

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 and 2nd year Common Scheme and Syllabus)

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.
3. 2nd year scheme and syllabus (3rd and 4th semester) implemented from 2025-26 batch approved by Board of Studies of USICT on 08/08/2026.
4. 2nd year scheme and syllabus (3rd and 4th semester) implemented from 2025-26 batch approved by Academic Council Sub-committee on 19/08/2026.

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 or 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.

Applicable from Batch Admitted in Academic Session 2025-26 Onwards

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 and syllabus of first and second year.
 2. The regulation for exit and re-entry into the programme after completion of one academic year at a time.
 3. The regulation for the award of the degree.
- B. The finalization of the scheme and syllabus of the third and fourth year shall occur in the subsequent meeting of Board of the Studies of the School

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.

Applicable from Batch Admitted in Academic Session 2025-26 Onwards

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 & SECOND 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**

Table 1: 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			19	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 marksheets of examination and the result of the student. Passing in this paper is mandatory for the student.

Generic Elective (GE) for other undergraduate programmes (Refer Table 5)

¹Mandatory 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

Table 2: 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 114 BCA 116 BCA 118	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	

¹Mandatory paper to be passed for the award of the degree.

Table 3: Third Semester						
Group	Code	Paper	L	P	Credits	Mode
¹ SEC	BCA 201T	Python Programming [#]	3	-	3	Theory
¹ PC	BCA 203T	Software Engineering	3	-	3	Theory
¹ PC	BCA 205T	Operating System	3	-	3	Theory
¹ PC	BCA 207T	Introduction to Data Analytics	3	-	3	Theory
¹ PC	BCA 209	Computer Organization and Architecture	3	-	3	Theory
MDC		Choose any one Multidisciplinary Course (MDC)**				
	BCA 211	Principles of Management and Organizational Behaviour	3	-	3	Theory
	BCA 213	Open Elective offered by other Department/School/Programme**	3	-	3	Theory
¹ SEC	BCA 201P	Python Programming Lab [#]	-	2	1	Practical
¹ PC	BCA 203P	Software Engineering Lab	-	2	1	Practical
¹ PC	BCA 205P	Operating System Lab	-	2	1	Practical
¹ PC	BCA 207P	Introduction to Data Analytics Lab	-	2	1	Practical
Total			18	8	22	

¹ Mandatory paper to be passed for the award of the degree.

Generic Elective (GE) for other undergraduate programmes (Refer Table 5)

Table 4: Fourth Semester						
Group	Code	Paper	L	P	Credits	Mode
¹ SEC	BCA 202T	Object Oriented Programming using Java	3	-	3	Theory
PC	BCA 204T	Software Testing	3	-	3	Theory
PC	BCA 206T	Computer Networks	3	-	3	Theory
¹ MDC		Choose any one multi-disciplinary course (MDC)				
	BCA 208	Digital Marketing	3	-	3	Theory
	BCA 210	Principle of accounting	3	-	3	Theory
	BCA 212*	MOOC course*	-	-	3	Theory
AEC	BCA 214	Introduction to Logical and Critical Thinking	2	-	2	Theory
¹ SEC	BCA 202P	Object Oriented Programming using Java Lab	-	2	1	Practical
PC	BCA 204P	Software Testing Lab	-	2	1	Practical
PC	BCA 206P	Computer Networks Lab	-	2	1	Practical
PCE		Choose any one Theory and Respective Practical (Programme Core Elective)				
	BCA 216T	Microprocessor and Interfacing	3	-	3	Theory
	BCA 216P	Microprocessor and Interfacing Lab	-	2	1	Practical
	BCA 218T	Computer Graphics	3	-	3	Theory
	BCA 218P	Computer Graphics Lab	-	2	1	Practical
	BCA 220T	Semantic Web Technologies	3	-	3	Theory
	BCA 220P	Semantic Web Technologies Lab	-	2	1	Practical
Total					21	

¹ Mandatory paper to be passed for the award of the degree.

*The student is allowed to do the elective through MOOCs (Massive Open Online Courses) offered through SWAYAM / NPTEL platform. For this purpose, the student must apply to the College/Institution for doing the MDC course through MOOC. Only with the approval of the HOD/Director of the Institution, the student may attend the course. All cost for attending and examinations have to be borne by the student. Such courses shall be of 3 or more credits (but shall be accounted for as 3 credits only). The marksheet of the MOOC shall have to be submitted to the College/Institution for onward transmission to the Examinations division of the University to include in the records of examinations and count the credits accrued (as 3 credits) together with the marks. These marks shall be reflected in the marksheet of the 6th semester. The student has to seek permission for the MOOC course / paper option by the end of the 5th semester. The marksheet issued by the MOOCs authority have to be submitted by the student within 12 weeks of completion of classes of the 6th semester. Failure to do so, shall imply the student is absent in the allowed paper through MOOCs and shall be marked as such by the College/Institution for transfer of marks to examination division.

Table 5: Generic (Open) Electives offered by BCA programmes for other undergraduate programmes

S.No.	Semester	Subject Code	Subject Name
1	I	BCA 107T BCA 107P	Web Technologies Web Technologies Lab
2	II	BCA 108T BCA 108P	Database Management System Database Management System Lab
3	III	BCA 201T BCA 201P	Python Programming Python Programming Lab

**First Year Common Syllabus of BCA
Programme
under the aegis of University School of
Information, Communication and Technology
offered at Affiliated Institutions of the University**

FIRST SEMESTER SYLLABUS

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 (1 st) 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],

Applicable from Batch Admitted in Academic Session 2024-25

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-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 (1 st) 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 (1 st) 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]

Applicable from Batch Admitted in Academic Session 2024-25

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 (1 st) 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	PO02	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, glyphsicons,

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, DTD's 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, O'reilly, 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 (1 st) 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

Applicable from Batch Admitted in Academic Session 2024-25

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: 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 (1 st) 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	To develop value-based understanding of self, relationships, and society.											
CO2	To introduce ethical concepts and decision-making for responsible human conduct.											
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): ICT-171	P : 4
Paper: Programming Using 'C' Language Lab	C : 2
Prerequisites: None	
Marking Scheme: - Teachers Continuous Evaluation: 40 marks - Term-End Semester Examinations: 60 Marks	
Instructions: - The course objectives and course outcomes are identical to that of BCA-103 as this is the practical component of the corresponding theory paper. - 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)	
1.	Write a program to convert temperature from Celsius to Fahrenheit by taking input from the user.
2.	Write a program to find the greatest number among 3 numbers given by the user.
3.	Write a program to check if a given number is a prime number or not.
4.	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 7 8 9 10
5.	Write a program to input marks of 50 students using an array and display the average marks of the class.
6.	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

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	(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. This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.	

Paper Code(s): ICT-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)	
1.	To explore the System settings - Personalisation, System, Devices, Apps, Network & Internet.
2.	To practice basic DOS commands like cd, md, dir, erase, cls, copy, date etc.
3.	To explore Windows Explorer functionalities like create, rename, move, delete folder and files etc.
4.	To practice the use of basic formatting features - Format Painter, Indentation, Line spacing, background color, find, replace, dictate commands.
5.	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.
6.	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.
7.	To practice the use of Layout Features – Margins, Orientation, Size, Columns, Indent, Spacing etc.
8.	To practice the use of Mail Merge Feature to generate Envelops and Labels.
9.	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.
10.	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.
11.	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.
12.	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.
13.	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.
14.	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.
15.	To practice the use of Slide Show Features – Custom Slide Show, Rehearse Timing etc.
Application Based Practicals (Implement minimum 5 out of 8 practical)	
16.	Create a Folder by your name in your system, store all the work done in this semester inside that folder.
17.	Create your Resume using basic formatting features like : table, bullets, wordart etc

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18.	Design an Invitation to Birthday Party using mail merge features send the invitation to 10 friends.
19.	Write an Article for Magazine with 3 columns and hyperlink.
20.	Create your own marksheet using basic formatting features.
21.	Create a list of marks of 10 students create charts and pivot table.
22.	Prepare a Sales summary and use features like sort, filter etc. to manipulate the data.
23.	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. This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.	

Paper Code(s): ICT-175	P : 3
Paper: Web Technologies Lab	C : 1
Prerequisites: None	
Marking Scheme: - Teachers Continuous Evaluation: 40 marks - Term-End Semester Examinations: 60 Marks	
Instructions: - The course objectives and course outcomes are identical to that of BCA 107 as this is the practical component of the corresponding theory paper. - 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.	Make following five different web pages: - Formatting Styles and Headings: Include Bold, italics, Underline, Strike, Subscript, superscript and all six type of headings - Font Styles and Image tag - Marquee: Move text, image and hyperlink - 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.				
2.	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.				
3.	Design a table with row span and column span and make use of attributes colspan, rowspan, width, height, cellpadding, cellspacing etc.				
4.	Design following frame: <table border="1"> <tr> <td> MAIN MENU Topic 1 Topic 2 Topic 3 </td><td> Explanation ----- ----- View Example </td></tr> <tr> <td></td><td>Example</td></tr> </table>	MAIN MENU Topic 1 Topic 2 Topic 3	Explanation ----- ----- View Example		Example
MAIN MENU Topic 1 Topic 2 Topic 3	Explanation ----- ----- View Example				
	Example				
5.	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.				
6.	Design Student registration form for admission in college.				
7.	Create a webpage and show the usage of inline and internal style sheet and external style sheet?				
8.	Create a webpage containing a background image and apply all the background styling attributes?				
9.	Create a web page showing the usage of font styling attributes				
10.	Create a web page and apply all Text styling attributes use Id and class selector.				
11.	Create a webpage and implement all list styling attributes.				
12.	Create a Webpage with three equal columns.				
13.	Create a webpage containing bootstrap table.				
14.	Create a webpage containing various types of images.				
15.	Create a webpage containing various types of buttons				

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16.	Create a webpage containing various, typography classes.
17.	Create a webpage containing to display the heading using. Jumbotron.
18.	Write a program to show the usage of inbuilt functions and dialog boxes.
19.	Write a program to show the usage of alert box and confirm box
20.	Write a program to implement event handling using onclick, onmouseover and onmouseout events.
21.	Write a program to show the usage of all the date, math and string object functions
22.	WAP to display the bookstore details in XML with CSS and internal DTD.
23.	WAP to format the Teacher details in XML with CSS using external DTD
Application Based Practical	
24.	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).
25.	Design a website and apply all the features of HTML, css, javascript and bootstrap to make the website attractive.
26.	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.
27.	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.
28.	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: 100 marks												
2. All evaluations to be conducted by the concerned teacher.												
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	PO02	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.

Applicable from Batch Admitted in Academic Session 2024-25

SECOND SEMESTER SYLLABUS

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 (1 st) 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 Friends, 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 (1 st) 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 (1 st) 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 (1 st) 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,

Applicable from Batch Admitted in Academic Session 2024-25

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. Elmars 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:												
2. Teachers Continuous Evaluation: 40 marks												
3. 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 (1 st) 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	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

Applicable from Batch Admitted in Academic Session 2024-25

- 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

Applicable from Batch Admitted in Academic Session 2024-25

Paper Code: BCA 114	Paper: Front End Design Tool VB.Net Lab					L	T/P	C				
							2	1				
Marking Scheme:												
4. Teachers Continuous Evaluation: 40 marks												
5. 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)	
1.	Create console application showing the use of conditional constructs - if, if-else, if-elseif-else, nested if, select case.
2.	Create console application showing the use of loops –Do While..Loop, Do Until ... Loop, While... Wend, For ... Next, For Each ... Next.
3.	Create a simple windows application showing the use of TextBox, Button, Label Controls, Radio Button, Check Box, Combo Box and List Box Controls.
4.	Create a windows application showing the use of Image, Timer, Panel, Scroll bar, Status Bar Controls.
5.	Create an MDI application showing the use of multiple forms, toolbar, menu, status bar, RichText Box, Dialog Controls.
6.	Create console/windows application to showing the use of Structured Exception handling- try..end try, catch, finally.

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7.	Create console/windows application to showing the use of Unstructured Exception handling- On Error, Resume Next etc.
8.	Create console/windows application showing the use of Array class - its methods and properties.
9.	Create console/windows application showing the use of Array List - its methods and properties.
10.	Create console/windows application showing the use of Enumeration, Constants and Structures.
11.	Create console/windows application showing the declaration and use of user defined functions.
12.	Create console/windows application showing the use of different argument passing mechanism – ByVal, ByRef, Optional and Paramarray.
13.	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.
14.	Create console/windows application showing the implementation of Inheritance.
15.	Create console/windows application showing the use of Polymorphism.
Application Based Practicals (Implement minimum 5 out of 10 practicals)	
16.	Write a Program to find diameter, circumference and area of circle using procedure.
17.	Write a Program to find maximum between three numbers using select case and if--else.
18.	Create Basic calculator with all the functionalities.
19.	Create a basic Digital or Analog Clock using Timer, Image, Button, ComboBox and other relevant controls.
20.	Write a Program to find second largest element and second smallest element in an array.
21.	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.
22.	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.
23.	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.
24.	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.
25.	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: In total 15 practical's to be implemented. Two additional practical may be given by the course instructor. This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.	

Paper Code: BCA 116				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 correlation 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

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TB2. Statistics For Management Using Microsoft Excel, Ash Narain Sah, John Wiley, 2018

REFERENCE BOOKS:

RB1. Statistics with Microsoft Excel by Dretzke, Beverly Jean, Prentice Hall, 2019

RB2. Applied Statistics with Microsoft Excel, Gral Keller, Cengage, 2015

List of Practical																																																	
S. No.	Detailed Statement																																																
1.	Enter the marks of 20 students in the given order - Serial number - Name of the student - Name of the college - Class - Subject-1 - Subject -2 - Subject -3 - Subject -4 In a separate columns, perform the following operations Calculate the following - Total marks of all the subjects - Percentage of marks for each of the students - Allotment of grades based on the criterion. - If the marks are more than 75% then the result is “Pass” else “Fail” - Now in other column allot the grades based on the following criterion - If the marks are more than 90% then grade is “A” - If the marks are more than or equal to 75 and less than 90% then the grade is “B” else the grade if “C” provided that the result is “Pass”																																																
2.	From the following table, calculate the following <table><tr><th>City</th><th>Number of Schools</th><th>Number of candidates</th></tr><tr><td>New Delhi</td><td>300</td><td>30000</td></tr><tr><td>Mumbai</td><td>450</td><td>45000</td></tr><tr><td>Bengaluru</td><td>500</td><td>48000</td></tr><tr><td>Chennai</td><td>480</td><td>67000</td></tr><tr><td>Trivandrum</td><td>459</td><td>77000</td></tr></table> - 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				City	Number of Schools	Number of candidates	New Delhi	300	30000	Mumbai	450	45000	Bengaluru	500	48000	Chennai	480	67000	Trivandrum	459	77000																											
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3.	From the following data calculate the <table><tr><th>Base City</th><th>Department</th><th>Client</th><th>Location</th><th>Nationality</th></tr><tr><td>New Delhi</td><td>Marketing</td><td>Adidas</td><td>New York</td><td>American</td></tr><tr><td>Mumbai</td><td>Advertising</td><td>Hilfiger</td><td>London</td><td>English</td></tr><tr><td>Bengaluru</td><td>Human Resource</td><td>Woodland</td><td>Paris</td><td>Spanish</td></tr><tr><td>Chennai</td><td>Human Resource</td><td>Nike</td><td>Sydney</td><td>Dutch</td></tr><tr><td>Trivandrum</td><td>Advertising</td><td>Allen Solley</td><td>Frankfurt</td><td>Japanese</td></tr><tr><td>New Delhi</td><td>Quality Control</td><td>Adidas</td><td>New York</td><td>American</td></tr><tr><td>Mumbai</td><td>Advertising</td><td>Hilfiger</td><td>Seoul</td><td>Korean</td></tr><tr><td>Bengaluru</td><td>Human Resource</td><td>Woodland</td><td>Paris</td><td>Spanish</td></tr></table>				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
Base City	Department	Client	Location	Nationality																																													
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	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 118	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)	
1.	Create a file to demonstrate the use of layers, groups & smart objects.
2.	Create a photo frame in Photoshop.
3.	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.
4.	Create a custom brush preset in Photoshop.
5.	Create a custom pattern preset in Photoshop.
6.	Create a visiting card for yourself in Photoshop. (size=3.5 x 2 inch., color coding: CMYK)
7.	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.
8.	Create a border design using a brush tool.
9.	Create basic shapes (square, triangle, circle, rectangle and parallelogram) in Photoshop on a single layer using the shape tools.
10.	Create a simple GIF in Photoshop.
Application Based Practicals (Implement minimum 5 out of 10 practicals)	
11.	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)
12.	Create a custom Desktop background in Photoshop.
13.	Create a water drop and heart shape in Photoshop using the shapes tools or Pen Tool.
14.	Create a "Save Water" Poster from the shapes created in Practical 13. (size=A8 or A4, color coding: CMYK)
15.	Perform Digital Makeup on the Photograph of some celebrity in Photoshop.
16.	Create a cartoon character in Photoshop using the Shape and Pen Tools.
17.	Create a chocolate bar with the brand name in Photoshop. The individual cube of the chocolate must have a 3D Visual Effect.
18.	Create your company logo in Photoshop.
19.	Create a magazine Cover in Photoshop.
20.	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): ICT-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(),array_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.

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	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): ICT-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: $(a + b / (c * d) - e)$)

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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): ICT-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. <u>1. COLLEGE DATABASE:</u> 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) <u>2.COMPANY DATABASE:</u> 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

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	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 types are specified. PERSON(<u>driver_id#</u> : string, name : string, address : string) CAR(<u>regno</u> : string, model : string, year : int) ACCIDENT(<u>report_number</u> : int, <u>acc_date</u> : date, location : string) OWNS(<u>driver_id#</u> : string, <u>regno</u> : string) PARTICIPATED(<u>driver_id#</u> : string, <u>regno</u> : string, <u>report_number</u> : int, <u>damage_amount</u> : 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 in 2002. (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) Iss_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 Elmarsy & 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 than 1000 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.
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**Second Year Common Syllabus of BCA
Programme
under the aegis of University School of
Information, Communication and Technology
offered at Affiliated Institutions of the University**

THIRD SEMESTER SYLLABUS

Paper Code: BCA 201T	Paper: Python Programming					L	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 (1 st) 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	Demonstrate knowledge of basic programming constructs in python.											
CO2	Illustrates string handling methods and user-defined functions in python.											
CO3	Applying data structures primitives like List, Dictionary and tuples.											
CO4	Identify the commonly used operations involved in file handling.											
CO5	To understand how python can be used for application development											
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	4	-	4	2	-	-	-	-	-	-	-	2
CO2	2	-	4	4	-	-	-	-	-	-	-	2
CO3	2	-	4	4	-	-	-	2	-	-	-	2
CO4	2	-	4	4	-	-	-	4	-	-	-	2
CO5	2	-	4	4	-	3	-	3	2	-	4	4

UNIT-I

Basic Introduction: Origin, Need of Python Programming, Features, program structure, identifiers, reserved words, escape sequences, IDLE-Python Interpreter

Python Programming Introduction: Variables and assignment statements, data types, Operators: Assignment, Unary, Binary, Arithmetic, Relational, Logical, Bitwise Operator and membership operator

Control Structures: if-conditional statements, if –else condition, if-elif-else condition, nested if-elif-else condition, Iteration (for Loop and while loop), Nested Loops, break and continue statement.

Strings: Slicing, Membership, Built in functions (count, find, capitalize, title, lower, upper and swap case, replace, join, isspace (), isdigit(), split(), startswith(), endswith()).

UNIT-II

Mutable and Immutable objects: List: creating, initializing, accessing, slicing, and traversing List. List operations: length, concatenation, repetition, in, not in, max, min, sum, all, any. List methods: append, extend, count, remove, index, pop, insert, sort, reverse.

Tuples: creating tuples, Tuple operations: length, concatenation, repetition, membership, maximum, minimum, tuple methods: count, index.

Dictionary: creating, accessing values, adding, modifying and deleting items in dictionary, Dictionary methods: len, str, clear, copy, get, update, copy. Difference between list and dictionary

UNIT-III

Concept of Functions: Functions: Defining, Calling and Types of Functions, Arguments and Return Values, Formal vs. Actual Arguments, Scope and Lifetime, Keyword Arguments, Default Arguments, Recursion.

Modules: importing Modules, Math and Random Module, creating your own modules, and concept of Packages

UNIT-IV

NumPy Library: introduction to NumPy, Creation of One-Dimensional Arrays, Re-shaping of an Array, Element-wise Operations, Aggregate Operations, Array indexing, Array Slicing, insert Row/Columns, Append Row/Columns, Array Manipulation Operations.

Introduction to matplotlib: Bar Graphs , pie charts

File handling: Types of Files (Text file, Binary Files, CSV file), Creation, writing, appending, Insertion, deletion, updating, modification of Data in into the files.

TEXTBOOKS:

TB1. Eric Matthes, Python Crash Course, 3rd Edition, No Starch Press, 2023..

TB2. Sheetal Taneja and Naveen Kumar, Python Programming: A Modular Approach, Pearson Education India, Latest Impression.

TB3. Wes McKinney, Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter, 3rd Edition, O'Reilly Media, 2022

REFERENCE BOOKS:

RB1. Yashavant Kanetkar, Let Us Python, 3rd Edition, BPB Publications, 2024.

RB2. Mark Lutz, Programming Python, 4th Edition, O'Reilly Media, 2010.

RB3. Martin C. Brown, Python: The Complete Reference, McGraw-Hill Education, 2018.

Paper Code: BCA 203T	Paper: Software Engineering					L	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 (1 st) 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	To evaluate languages to code front end and back end of a software											
CO2	Instantiating into the process of designing, coding and testing a software module.											
CO3	Organizing a software product along with its complete documentation.											
CO4	Implementing Software Development Cycle to develop a software module.											
CO5	To analyze the use of techniques, skills and modern engineering tools necessary for software development.											
CO6	Organizing a complete software module											
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	-	-	4	2	4	-	-	-	-	-	-	-
CO2	-	-	4	4	2	-	-	4	-	-	2	-
CO3	-	2	2	4	-	-	-	2	4	-	2	-
CO4	-	-	4	4	2	-	-	3	-	-	4	2
CO5	-	-	2	4	4	3	-	3	2	-	4	4
CO6	-	-	4	4	2	2	-	4	3	-	4	4

UNIT – I

Introduction of software engineering: Software Crisis, Software life cycle models, Waterfall, Prototype, Spiral Models,– Agile model.

Software Requirements analysis & specifications: Requirement engineering, requirement elicitation techniques like FAST, QFD, Requirement analysis using (BFD use-case, sequence and class diagram (with case studies), ER Diagrams, Requirements documentation: SRS, Characteristics & organization of SRS

UNIT – II

Software Project Planning: Software Metrics-Definition and Need, Types of Metrics-Product, Process and Project Metrics, Size Estimation like lines of Code & Function Count, Halstead Software Science measure, Cost Estimation: Need, Models COCOMO: Basic model, Intermediate model

Risk Management: Software Risks, Types of risk, risk management activities: risk assessment, risk control.

UNIT – III

Software Design: Cohesion & Coupling, Classification of Cohesiveness & Coupling,

Quality management: Quality concept, software quality assurance, Total Quality Management (TQM), software review, software inspection

Software Implementation: Structured coding techniques, coding style, Standards and guidelines, documentation guidelines. Reverse Engineering, Software Re-engineering, Configuration Management.

Applicable from Batch Admitted in Academic Session 2024-25

UNIT – IV

Software Testing: Testing Process, Levels of Testing: Unit testing, Integration testing and system testing. Types of Testing: Manual testing, Automation Testing. Methods of Testing- , Black box, White box and Grey Box Testing. Validation, Verification, Alpha-Beta testing, Acceptance testing, Functional Testing and its types, Structural Testing Difference between: Testing and Debugging

Software Maintenance: Management of Maintenance, The Maintenance Process and Types of maintenance: Preventive, Perceptive, Adaptive and Corrective Maintenance. Maintenance tools and techniques.

TEXT BOOKS:

TB1. K. K. Aggarwal and Yogesh Singh, “Software Engineering”, 3rd Edition, New Age International Publishers, 2008.

TB2. Ian Sommerville, “Software Engineering”, 10th Edition, Pearson Education, 2015.

REFERENCE BOOKS:

RB1. Jibitesh Mishra and Ashok Mohanty, “Software Engineering”, Pearson Education, 2011

RB2. Roger S. Pressman and Bruce R. Maxim, “Software Engineering: A Practitioner’s Approach”, 9th Edition, McGraw-Hill Education, 2019.

RB3. James F. Peters and Witold Pedrycz, “Software Engineering: An Engineering Approach”, Wiley India / John Wiley & Sons, 2000.

Paper Code: BCA 205T				Paper: Operating System				L	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 (1 st) 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 basic concept of Operating System with the help of Unix and Linux Architecture.											
CO2	Understand the concept of Processes, Process Scheduling, Process Synchronization and applying process commands in Linux environment											
CO3	Understand the concept of memory management and deadlock.											
CO4	Understand the concept of file Systems, Types and Access Methods by using Linux commands											
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	4	-	4	2	-	-	-	-	-	-	-	-
CO2	3	-	4	4	-	-	-	2	-	-	-	-
CO3	4	-	4	4	-	-	-	2	-	-	-	2
CO4	2	-	4	4	-	-	4	4	2	-	3	4

UNIT-I

Introduction: What is an Operating System, Functions of Operating System, Simple Batch Systems; Multi programmed Batch systems, Time-Sharing Systems, Personal-computer systems, Parallel systems, Distributed Systems, Real-Time Systems.

Introduction to Linux: Architecture of Linux OS, Basic directory structure of Linux, Basic commands of Linux:- man, info, help, what is, apropos, basic directory navigation commands like cat, mkdir, rmdir, cd, mv, cp, rm, ,file, pwd, date, cal, echo, bc, ls, who, whoami, hostname, uname, tty, alias

Vi Editor: vi basics, Three modes of vi Editor, how to write, save, execute a shell script in vi editor

UNIT-II

Processes: Process Concept, Process Scheduling, Operation on Processes, Threads

CPU Scheduling: Basic Concepts, Scheduling Criteria and Scheduling Algorithms: FCFS, SJF, SRTF, Priority and Round Robin Scheduling algorithms.

Process Synchronization: Background, The Critical-Section Problem, Semaphores solution to critical section Problem, Classical Problem: Consumer Producer

Process related commands in Linux: ps, top, pstree, nice, renice and system calls

UNIT-III

Memory Management: Background, Logical versus Physical Address space, swapping, Contiguous allocation, Segmentation, Paging

Virtual Memory: Demand Paging, Performance of Demand Paging, Page Replacement, Page-replacement Algorithms, Allocation of Frames, Thrashing

Applicable from Batch Admitted in Academic Session 2024-25

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

UNIT-IV

Information Management: Introduction, File Concept, Access methods, Directory and Disk structure, File Protection

Linux File Security: Permission types, examining permissions, changing permissions (symbolic method and numeric method)

TEXT BOOKS:

TB1. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, “Operating System Concepts”, 10th Edition, John Wiley & Sons, 2018

TB2. Sumitabha Das, “Unix Concepts and Applications”, 4th Edition, Tata McGraw-Hill Education

REFERENCE BOOKS:

RB1. Madnick E. and Donovan J., “Operating Systems”, Tata McGraw Hill, 2011

RB2. Andrew S. Tanenbaum and Herbert Bos, “Modern Operating Systems”, 5th Edition, Pearson Education, 2024

RB3. Sivaselvan and Gopalan, “A Beginner’s Guide to UNIX”, PHI Learning

Paper Code: BCA 207T				Paper: Introduction to Data Analytics				L	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 (1 st) 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	Explain the concepts, lifecycle, and applications of data analytics.											
CO2	Apply data collection, preprocessing, visualization, and exploratory data analysis techniques.											
CO3	Apply basic statistical methods and machine learning algorithms for predictive and descriptive analytics.											
CO4	Perform data analysis using Python libraries for real-world datasets											
CO5	Describe big data concepts, Hadoop ecosystem, and applications of data analytics in various domains.											
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	4	-	-	-	4	-	-	-	-	-	2
CO2	-	2	-	4	-	4	-	2	-	-	-	2
CO3	-	2	2	4	-	4	-	2	-	-	-	2
CO4	-	-	4	4	2	4	-	2	-	-	-	3
CO5	-	4	-	2	-	4	-	-	-	-	2	4

UNIT – I

Introduction to Data Analytics: Data, Information and Knowledge, Types of Data, Data Analytics Process, Data Analytics Lifecycle, Applications of Data Analytics, Data Collection, Sampling Techniques, Data Cleaning, Data Preprocessing, Data Transformation.

UNIT-II

Statistical Foundations and Exploratory Data Analysis: Measures of Central Tendency, Measures of Dispersion, Correlation, Probability Basics, Exploratory Data Analysis (EDA), Data Visualization, Histograms, Box Plots, Scatter Plots, Introduction to Hypothesis Testing.

UNIT-III

Predictive and Descriptive Analytics: Supervised and Unsupervised Learning, Classification, Regression, Naïve Bayes, K-Nearest Neighbour (KNN), Linear Regression, Clustering, K-Means Algorithm, Hierarchical Clustering, Association Rule Mining, Apriori Algorithm.

UNIT-IV

Python for Data Analytics and Big Data: Introduction to NumPy, Pandas, Matplotlib and Seaborn, Data Import and Export, Data Manipulation, Data Visualization, Big Data Fundamentals, Hadoop Ecosystem, MapReduce, Applications of Data Analytics.

Applicable from Batch Admitted in Academic Session 2024-25

TEXT BOOKS:

TB1. Foster Provost and Tom Fawcett, "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking", 2nd Edition, O'Reilly Media, 2023.

TB2. Wes McKinney, "Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter", 3rd Edition, O'Reilly Media, 2022.

TB3. Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining: Concepts and Techniques", 4th Edition, Morgan Kaufmann (Elsevier), 2023.

REFERENCE BOOKS:

RB1. Joel Grus, "Data Science from Scratch: First Principles with Python", 2nd Edition, O'Reilly Media, 2019.

RB2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley, 1st Edition, 2014.

RB3. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", 1st Edition, O'Reilly Media, 2016.

RB4. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani and Jonathan Taylor, "An Introduction to Statistical Learning with Applications in Python", 2nd Edition, Springer, 2023

Paper Code: BCA 209	Paper: Computer Organization and Architecture					L	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 (1 st) 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	Able to understand the fundamentals of digital principles and able to design digital circuits by simplifying the Boolean functions											
CO2	Implement the combinational and sequential circuits for the given specifications											
CO3	Able to trace the execution sequence of an instruction through the processor											
CO4	Demonstrate computer architecture concepts related to design of modern processors, memories and I/Os											
CO5	Demonstrate the ability to classify the addressing modes, instructions set											
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	4	-	2	4	-	-	-	-	-	-	-	2
CO2	4	-	4	4	-	-	-	2	-	-	-	2
CO3	4	-	4	2	-	-	-	-	-	-	-	2
CO4	4	-	2	4	-	-	-	-	-	-	-	2
CO5	4	-	4	4	-	-	-	-	-	-	-	2

UNIT – I

Boolean Algebra and Logic: Basics Laws of Boolean Algebra, Logic Gates, Simplifications of Boolean equations using K-maps SOP and POS, Don't Care condition.

Arithmetic Circuits: Adder, Subtractor, Parallel binary adder/Subtractor.

UNIT – II

Combinational Circuits: Multiplexers, De-Multiplexers, Decoders, Encoders.

Flip-flops: S-R, D, J-K, T, Clocked Flip-flop, Race around condition, Master slave Flip-Flop, Realisation of one flip-flop using other flip-flop, Applications of flip flop: Latch, Registers, Counters (elementary treatment to be given).

UNIT – III

Data Transfer Operations: Register Transfer, Bus and Memory Transfer, Registers and micro-operations.

Basic Computer Organizations and Design: Instruction Codes, Computer Registers, Instruction Cycle, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes,

UNIT – IV

Input-Output Organization: Peripheral Devices, Input-Output Interfaces, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA)

Memory Organization: Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

TEXT BOOKS:

Applicable from Batch Admitted in Academic Session 2024-25

- TB1.** Morris Mano, Computer System Architecture, 3rd Edition, Prentice-Hall of India Private Limited, 1999.
TB2. Moris Mano, “Digital Logic and Computer Design”, PHI Publications, 2002

REFERENCES:

- RB1.** R. P. Jain, “Modern Digital Electronics”, TMH, 3rd Edition, 2003.
RB2. Wliam Stallings, Computer Organization and Architecture, 4th Edition, Prentice Hall of India Private Limited, 2001
RB3. Subrata Ghosal,” Computer Architecture and Organization”, Pearson 2011
RB4. Malvino, “Digital Computer Electronics: An Introduction to Microcomputers”, McGraw Hill

Paper Code: BCA 211				Paper: Principle of Management and Organizational Behavior				L	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 (1 st) 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	Explain the concepts, principles, functions, and evolution of management.											
CO2	Apply planning, organizing, staffing, and controlling techniques for effective management.											
CO3	Analyse individual and group behaviour, motivation, communication, and leadership in organizations.											
CO4	Evaluate organizational culture, conflict, power, organizational change, and decision-making processes.											
CO5	Apply management and organizational behaviour concepts to solve real-world organizational problems.											
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	-	4	-	-	-	-	-	-	3	-	2	-
CO2	-	4	-	2	-	-	-	-	4	-	4	-
CO3	-	4	-	-	-	-	-	-	4	4	4	2
CO4	-	4	-	2	-	-	-	-	4	4	4	2
CO5	-	4	-	4	-	-	-	-	4	4	4	4

UNIT – I

Introduction to Management: Nature, Scope and Functions of Management, Managerial Roles and Skills, Evolution of Management Thought, Classical, Neo-Classical and Modern Management Theories, Principles of Management.

UNIT-II

Planning and Organizing: Planning Process, Types and Levels of Planning, Management by Objectives (MBO), Strategic Management, Forecasting, Decision Making Process, Organizational Structure, Organizational Design, Delegation, Authority and Responsibility, Centralization and Decentralization, Coordination, Staffing, Human Resource Management, Selection Process.

UNIT-III

Organizational Behaviour: Foundations of Organizational Behaviour, Individual Behaviour, Personality, Learning, Values, Attitudes, Emotional Intelligence, Perception, Attribution Theory, Motivation Theories (Maslow, Herzberg, McGregor, McClelland, Alderfer, Vroom, Adams, Goal Setting Theory), Group Behaviour, Team Building, Communication and Barriers.

UNIT-IV

Leadership and Organizational Development: Leadership Theories, Conflict Management, Power and Politics, Organizational Culture, Organizational Change, Resistance to Change, Change Management Process, Controlling, Types of Control, Control Techniques, Contemporary Management Practices and Case Studies.

TEXT BOOKS

Applicable from Batch Admitted in Academic Session 2024-25

- TB1.** Stephen P. Robbins, Mary Coulter and Lori Long, Management, 16th Edition, Pearson, 2025.
- TB2.** Stephen P. Robbins and Timothy A. Judge, Organizational Behaviour, 19th Edition, Pearson, 2024.
- TB3.** Harold Koontz, Heinz Weihrich and Mark V. Cannice, Essentials of Management: An International, Innovation and Leadership Perspective, 11th Edition, McGraw-Hill, 2023.

REFERENCE BOOKS

- RB1.** Richard L. Daft, Management, 15th Edition, Cengage Learning, 2024.
- RB2.** Fred Luthans, Organizational Behavior: An Evidence-Based Approach, 14th Edition, Information Age Publishing, 2022.
- RB3.** Ricky W. Griffin, Management, 14th Edition, Cengage Learning, 2021.
- RB4.** John R. Schermerhorn Jr., Introduction to Management, 15th Edition, Wiley, 2023.
- RB5.** Peter G. Northouse, Leadership: Theory and Practice, 9th Edition, Sage Publications, 2021

Course Code: BCA 201P

L P C

Course Name: Python Programming Lab

- 2 1

INSTRUCTIONS

- 1.The course objectives and course outcomes are identical to that of BCA 201T 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

Course Code: BCA 203P

L P C

Course Name: Software Engineering Lab

- 2 1

INSTRUCTIONS

- 1.The course objectives and course outcomes are identical to that of BCA 203T 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

Course Code: BCA 205P

L P C

Course Name: Operating System Lab

- 2 1

INSTRUCTIONS

- 1.The course objectives and course outcomes are identical to that of BCA 205T 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

Course Code: BCA 207P

L P C

Course Name: Introduction to Data Analytics Lab

- 2 1

INSTRUCTIONS

- 1.The course objectives and course outcomes are identical to that of BCA 207T 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

FOURTH SEMESTER SYLLABUS

Paper Code: BCA 202T				Paper: Object Oriented Programming using Java				L	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 (1 st) 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	Illustrate the Object-Oriented paradigm and Java language constructs											
CO2	To inculcate concepts of inheritance to create new classes from existing ones and design the Classes needed given a problem specification. To familiarize the concepts of packages and interfaces											
CO3	To manage input output using console and files											
CO4	To facilitate students in handling exceptions and defining their own exceptions											
CO5	To apply the Java Thread model to develop multithreading applications											
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	-	4	-	-	-	-	-	-	3	-	2	-
CO2	-	4	-	2	-	-	-	-	4	-	4	-
CO3	-	4	-	-	-	-	-	-	4	4	4	2
CO4	-	4	-	2	-	-	-	-	4	4	4	2
CO5	-	4	-	4	-	-	-	-	4	4	4	4

UNIT-I

No. of Hours: 12 Chapter/Book Reference: TB1 [Chapters – 1, 2, 3, 5, 6], TB2[Chapters- 2, 3, 4, 5, 6, 7, 8]

Object Oriented Paradigm: Procedural vs. object-oriented development, basic concepts of object-oriented programming, applications and benefits of OOP

Java Basics: Java as Object-oriented Programming Language History of Java, Features of Java, Difference between Java and C++, Java Architecture (JDK, JVM, JRE), Java Tokens: Basics of Java programming: Data types, Literals, Variables, Scope and lifetime of variables, Operators. Control Structures including selection, Looping, Arrays.

UNIT – II

No. of Hours: 12 Chapter/Book Reference: TB1 [Chapters – 7, 8, 9], TB2[Chapters - 9,10, 11]

Introducing Classes: Creating a Class: properties, methods and constructors. Object Access modifiers, this keyword, Static (variable, method, block), final keyword, String class and methods.

Inheritance: Types, Super keyword, method overriding, covariant return type, abstract class.

Interfaces and Packages: Creation and implementing an interface, difference between abstract class and interface, Packages, and importing a package.

Polymorphism: Dynamic binding, Generic programming, Casting objects, Instance of operator, Method Overloading

UNIT – III

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters – 11, 12], TB2[Chapters - 13]

Using I/O: Elementary concepts of Input/Output, using the byte streams, reading and writing using byte streams, automatically closing a file, using the character-based streams, File I/O using character streams (using a File Writer and using a File Reader)

UNIT – IV

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters – 17, 18]

Exception Handling: Exception Class, built-in checked and unchecked exceptions, user-defined exceptions, use of try, catch, throw, throws, finally

Multi-threaded programming: Multithreading fundamentals, Thread class, and Runnable interface, the life cycle of thread, creation of single and multiple threads, implementation of Thread methods, Synchronization (using Synchronized methods, synchronized statement).

TEXT BOOKS:

TB1. Herbert Schildt, “Java 2 -The Complete Reference” – Tata McGraw Hill Education Private Limited, 2010

TB2. Trilochan Tarai, “Java Core Concepts and Applications”, I.K. International Publishing house pvt. Ltd., 2015

REFERENCE BOOKS:

RB1. E. Balaguruswamy, “Programming with Java A Primer”, McGraw Hill Education Private Limited, 5th Edition, 2015

RB2. Herbert Schildt, Dale Skrien, “Java Fundamentals A Comprehensive Introduction” – Tata McGraw Hill Education Private Limited, 2013

RB3. Cay S. Horstmann, “Core Java Volume 1 – Fundamentals”, 10th edition, Pearson, 2017

RB4. Ken Arnold, Davis Holmes, James Gosling, Prakash Goteti, “The Java Programming Language”, 3rd edition, Pearson, 2008

Paper Code: BCA 204T	Paper: Software Testing	L	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 (1 st) 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	Identify the different types of Testing											
CO2	Differentiate between the testing and Debugging. Different Models of testing											
CO3	Develop test cases for given problem with respect to structural and functional testing techniques											
CO4	Integrating the test planning and Management											
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	-	4	-	-	-	-	4	-	-	-	2
CO2	2	-	4	2	-	-	-	4	-	-	-	2
CO3	-	-	4	4	-	-	-	4	2	-	-	2
CO4	-	-	3	4	-	-	-	4	4	-	3	2

UNIT – I

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters 1, 2, 4, 5]; TB2 [Chapters 3, 4]; RB1 [Chapters 2, 3, 4]

Introduction to Software Testing: What is software testing and why it is so hard? Goals of Testing, Principles of Software Testing, Error, Fault, Failure, Incident, Error and Fault Taxonomies, Test Cases, Software Testing Life Cycle, Verification and Validation: - V-testing Life cycle, Limitations of Testing, Static and Dynamic Testing, Static: Inspection, Walkthrough, Technical Review.

UNIT – II

No. of Hours: 11 Chapter/Book Reference: TB1 [5, 6]; R1 [4]; R3 [3]

Functional Testing: Black Box Testing, Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing.

Structural Testing: White Box Testing, Need of white box Testing, Path testing, DD-Paths, Cyclomatic Complexity, Graph Metrics, Data Flow Testing

UNIT – III

No. of Hours: 11 Chapter/Book Reference: TB1 [5]; TB2 [4]; R3 [6]

LEVELS OF TESTING: Unit Testing: Overview, Integration Testing, System Testing and its categories, Acceptance Testing, Types of Acceptance Testing

UNIT – IV

No. of Hours: 11 Chapter/Book Reference: TB1 [7]; TB2 [6]

Test Planning: Preparing a Test plan, Scope management, Decide Test Approach, Setting up Criteria for testing, Identifying responsibilities, Staffing, training needs, Resource requirements, Test deliverables, Testing Tasks

Test Management: Test infrastructure management, Test people management, Integrating with product release, Test Process: Base line a test plan, Test case specification, Update of traceability, Test reporting: Recommending product release

TEXTBOOKS:

TB1. Software Testing: Principles and Practice by Srinivasan Desikan, Gopalaswamy Ramesh, Pearson

TB2. Software Testing: Principles and Practice by Naresh Chauhan, Oxford

REFERENCE BOOKS:

RB1. Paul C. Jorgensen, "Software Testing- a Craftsman's Approach", Second Edition, CRC Press, 2018

RB2. Glenford Myers, "The Art of Software Testing", John Wiley & Sons Inc., New York

RB3. K.K. Aggarwal & Yogesh Singh, "Software Testing", New Age International Publishers, New Delhi, 2016

Paper Code: BCA 206T	Paper: Computer Networks					L	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 (1 st) 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	Utilize the fundamentals of data communication and networking to identify the topologies and connecting devices of networks.											
CO2	Understand and describe the layered protocol model (OSI and TCP/IP model)											
CO3	Analyse the elements and protocols for peer – peer and communication between layers											
CO4	Evaluate and implement routing algorithms and Router basic configuration											
CO5	Evaluate the protocols and Principles in computer networking											
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	4	3	-	-	-	-	4	2	-	-	-	2
CO2	4	3	-	-	-	-	4	-	-	-	-	2
CO3	4	2	-	4	-	3	4	2	-	-	-	2
CO4	4	-	-	4	-	2	4	4	-	-	-	2
CO5	4	2	-	4	-	4	4	4	-	-	-	3

UNIT – I

No. of Hours: 10 Chapter/Book Reference: TB1[Chapter-1], TB2[Chapter-1, 2]

Basic Concepts: Components of data communication, distributed processing, Line configuration, topology, transmission mode, and categories of networks. **OSI and TCP/IP Models:** Layers and their functions, comparison of models. **Transmission Media:** Guided and unguided, Attenuation, distortion, noise, throughput, propagation speed and time, wavelength, Shannon Capacity.

UNIT – II

No. of Hours: 12 Chapter/Book Reference: TB1[Chapter-2, 3], TB2[Chapter-3, 9]

Telephony: Multiplexing, WDM, TDM, FDM, circuit switching, packet switching and message switching. **Data Link Layer:** Types of errors, Framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- NARQ, Selective repeat ARQ.

UNIT – III

No. of Hours: 12 Chapter/Book Reference: TB1[Chapter-5], TB2[Chapter-18, 19, 20, 22]

Network Layer: Internetworking & Devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway, Modems; Addressing: IPv4 and IPv6 addressing, IPv4 subnetting; Routing: Unicast Routing Protocols: RIP, OSPF, BGP;
 Routing: Routing Methods- Static and Dynamic Routing, Routing basic commands, Distance vector protocol, Link state protocol

UNIT – IV

No. of Hours: 10 Chapter/Book Reference: TB1[Chapter-6,7], TB2[Chapter-23, 24,25]

Transport and upper layers in OSI Model: Transport layer functions and Protocols, connection management, functions of session layers, Presentation layer, and Application layer.

TEXT BOOKS:

TB1. Andrew S. Tanenbaum and Nick Feamster, “Computer Networks”, 6th Edition, Pearson, 2021.

TB2. Behrouz A. Forouzan, “Data Communications and Networking”, 5th Edition, McGraw Hill Education, 2013.

REFERENCES:

RB1. Douglas E. Comer, “Internetworking with TCP/IP: Principles, Protocols and Architecture”, 6th Edition, Pearson, 2014.

RB2. William Stallings, “Data and Computer Communications”, 11th Edition, Pearson, 2017.

RB3. Allan Leinwand and Bruce Pinsky, “Cisco Router Configuration Handbook”, 2nd Edition, Cisco Press, 2001.

Paper Code: BCA 208	Paper: Digital Marketing					L	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 (1 st) 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	Gain Understanding the digital marketing concepts and its usefulness in business.											
CO2	Planning steps for digital marketing strategy and successfully executing it.											
CO3	Understand the importance of Social Media Platforms and Social Media Marketing for online communication.											
CO4	Applying Search Engine Optimization techniques (SEO) and Search Engine Marketing (SEM) to maximize reach and enhance engagement of users.											
CO5	Analysing web using analytics tools and gaining insights to various tools for Social Media Marketing.											
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	-	4	-	-	-	-	-	-	2	-	4	2
CO2	-	4	-	4	-	-	-	2	2	-	4	2
CO3	-	4	-	2	2	-	-	-	4	-	4	2
CO4	-	2	-	4	4	-	-	2	2	-	4	2
CO5	-	4	-	4	2	-	-	2	4	-	4	4

UNIT – I

No. of Hours: 11 Book Reference: TB1, TB2

Digital Marketing Basics: Digital Marketing meaning and its importance, Traditional vs Digital Marketing, Benefits of Digital Marketing, Internet Marketing basics, Digital Marketing channels, Types of Business models, Digital Marketing strategies (P.O.E.M framework), Inbound and Outbound marketing, Digital Transformation model, 4Cs of Digital Marketing.

UNIT – II

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

Social Media Marketing: Introduction, Social Media marketing strategies, Overview of Social media platforms – Instagram, Snapchat, Facebook, Mobile, Twitter, Content Planning and Strategy, Influential marketing, Content marketing, Digital Marketing campaign.

UNIT – III

No. of Hours: 10 Book Reference: TB1

Search Engine Optimization – Introduction to SEO, On-Page and Off-Page Optimization, Role of Keywords in SEO, Organic vs Non-Organic SEO, Blogging as marketing strategy, Types of Blogs.

Search Engine Marketing – Introduction to Paid marketing, Google Adwords, Types of campaigns and Campaign creation.

UNIT – IV

No. of Hours: 11 Book Reference: TB1

Tools for SMM and Marketing communication – Overview of Buffer, Hootsuite, Canva, Trello and Hot jar
Web Analytics: Meaning, Purpose and process, Types, Tools for analytics – Google analytics, Audience analytics, Acquisition analytics, Behavior analytics, Conversion analytics.

TEXT BOOKS:

TB1. Rajan Gupta and Supriya Madan, Digital Marketing, 2nd Edition, BPB Publications, 2024

TB2. Seema Gupta, Digital Marketing, 3rd Edition, McGraw Hill Education, 2023.

TB3. Puneet Singh Bhatia, Fundamentals of Digital Marketing, 3rd Edition, Pearson, 2023.

REFERENCE BOOKS:

RB1. Ian Dodson, The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns, 2nd Edition, Wiley, 2021.

RB2. Nitin Kamat and Chinmay Nitin Kamat, Digital Marketing, 3rd Edition, Himalaya Publishing House, 2023.

RB3. Vandana Ahuja, Digital Marketing, 2nd Edition, Oxford University Press, 2023.

RB4. Judy Strauss and Raymond Frost, E-Marketing, 8th Edition, Pearson, 2024.

RB5. Moutusy Maity, Internet Marketing, 2nd Edition, Oxford University Press, 2021.

RB6. Stephanie Diamond, Digital Marketing All-in-One For Dummies, 2nd Edition, Wiley, 2023.

RB7. T. N. Swaminathan and Karthik Kumar, Digital Marketing: From Fundamentals to Future, 2nd Edition, Cengage Learning, 2023.

Paper Code: BCA 210	Paper: Principle of Accounting	L	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 (1 st) 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	Basic accounting knowledge, accounting equations, accounting concepts &convention											
CO2	Rules of debit & credit, journal, ledger, trial balance											
CO3	Final A/c's (Trading A/c, Profit & Loss A/c, Balance Sheet) without adjustment& with adjustment											
CO4	Sub division of Journal: Cash Journal, Petty Cash Book, Purchase Journal, Purchase Return Journal, Sales Journal, Sales Return Journal.											
CO5	Inventory valuation, Inventory System, Methods of valuation of Inventories (FIFO, LIFO & Weighted Average Method).											
CO6	Depreciation concept & causes, Method of recording depreciation & Method ofproviding depreciation.											
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	4	-	-	-	-	-	-	2	-	2	2
CO2	-	4	2	3	-	-	-	2	2	-	2	2
CO3	-	4	2	4	-	-	-	3	2	-	2	2
CO4	-	4	2	3	-	-	-	2	2	-	2	2
CO5	-	4	2	3	-	-	-	3	2	-	2	2
CO6	-	4	2	3	-	-	-	3	2	-	2	2

UNIT – I

No. of Hours: 11 Chapter / Book Reference: TB2 [Chapters - 1,2,3], RB4 [Chapters - 1, 2]

Meaning and nature of accounting, Scope of financial accounting, Interrelationship of Accounting with other disciplines, Branches of Accounting, Accounting concepts and convention, Accounting standards in India.

UNIT – II

No. of Hours: 11 Chapter / Book Reference: TB2 [Chapters - 6, 8], RB4 [Chapters - 5, 6]

Journal, Rules of Debit and Credit, Sub Division of Journal: Cash Journal, Petty Cash Book, Purchase Journal, Purchase Return, Sales Journal, Sales Return Journal, Ledger, Trial Balance.

UNIT – III

No. of Hours: 11 Chapter / Book Reference: TB2 [Chapter – 9], RB4 [Chapter – 8]

Preparation of Final Accounts, Profit & Loss Account, Balance Sheet-Without adjustments and with adjustments.

UNIT – IV

No. of Hours: 11 Chapter / Book Reference: TB2 [Chapters - 11, 12], RB4 [Chapters - 7, 10]

Meaning of Inventory, Objectives of Inventory Valuation, Inventory Systems, Methods of Valuation of Inventories- FIFO, LIFO and Weighted Average Method, Concept of Deprecation, Causes of Depreciation, Meaning of Depreciation Accounting, Method of Recording Depreciation, Methods of Providing Depreciation.

TEXT BOOKS:

TB1. Maheshwari, S.N. and Maheshwari, S. K., (2022) An Introduction to Accountancy, Eighth Edition, Vikas Publishing House.

TB2. Tulsian, P.C., (2020) Financial Accountancy, 2nd edition, Pearson Education.

TB3. Goyal, Bhusan Kumar , Basic Financial Accounting, 2020, International Book House Pvt. Ltd

REFERENCE BOOKS:

RB1. Gupta R. L., & Gupta V.K., “Principles & Practice of Accounting”, Sultan Chand & Sons, 1999.

RB2. Monga J R, “Introduction to Financial Accounting”, Mayur Paperbacks, 2010.

RB3. Raja Sekaran/Lalitha, “Financial Accounting”, Pearsons

RB4. Goyal V.K. & Goyal Ruchi (2022) Financial accounting , PHI

Paper Code: BCA 214	Paper: Introduction to Logical & Critical Thinking					L	P	C				
						2	-	2				
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 (1 st) 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	Explain the concepts of logical reasoning, critical thinking, and argument analysis.											
CO2	Apply deductive and inductive reasoning techniques to solve logical problems.											
CO3	Analyse arguments, propositions, and logical fallacies using appropriate reasoning methods.											
CO4	Apply scientific reasoning, decision-making, and computational thinking to real-world and computing problems.											
CO5	Demonstrate strategic thinking, creativity, and ethical reasoning for effective problem solving.											
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	-	4	-	-	-	-	-	-	4	2	-	2
CO2	-	2	-	4	-	-	-	4	2	-	-	2
CO3	-	2	-	4	-	-	-	2	4	2	-	2
CO4	-	2	-	4	-	3	-	4	2	-	2	3
CO5	-	2	-	3	-	-	-	2	4	4	4	4

UNIT – I

No. of Hours: 10 Chapter/Book Reference: TB1, TB2

Introduction to Logical and Critical Thinking: Critical Thinking, Logical Thinking, Elements of Reasoning, Arguments, Premises and Conclusions, Deductive and Inductive Reasoning, Validity, Soundness, Strength and Cogency.

UNIT-II

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

Argument Analysis and Informal Logic: Meaning Analysis, Recognizing and Evaluating Arguments, Categorical Propositions, Venn Diagrams, Square of Opposition, Logical Equivalence, Introduction to Informal Fallacies.

UNIT-III

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

Propositional Logic and Scientific Reasoning: Propositional Logic, Logical Connectives, Truth Tables, Scientific Reasoning, Evidence-Based Reasoning, Hypothesis, Problem Solving, Decision Making.

UNIT-IV

No. of Hours: 10 Chapter/Book Reference: TB2, TB3

Strategic and Critical Thinking: Creative Thinking, Strategic Reasoning, Biases in Thinking, Ethical Decision Making, Computational Thinking, Applications of Logical and Critical Thinking in Computing and Everyday Life.

TEXT BOOKS

TB1. Patrick J. Hurley, A Concise Introduction to Logic, 13th Edition, Cengage Learning, 2023.

TB2. Brooke Noel Moore and Richard Parker, Critical Thinking, 13th Edition, McGraw-Hill Education, 2024.

TB3. Irving M. Copi, Carl Cohen and Kenneth McMahon, Introduction to Logic, 15th Edition, Pearson, 2019.

REFERENCE BOOKS

RB1. Tracy Bowell and Gary Kemp, Critical Thinking: A Concise Guide, 5th Edition, Routledge, 2020.

RB2. Diane F. Halpern, Thought and Knowledge: An Introduction to Critical Thinking, 6th Edition, Psychology Press, 2020.

RB3. Alec Fisher, Critical Thinking: An Introduction, 2nd Edition, Cambridge University Press, 2011.

RB4. M. Neil Browne and Stuart M. Keeley, Asking the Right Questions: A Guide to Critical Thinking, 12th Edition, Pearson, 2018.

RB5. Edward de Bono, Lateral Thinking: Creativity Step by Step, Harper Perennial, 2015

Paper Code: BCA 216T	Paper: Microprocessor and Interfacing	L	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 (1 st) 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	Explain the architecture, organization, and operation of the 8086 microprocessors.											
CO2	Develop simple assembly language programs using the 8086-instruction set and addressing modes.											
CO3	Describe the evolution of Intel processors and compare the features of modern microprocessors.											
CO4	Apply interfacing techniques to connect memory and peripheral devices with the 8086 microprocessors.											
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	-	-	2	-	-	-	-	2
CO2	2	-	3	3	-	-	2	2	1	-	1	2
CO3	2	-	2	2	-	2	2	-	1	-	1	2
CO4	2	1	2	3	-	2	3	2	1	-	2	2

UNIT-I

No. of Hours: 10 Chapter/Book Reference: TB1; TB2

Introduction to Microprocessors Evolution of Microprocessors, Classification of 8-bit and 16-bit Microprocessors, 8086 Architecture, Register Organization, Execution Unit, Bus Interface Unit, Pin Configuration, Memory Organization, Bus Operation, Minimum and Maximum Modes.

UNIT-II

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

8086 Programming Addressing Modes, Instruction Set, Assembly Language Program Development, Assembler Directives, Program Structures, Procedures, Macros, Interrupts and Applications.

UNIT-III

No. of Hours: 10 Chapter/Book Reference: TB2; TB3

Intel Processor Family Overview of 80186, 80286, 80386, 80486, Pentium Family, Core Processors, Processor Architecture, Memory Management, Processor Modes, Features of Modern Processors.

UNIT-IV

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

Microprocessor Interfacing Memory Interfacing, Programmable Peripheral Interface (8255), Programmable Interval Timer (8254), Keyboard and Display Interfacing (8279), Introduction to A/D and D/A Converter Interfacing, Applications.

TEXT BOOKS:

TB1. Douglas V. Hall, Microprocessors and Interfacing: Programming and Hardware, 2nd Edition, McGraw-Hill Education.

TB2. Barry B. Brey, The Intel Microprocessors: Architecture, Programming and Interfacing, 8th Edition, Pearson Education, 2009.

TB3. A. K. Ray and K. M. Bhurchandi, Advanced Microprocessors and Peripherals, 3rd Edition, McGraw-Hill Education, 2017.

REFERENCE BOOKS:

RB1. William Stallings, Computer Organization and Architecture, 11th Edition, Pearson, 2019.

RB2. John P. Hayes, Computer Architecture and Organization, 3rd Edition, McGraw-Hill Education.

RB3. Yu-Cheng Liu and Glenn A. Gibson, Microcomputer Systems: The 8086/8088 Family—Architecture, Programming and Design, 2nd Edition, Pearson.

RB4. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, 6th Edition, Penram International.

Paper Code: BCA 218T	Paper: Computer Graphics					L	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 (1 st) 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 basic knowledge of computer-generated graphics, their applications, display devices and drawing of graphic objects on display devices.											
CO2	To develop knowledge of various graphics 2D transformation operation, their mathematical calculations.											
CO3	To learn about the surfaces and curves, properties of curves and shading of surfaces											
CO4	To give basic knowledge of 3D projection and identifying hidden surfaces to be removed.											
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	-	-	-	-	-	-	-	1
CO2	3	-	3	3	2	-	-	-	-	-	-	1
CO3	2	-	2	3	2	1	-	-	-	-	-	2
CO4	3	-	2	3	3	2	-	2	-	-	1	2

UNIT-I

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

Introduction: Introduction to computer graphics, Applications of Computer Graphics, Non Interactive and interactive graphics, Conceptual Framework for Interactive Graphics. Introduction to Raster and Random scan display, Characteristics of display devices, Aliasing and Antialiasing, Introduction to latest display technologies (LED, OLED, Curved LED display)

Scan Conversion Scan Converting Lines using DDA & Bresenham's Algorithm, Scan Converting Circles using Bresenham's algorithm.

UNIT-II

No. of Hours: 11 Chapter/Book Reference: TB1; TB2; RB3

Clipping Cohen- Sutherland Algorithm, Cyrus-Beck Algorithm

Geometrical Transformations 2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Composition of 2D Transformations, Window-to-Viewport Transformation, Introduction of Matrix Representation of 3D Transformations of translation, scaling and rotation (without derivation).

UNIT-III

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

Representing Curves Introduction to Polygon Meshes and its types, Parametric Cubic Curves: parametric and geometric continuity, Hermite, Bezier & B-Spline.

Surfaces Surface rendering- Basic Illumination, Effect of ambient lighting and distances, Shading models- Gourard Shading, phong model.

UNIT-IV

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

Applicable from Batch Admitted in Academic Session 2025-26 Onwards

Three Dimensional Viewing: Introduction, Representation of Three-dimensional objects, Projections, Parallel projections: Orthographic Projections, Oblique Projections. Perspective Projection,

Hidden Surface Removal: Depth-Buffer (z-buffer) method, Depth-sorting Method (Painter's algorithm)

TEXT BOOKS:

TB1. John F. Hughes, Andries van Dam, Morgan McGuire, David F. Sklar, James D. Foley, Steven K. Feiner and Kurt Akeley, Computer Graphics: Principles and Practice, 3rd Edition, Pearson, 2014.

TB2. Chennakesava R. Alavala, Computer Graphics, PHI Learning Pvt. Ltd.

REFERENCE BOOKS:

RB1. Donald Hearn and M. Pauline Baker, Computer Graphics with OpenGL, 3rd Edition, Pearson Education, 2009.

RB2. James D. Foley and Andries van Dam, Fundamentals of Interactive Computer Graphics, Addison-Wesley.

RB3. David F. Rogers and J. Alan Adams, Mathematical Elements for Computer Graphics, 2nd Edition, McGraw-Hill, 1990.

Paper Code: BCA 220T	Paper: Semantic Web Technologies					L	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 (1 st) 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	Explain the principles, architecture, and fundamental concepts of the Semantic Web.											
CO2	Describe Semantic Web standards including RDF, RDFS, OWL, SPARQL, and Linked Data.											
CO3	Apply Semantic Web technologies to organize, integrate, and retrieve web information.											
CO4	Analyse real-world applications and develop simple Semantic Web solutions.											
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	-	2	-	-	-	-	-	2
CO2	3	-	2	3	2	3	-	2	-	-	-	2
CO3	2	2	2	3	2	3	-	2	1	-	1	2
CO4	2	2	2	3	2	3	-	2	2	1	2	3

UNIT-I

No. of Hours: 10 Chapter/Book Reference: TB1; TB2

Introduction to Semantic Web Evolution of the Web, Semantic Web Overview, Semantic Web Architecture, RDF, RDF Triples, Metadata, Knowledge Representation, Introduction to Ontologies.

UNIT-II

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

Semantic Web Standards RDF Schema (RDFS), OWL, SPARQL, Linked Data Principles, Ontology Development Basics, Semantic Reasoning.

UNIT-III

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

Semantic Web Applications Semantic Annotation, Semantic Search, Information Integration, Semantic Web Services, Knowledge Graphs, Industrial Applications.

UNIT-IV

No. of Hours: 10 Chapter/Book Reference: TB2; TB3

Emerging Trends in Semantic Web Semantic Web and Artificial Intelligence, Semantic Web in IoT, Open Data, Intelligent Assistants, Future Trends, Case Studies.

TEXT BOOKS:

TB1. Grigoris Antoniou and Frank van Harmelen, A Semantic Web Primer, 4th Edition, MIT Press, 2023.

TB2. John Davies, Rudi Studer and Paul Warren, Semantic Web Technologies: Trends and Research in Ontology-based Systems, Wiley, 2006 (still a standard reference; no newer edition available).

TB3. Dean Allemang and James Hendler, Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL, 3rd Edition, Association for Computing Machinery (ACM), 2020.

REFERENCE BOOKS:

RB1. Pascal Hitzler, Markus Krötzsch and Sebastian Rudolph, Foundations of Semantic Web Technologies, Chapman & Hall/CRC, 2009.

RB2. Tom Heath and Christian Bizer, Linked Data: Evolving the Web into a Global Data Space, 2nd Printing, Morgan & Claypool, 2011.

RB3. Tim Berners-Lee, James Hendler and Ora Lassila, The Semantic Web, Scientific American, Vol. 284, No. 5, 2001.

RB4. Dean Allemang and James Hendler, Semantic Web for the Working Ontologist, 3rd Edition, ACM Books, 2020.

Course Code: BCA 202P

L P C

Course Name: Object Oriented Programming Using Java Lab

- 2 1

INSTRUCTIONS

- 1.The course objectives and course outcomes are identical to that of BCA 202T 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

Course Code: BCA 204P

L P C

Course Name: Software Testing Lab

- 2 1

INSTRUCTIONS

- 1.The course objectives and course outcomes are identical to that of BCA 204T 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

Course Code: BCA 206P

L P C

Course Name: Computer Networks Lab

- 2 1

INSTRUCTIONS

- 1.The course objectives and course outcomes are identical to that of BCA 206T 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

Course Code: BCA 216P

L P C

Course Name: Microprocessor and Interfacing Lab

- 2 1

INSTRUCTIONS

- 1.The course objectives and course outcomes are identical to that of BCA 216T 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

Course Code: BCA 218P

L P C

Course Name: Computer Graphics Lab

- 2 1

INSTRUCTIONS

- 1.The course objectives and course outcomes are identical to that of BCA 218T 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

Course Code: BCA 220P

L P C

Course Name: Semantic Web Technologies Lab

- 2 1

INSTRUCTIONS

- 1.The course objectives and course outcomes are identical to that of BCA 220T 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

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 marksheets 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 discipline / 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 be awarded. The student may re-join later with the proviso 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
1 st Year	Certificate in Computer Applications	Has earned at least 40 credits in the 1 st 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 1 st year on re-joining% in the second year to complete the requirement for the award of the degree. (Interim Degree)
2 nd Year	Undergraduate Diploma in Computer Applications	Has earned at least 80 credits upto and including the 2 nd year and provided they have undergone a minimum skill-enhancement course(s) equivalent to at least 4 credits or 4 weeks of training over	Shall not be allowed to reappear in any failed paper studied till 2 nd year on re-joining% in the third year to complete the requirement for the award of the degree. (Interim Degree)

		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 second year have to be passed.*	
3 rd Year	Bachelor of Computer Applications	Has earned at least 120 credits upto and including the 3 rd year [§]	This is a three year degree (Interim Degree). Shall not be allowed to reappear in any failed paper studied till 3 rd year on re-joining [%] in the fourth year to complete the requirement for the award of the final 4-year degree.
4 th Year	See Clause 7	Has earned at least 160 credits upto and including the 4 th 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

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 alongwith 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 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'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 be awarded. The student may re-join later with the proviso 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
1 st Year	Certificate in Computer Applications	Has earned at least 40 credits in the 1 st 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 1 st year on re-joining% in the second year to complete the requirement for the award of the degree. (Interim Degree)
2 nd Year	Undergraduate Diploma in Computer Applications	Has earned at least 80 credits upto and including the 2 nd year and provided they have undergone a minimum skill-enhancement course(s) equivalent to	Shall not be allowed to reappear in any failed paper studied till 2 nd year on re-joining% in the third year to complete the requirement for the award of the degree. (Interim Degree)

		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 second year have to be passed.*	
3 rd Year	Bachelor of Computer Applications – Data Science	Has earned at least 120 credits upto and including the 3 rd year [§]	This is a three year degree (Interim Degree). Shall not be allowed to reappear in any failed paper studied till 3 rd year on re-joining [%] in the fourth year to complete the requirement for the award of the final 4-year degree.
4 th Year	See Clause 7	Has earned at least 160 credits upto and including the 4 th 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.