Photograph of some celebrity in Photoshop.
	Create a cartoon character in Photoshop using the Shape and Pen Tools.
	Create a chocolate bar with the brand name in Photoshop. The individual cube of the chocolate must have a 3D Visual Effect.
	Create your company logo in Photoshop.
	Create a magazine Cover in Photoshop.
	Create a Thanks Giving card & export it in Pdf (size=A8 or A4, color coding: RGB)
Note: **1. In total 15 practicals 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-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)	
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

15	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. (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.

2nd Year Onward Scheme and implementation guideline for Core Branches (Major / Primary Disciplines), namely:

1. Bachelor of Computer Applications

Note: The scheme and Syllabi for 2nd to 4th years shall be notified subsequently

Regulation for Implementation for Bachelor of Computer Applications Programme of Study

A. Guidelines for Electives

Electives are papers/courses that the student is allowed to choose from a specified list of papers. The electives shall be offered in two sections, namely:

1. The program core elective section
2. The emerging area elective section

For the programme core electives, a subset of the electives in the list of electives shall be chosen by the Academic Programme Committee (APC) of the institution to be offered to students depending on the availability of faculty and other academic resources and only from this subset an elective shall be allowed to be studied by a group of students if and only if at least one third of the discipline intake of that particular admission year desire to study a particular paper / course.

From the emerging area elective section, the student has to study a set/group of 5 papers (in the regular route for the award of the degree). Some of the papers of the elective groups may be combined into minor specializations groups and shall be enumerated in this document. No minor specialization outside the list specified shall be allowed. A subset of the electives in the list of electives shall be chosen by the Academic Programme Committee (APC) of the institution to be offered to students depending on the availability of faculty and other academic resources and only from this subset an elective shall be allowed to be studied by a group of students if and only if at least one third of the discipline intake of that particular admission year desire to study a particular paper / course.

The elective papers shall be allowed to be taken / studied by the students, by the APC of the institution, keeping in view that two papers studied by the student should not have a substantial overlap. All papers studied by the student should be substantially distinct in content.

B. Credits per Academic Year

The credits offered to a student in a particular academic year of study shall be between 40 to 48 credits.

C. Provision of Bridge Course of Students

Students without mathematics at the 10+2 levels are eligible for admission to the programme. Such students shall study the papers / courses a non-credit course on mathematics as an additional course / paper for the award of the degree. Namely:

Paper Code	Paper Name	L/P
BCA-181	Bridge Course in Mathematics	4

Implementation Rules for Bridge Courses:

1. The classes for the above bridge courses in the 1st Semester shall be conducted alongwith the classes of the other courses.
2. These papers have to be qualified by the students.
3. For these papers examination shall be conducted by the concerned subject teacher as NUES, the same shall be transferred to Examination Division of the University.
4. The degree to be awarded to the student only subject to the acquiring qualifying grade/marks in the bridge courses and the minimum credits in the regular courses of the scheme of study as prescribed.
5. These Courses shall be qualifying in nature; they shall not be included for calculation of CGPA. The qualifying marks shall be 40 marks in each paper.
6. A separate marksheet will be issued by the Examination Division of the University for the Bridge Course.

D. Members of APC

Teachers of other institution, as and when deputed by their departments, for teaching the students enrolled in programmes offered by the a department shall be a part of the Academic Programme Committee of the discipline / programme of study. Such teachers, for all academic matters, including teaching, teachers' continuous evaluation, term end examinations etc. shall be governed by the decisions of the APC of the

disciple / programme of study. Similarly, the guest faculty, the visiting faculty and the contract / Ad Hoc faculty as and when deputed to teach students of a particular discipline / programme of study shall form a part of the APC for that particular discipline / programme of study.

E. Medium of Instructions

The medium of instructions and examinations shall be English.

F. Power to Remove Difficulty

In case of difference of opinion in the interpretation of any statement or clause of this regulation or the scheme and syllabus, the decision of the Dean of the University School of Information, Communication and Technology, shall be final.

Regulation for Award of the Degree of Bachelor of Computer Applications

1. (a) The examinations, attendance criteria to appear in examinations, promotion and award of the degree shall be governed by the Ordinance 11 of the University.

   (b) Pass marks in every paper shall be 40.

   (c) Grading System shall be as per Ordinance 11 of the University.

2. **Minimum duration** of the Bachelor of Computer Applications programme shall be 4 years (N=4 years) (8 semesters) for the students admitted in the 1st year and 1st semester of the degree programme.

3. **Maximum duration** of the Bachelor of Technology part of the Bachelor of Computer Applications programme shall be 7 years (N+3 years). After completion of N+3 years of study, no extension shall be given to the student for completing the requirements of the degree and the admission of the student shall stand cancelled. That is, if the student does not complete the requirements for the award of the degree in this period, the admission of the student shall be cancelled. That is, if a batch of regular students is admitted in the 1st semester / 1st year, in the Academic session 2025-26, then the batch period of study finishes in the Academic Session 2032-33.

4. Three routes for award of the final degree are defined in Clause 7 below.

5. After the 6th semester, and before the commencement of the 7th semester, the student has to choose from one of the following routes for the award of the degree:
   a. Regular Route
   b. Internship Route
   c. Research Route

   Three routes for award of the final degree are defined in Clause 7 below.

6. **Exit After Completion of an Academic Year**:

   A student may exit after completion of any of the year of study. That is, a student may take a break after any year of study, and if he/she satisfies the required conditions as per table below, then the Certificate/ Diploma/Degree to be awarded shall awarded. The student may re-join later with the provision that the maximum time allowed is same as clause 3 above. The interim awards shall be as follows:

On Completion of	Be Awarded	Condition to be Satisfied	Remarks
1st Year	Certificate in Computer Applications	Has earned at least 40 credits in the 1st year and provided they have undergone a minimum skill-enhancement course(s) equivalent to at least 4 credits or 4 weeks of training over and above the 40 credits earned in the first year. The training has to be completed after the completion of the first year examinations. All mandatory papers of the first year have to be passed.*	Shall not be allowed to reappear in any failed paper of 1st year on re-joining% in the second year to complete the requirement for the award of the degree. (Interim Degree)

2nd Year	Undergraduate Diploma in Computer Applications	Has earned at least 80 credits upto and including the 2nd year and provided they have undergone a minimum skill-enhancement course(s) equivalent to at least 4 credits or 4 weeks of training over and above the 80 credits earned upto and including the second year. The training has to be completed after the completion of the second year examinations. All mandatory papers upto and including the	Shall not be allowed to reappear in any failed paper studied till 2nd year on re-joining% in the third year to complete the requirement for the award of the degree. (Interim Degree)
3rd Year	Bachelor of Computer Applications	Has earned at least 120 credits upto and including the 3rd year$	This is a three year degree (Interim Degree). Shall not be allowed to reappear in any failed paper studied till 3rd year on re-joining% in the fourth year to complete the requirement for the award of the final 4-year degree.
4th Year	See Clause 7	Has earned at least 160 credits upto and including the 4th year	(Final Degree)

* The students desirous of taking the exit after 1st or 2nd year, shall apply to the respective institutions before the completion of examinations of 1st semester or 3rd semester, respectively. The students shall specify the specific skill based course(s) / training of at least 4 weeks, that they are desirous of completing for taking the exit route. All such cases shall be put before a sub-committee of the Programme Coordination Committee (PCC) of the programme of study by the institution. The PCC sub-committee meeting in this regard shall be chaired by the convenor of the PCC and all Director / Principal of the concerned institution(s) or their nominee shall be the members of this sub-committee. The student(s) may be asked to appear before this sub-committee. The sub-committee may change the course(s) or the training programme to be completed by the student, as proposed by the student. The sub-committee should ensure that the course(s) opted by the student are relevant skill based course(s) and shall not be (majorly) part of any course taught or to be taught as a part of the complete curricula of the programme of study. The student shall proceed to study the course(s) / training as approved by this committee. The list of such students shall be forwarded by the respective institutions before the commencement of the examinations of the 2nd or the 4th semester as applicable, to the Controller of Examinations of the University, together with the minutes of the sub-committee approval.

Also, if such a student, who is allowed to take the exit route, but does not desire to take it, and wants to continue of the subsequent year of study, such students shall be allowed. However, the course(s) / training, if completed, shall not be taken on record of examinations.

Also, all expenses related to these additional course(s) / training shall be borne by the concerned student. The student must submit the certificate of successful completion of such course(s) / training by 31st July of the academic session after which the exit is desired. The concerned institution shall submit the complete documentation for these cases to the Examinations Division of the University on or before 31st August of the same year.

Also, the credits awarded by the concerned authority from where the student pursues the course(s) / training for completing the requirements of the exit shall not be recorded by the examinations division of the University. Only the fact of successful completion of the course(s) / training shall be recorded by the Examinations Division of the University.

$The student desirous of taking the interim degree (exit) after the 3rd year must apply to the concerned institution before the commencement of examinations of the 6th semester. The concerned institution must forward the list of all such cases to the Controller of Examinations of the University before beginning of classes of the 7th semester.

%The re-joining is to be allowed if and only if sufficient numbers of years of study are still remaining as per clause 3, for completion of the requirement of the award of the final degree (after 4th year of study as per scheme and syllabi specified in this document).

Thus, the **minimum credit** for the award of the final degree is 160. A student must obtain at-least 160 credits for the award of the degree

And, the **maximum credit** for the award of the final degree is 176. A student must appear for all 176 credits.

7. The following final degree route can be taken by a student:

   a. Regular Route

   i. Degree with one minor specializations:

   1. The student acquires at least 160 credits (as per the scheme of examinations for this route).
   2. Has cleared all mandatory papers to be passed.
   3. Has earned 20 credits from the minor specialization group.
   4. The degree nomenclature of the degree shall be as: "**Bachelor of Computer Applications with minor specializations in < Minor Specialization Group Name> (Honours)**";

   ii. **Degree with no minor specialization:**

   1. The student acquires at least 160 credits (as per the scheme of examinations for this route).
   2. Has cleared all mandatory papers to be passed.
   3. The degree nomenclature of the degree shall be as: "**Bachelor of Computer Applications (Honours)**";

   b. **Internship Route**

   1. The student acquires at least 160 credits (as per the scheme of examinations for this route).
   2. Has cleared all mandatory papers to be passed.
   3. The degree nomenclature of the degree shall be as: "**Bachelor of Computer Applications with Internship**"

   c. **Research Route**

   1. The student acquires at least 160 credits (as per the scheme of examinations for this route).
   2. Has cleared all mandatory papers to be passed.
   3. The degree nomenclature of the degree shall be as: "**Bachelor of Computer Applications with Research"**

8. In case of difference of opinion in the interpretation of any statement or clause of this regulation or the scheme and syllabus, the decision of the Dean of the University School of Information, Communication and Technology, shall be final.

9. This regulation has to be read together with the rest of this document.

Bachelor of Computer Applications Programme(s) in Emerging Areas Disciplines:

The programmes in the emerging areas shall have the first year curriculum as specified in the beginning of this document. The fundamental change in these programmes is that these programmes are oriented towards not only core area expertise but also expertise in emerging areas and multi-disciplinary areas(s) of engineering and technology. Therefore, the major change in the structure of the curriculum vis-à-vis the core area programme is reduction in the number of electives so that emerging areas can be given a complete coverage. The following emerging area and / or multi-disciplinary area degree programmes shall be offered:

1. Bachelor of Computer Applications – Data Science

Note: The scheme and Syllabi for 2nd to 4th years shall be notified subsequently

Regulation for Implementation of Bachelor of Computer Applications – Data Science

A. Guidelines for Electives

Electives are papers/courses that the student is allowed to choose from a specified list of papers. The electives shall be offered in two sections, namely:

1. The program core elective section

For the programme core electives, a subset of the electives in the list of electives shall be chosen by the Academic Programme Committee (APC) of the institution to be offered to students depending on the availability of faculty and other academic resources and only from this subset an elective shall be allowed to be studied by a group of students if and only if at least one third of the discipline intake of that particular admission year desire to study a particular paper / course.

The elective papers shall be allowed to be taken / studied by the students, by the APC of the institution, keeping in view that two papers studied by the student should not have a substantial overlap. All papers studied by the student should be substantially distinct in content.

B. Credits per Academic Year

The credits offered to a student in a particular academic year of study shall be between 40 to 48 credits.

C. Provision of Bridge Course of Students

Students without mathematics at the 10+2 levels are eligible for admission to the programme. Such students shall study the papers / courses a non-credit course on mathematics as an additional course / paper for the award of the degree. Namely:

Paper Code	Paper Name	L/P
BCA-181	Bridge Course in Mathematics	4

Implementation Rules for Bridge Courses:

1. The classes for the above bridge courses in the 1st Semester shall be conducted along with the classes of the other courses.
    1. These papers have to be qualified by the students.
    2. For these papers examination shall be conducted by the concerned subject teacher as NUES, the same shall be transferred to Examination Division of the University.
    3. The degree to be awarded to the student only subject to the acquiring qualifying grade/marks in the bridge courses and the minimum credits in the regular courses of the scheme of study as prescribed.
    4. These Courses shall be qualifying in nature; they shall not be included for calculation of CGPA. The qualifying marks shall be 40 marks in each paper.
    5. A separate marksheet will be issued by the Examination Division of the University for the Bridge Course.

D. Members of APC

Teachers of other institution, as and when deputed by their departments, for teaching the students enrolled in programmes offered by the a department shall be a part of the Academic Programme Committee of the discipline / programme of study. Such teachers, for all academic matters, including teaching, teachers' continuous evaluation, term end examinations etc. shall be governed by the decisions of the APC of the disciple / programme of study. Similarly, the guest faculty, the visiting faculty and the contract / Ad Hoc faculty as and when deputed to teach students of a particular discipline / programme of study shall form a part of the APC for that particular discipline / programme of study.

E. Medium of Instructions

The medium of instructions and examinations shall be English.

Regulation for Award of the Degree of Bachelor of Computer Applications – Data Science

1. (a) The examinations, attendance criteria to appear in examinations, promotion and award of the degree shall be governed by the Ordinance 11 of the University.

   (b) Pass marks in every paper shall be 40.

   (c) Grading System shall be as per Ordinance 11 of the University.

2. **Minimum duration** of the Bachelor of Computer Applications programme shall be 4 years (N=4 years) (8 semesters) for the students admitted in the 1st year and 1st semester of the degree programme.

3. **Maximum duration** of the Bachelor of Computer Applications programme shall be 7 years (N+3 years). After completion of N+3 years of study, no extension shall be given to the student for completing the requirements of the degree and the admission of the student shall stand cancelled. That is, if the student does not complete the requirements for the award of the degree in this period, the admission of the student shall be cancelled. That is, if a batch of regular students is admitted in the 1st semester / 1st year, in the Academic session 2025-26, then the batch's maximum period of study finishes in the Academic Session 2032-33.

4. Three routes for award of the final degree are defined in Clause 7 below.

5. After the 6th semester, and before the commencement of the 7th semester, the student has to choose from one of the following routes for the award of the degree:

   a. Regular Route

   b. Internship Route

   c. Research Route

   Three routes for award of the final degree are defined in Clause 7 below.

6. **Exit After Completion of an Academic Year**:

   A student may exit after completion of any of the year of study. That is, a student may take a break after any year of study, and if he/she satisfies the required conditions as per table below, then the Certificate/ Diploma/Degree to be awarded shall awarded. The student may re-join later with the provision that the maximum time allowed is same as clause 3 above. The interim awards shall be as follows:

On Completion of	Be Awarded	Condition to be Satisfied	Remarks

1st Year	Certificate in Computer Applications	Has earned at least 40 credits in the 1st year and provided they have undergone a minimum skill-enhancement course(s) equivalent to at least 4 credits or 4 weeks of training over and above the 40 credits earned in the first year. The training has to be completed after the completion of the first year examinations. All mandatory papers of the first year have to be passed.*	Shall not be allowed to reappear in any failed paper of 1st year on re-joining% in the second year to complete the requirement for the award of the degree. (Interim Degree)
2nd Year	Undergraduate Diploma in Computer Applications	Has earned at least 80 credits upto and including the 2nd year and provided they have undergone a minimum skill-enhancement course(s) equivalent to at least 4 credits or 4 weeks of training over and above the 80 credits earned upto and including the second year. The training has to be completed after the completion of the second year examinations. All mandatory papers upto and including the	Shall not be allowed to reappear in any failed paper studied till 2nd year on re-joining% in the third year to complete the requirement for the award of the degree. (Interim Degree)
3rd Year	Bachelor of Computer Applications – Data Science	Has earned at least 120 credits upto and including the 3rd year$	This is a three year degree (Interim Degree). Shall not be allowed to reappear in any failed paper studied till 3rd year on re-joining% in the fourth year to complete the requirement for the award of the final 4-year degree.
4th Year	See Clause 7	Has earned at least 160 credits upto and including the 4th year	(Final Degree)

* The students desirous of taking the exit after 1st or 2nd year, shall apply to the respective institutions before the completion of examinations of 1st semester or 3rd semester, respectively. The students shall specify the specific skill based course(s) / training of at least 4 weeks, that they are desirous of completing for taking the exit route. All such cases shall be put before a sub-committee of the Programme Coordination Committee (PCC) of the programme of study by the institution. The PCC sub-committee meeting in this regard shall be chaired by the convenor of the PCC and all Director / Principal of the concerned institution(s) or their nominee shall be the members of this sub-committee. The student(s) may be asked to appear before this sub-committee. The sub-committee may change the course(s) or the training programme to be completed by the student, as proposed by the student. The sub-committee should ensure that the course(s) opted by the student are relevant skill based course(s) and shall not be (majorly) part of any course taught or to be taught as a part of the complete curricula of the programme of study. The student shall proceed to study the course(s) / training as approved by this committee. The list of such students shall be forwarded by the respective institutions before the commencement of the examinations of the 2nd or the 4th semester as applicable, to the Controller of Examinations of the University, together with the minutes of the sub-committee approval.

Also, if such a student, who is allowed to take the exit route, but does not desire to take it, and wants to continue of the subsequent year of study, such students shall be allowed. However, the course(s) / training, if completed, shall not be taken on record of examinations.

Also, all expenses related to these additional course(s) / training shall be borne by the concerned student. The student must submit the certificate of completion of such course(s) by 31st July of the academic session after which the exit is desired. The concerned

$The student desirous of taking the interim degree (exit) after the 3rd year must apply to the concerned institution before the commencement of examinations of the 6th semester. The concerned institution must forward the list of all such cases to the Controller of Examinations of the University before beginning of classes of the 7th semester.

%The re-joining is to be allowed if and only if sufficient numbers of years of study are still remaining as per clause 3, for completion of the requirement of the award of the final degree (after 4th year of study as per scheme and syllabi specified in this document).

Thus, the **minimum credit** for the award of the final degree is 160. A student must obtain at-least 160 credits for the award of the degree

And, the **maximum credit** for the award of the final degree is 176. A student must appear for all 176 credits.

7. The following final degree route can be taken by a student:

   a. Students taking the Regular Route

   i. Degree with Honours:

   1. The student acquires at least 160 credits (as per the scheme of examinations for this route).
   2. Has cleared all mandatory papers to be passed as defined for this route, in the scheme of studies.
   3. Has earned 20 credits as specified in clause 5 above.
   4. The degree nomenclature of the degree shall be as: "**Bachelor of Computer Applications – Data Science (Honours)**";

   b. **Students taking the Internship Route**

   1. The student acquires at least 160 credits (as per the scheme of examinations for this route).
   2. Has cleared all mandatory papers to be passed as defined for this route, in the scheme of studies.
   3. The degree nomenclature of the degree shall be as: "**Bachelor of Computer Applications – Data Science with Internship (Honours)**"

   c. **Students taking the Research Route**

   1. The student acquires at least 160 credits (as per the scheme of examinations for this route).
   2. Has cleared all mandatory papers to be passed as defined for this route, in the scheme of studies.
   3. The degree nomenclature of the degree shall be as: "**Bachelor of Computer Applications – Data Science with Research (Honours)**"

8. In case of difference of opinion in the interpretation of any statement or clause of this regulation or the scheme and syllabus, the decision of the Dean of the University School of Information, Communication and Technology, shall be final.

9. This regulation has to be read together with the rest of this document.

Assessment of Outcomes Achieved in a Course / Paper. That is, Learning Outcome Assessment Alignment Grid.

Learning Outcome	Course/Project	How Learning Will Be Assessed	Resources	Attainment Level

To complete the alignment grid, start by listing one learning outcome per row beneath the ‘‘Learning Outcome” column. Make sure that each learning outcome can be assessed by a single method.

Next, beneath the "Course/ Project" column, list the course(s) or project(s) or assignments or tests that students will complete in order to achieve the learning outcome.

In the "How Learning Will Be Assessed" column, list the assessment(s) tool that will be used for that particular learning outcome. It is fine for there to be more than one assessment used for a particular outcome, so long as each assessment captures the outcome in its entirety. Likewise, it is fine for a single assessment to be used for multiple outcomes.

In the column entitled "Resources", list any additional materials, technologies, or resources needed for students to meet the learning outcome.

In the column entitled "Attainment Level", list in a quantifiable manner the average attainment level.

Every teacher must make this sheet for every paper taught. Be that a paper with only theory component, only practical component or with both theory and practical component.