SCHEME AND SYLLABUS

(W.E.F. ACADEMIC SESSION 2024-25)

FOR

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

(1st and 2nd Year Common Scheme and Syllabus)

Offered by

University School of Information, Communication & Technology
GGSIPU at Affiliated Institutions of the University

GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY

Guru Gobind Singh Indraprastha University Sector 16C,
Dwarka, Delhi – 110 078 [INDIA]
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Vision of the School

Create High-Quality Engineering and Computer Application Professionals

Mission of the School

To serve humanity by creating professionally competent, socially sensitive engineers with high ethical values who can work as individuals or in groups in multicultural global environments.

Approval History:

1. Scheme of study of BCA programme, its first year detailed syllabus and implementation rules approved by Board of Study of University School of Information, Communication and Technology on 15.12.2023.

2. Scheme of study of BCA programme, its first year detailed syllabus and implementation rules approved by Academic Council on 20.12.2023.

3. Scheme of study of BCA programme, its second year detailed syllabus and implementation rules approved by Board of Study of University School of Information, Communication and Technology on 28.07.2025.

4. Scheme of study of BCA programme, its second year detailed syllabus and implementation rules approved by Academic Council sub-committee on 01.08.2025.

Bachelor of Computer Applications Curriculum Framework as per CCFUP

Aim: In accordance with the revised UGC Curriculum and Credit Framework for Undergraduate Programmes, the Bachelor of Computer Applications (BCA) programme w.e.f academic session 2024-25 curriculum framework shall be as follows:

The BCA programme covers basic to advanced level concepts in Computer Science, Computer Applications and Information Technology. The theoretical concepts in class room teaching and hands on machine experience in digital laboratories using computer program using computers and standard tools widen the horizon of the students. With the acquired knowledge, students can solve the problems in various domains using computers.

Eligibility Criteria: The students are required to refer the eligibility criteria provided in the admission brochure for BCA programme for the specific academic session. As per the Admission Brochure for the Academic Session (AS) 2023-24, the eligibility criteria for BCA programme is 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 / or other subject related to Computer Science".

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".

Duration of the BCA Programme, Provision of Multiple Exit and Awarding Certificate, Diploma, and Degrees

The maximum duration of programme will be as per regulations and recommendations of the statutory bodies governing the BCA programme. As per existing UGC CCFUP, the total duration for completing the BCA programme from the date of admission in first year to completion of Certificate / Diploma / 3 years' degree/ 4 years Hons. degree (including Breaks) shall not exceed 7 years. The detailed qualification award (Certificate / Diploma/ Degree), exit options and other requirement is given in Table1. Grading System shall be as per Ordinance 11 of the University.

Table1: Duration and qualification Award Details:

No of years of completion	Qualification Awarded	Exit Options	Credit Requirement	Entry Option	Remarks
One Year (I & II Semester)	BCA Certificate	Students have an option of exiting the programme after completion of first year (Semester I and semester II)	Students are required to complete Minimum 52 credits including vocational course which is mandatory.	Students who exit with a BCA certificate are permitted to re-enter within three years from the date	Students are required to secure minimum 48 credits during first year and 4 credits in work based vocational courses during summer break after first year. ii. Students may be permitted to take a break from the study during the period of BCA programme but the total duration for completing the BCA

				when student took break and may complete the BCA programme.	programme from the date of admission in first year shall not exceed 7 years.
Two Years (I to IV Semesters)	BCA Diploma	Students have an option of exiting the programme after completion of second year (Semester III & IV)	Students are required to complete Minimum 96 credits and also secure 4 credits in skill based vocational course either offered after first year or after second year during the summer break time.	Students who exit with a BCA diploma are permitted to re-enter within three years from the date when student took break and may complete BCA programme.	i. Students exiting the programme after securing 96 credits in initial two years of admission will be awarded BCA Diploma provided they secure additional 4 credit in skill based vocational courses offered after first year or after second year during the summer break time. ii. Students may be permitted to take a break from the study during the period of BCA programme but the total duration for completing the BCA programme from the date of admission to first year shall not exceed 7 years.
Three Years (I to VI Semesters)	BCA	Students will be allowed to exit after completion of the 3rd year (V & VI semesters)	Students are required to complete Minimum 146 credits and also secure 4 credits in Summer Internship during the summer break time after 2nd year.	Students who exit with a BCA are permitted to re-enter within two years and complete the four year BCA, but the student is not entitled to re-enter for BCA (Honours).	Students who want to undertake 3-year BCA programme will be awarded BCA Degree upon securing 146 credits Students may be permitted to take a break from the study during the period of BCA programme but the total duration for completing the BCA programme from the date of admission year shall not exceed 7 years.
Four Years (I to VIII Semesters)	BCA Honours (Hons.)		Hons. shall only be awarded if the student acquires full credits in every semester with a total CGPA of above or equal to 7.5, and the degree is	--	Students will be awarded BCA (Hons.) Degree

			awarded after the immediate completion of the 4th year from the year of admission. No Hons. shall be conferred if the degree requirements are not completed in the minimum dura tion.		

It is envisioned that the graduates passing out BCA programme, will achieve the following BCA programme specific Learning Outcomes (PLO) and Generic Learning Outcomes (PO) as detailed in Table 2.

Table 2: Programme specific Learning Outcomes (PLO) and Generic Learning Outcomes (GLO)

Programme Specific Learning Outcomes (PLOs)	Description
PSO 1	Comprehensive knowledge and coherent understanding of the Computer Applications in various domains and emerging developments associated with the Computer Science and Information Technology
PSO 2	Practical, professional, and procedural knowledge required for carrying out professional or highly skilled work/tasks in the field of computer science and Information Technology, including knowledge required for undertaking self-employment initiatives, and knowledge and mindset required for entrepreneurship involving enterprise creation, improved product development, or a new mode of organization.
PSO 3	Skills in areas related to specialization in the chosen disciplinary/interdisciplinary area(s) of learning including wide-ranging practical skills, involving variable routine and non-routine contexts relating to the Computer Applications
PSO 4	Capacity to extrapolate from what has been learned, translate concepts to real-life situations and apply acquired competencies in new/unfamiliar contexts, rather than merely replicate curriculum content knowledge, to generate solutions to specific problems.
Programme Outcomes (PO)	The student should be able to demonstrate the capability to:
PO1	***Disciplinary Knowledge:*** Apply the knowledge of computer application concepts and domain knowledge to solve the problems in IT domain/IT industry
PO2	***Problem Analysis:*** Identify, formulate, review research literature, and analyse complex computer application problem at their workplace and for the society.
PO3	***Design /Development of Solutions:***

	Design and evaluate solutions for computer applications problems, and design the processes that meet specified needs with appropriate consideration for the public health, safety, cultural, societal, and environmental considerations.
PO4	***Modern Tool Usage:*** Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computer application activities, with an understanding of the limitations.
PO 5	***Professional Ethics:*** Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices.
PO 6	***Life-long Learning:*** Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.
PO 7	***Project management and finance:*** Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 8	***Communication Efficacy with Cooperation/teamwork*** Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions. Function effectively as an individual and as a member or a leader.
PO 9	***Societal and Environmental Concern:*** Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practices.
PO 10	***Innovation and Entrepreneurship*** Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

Curricular components of the BCA programme

The BCA programme curriculum consists of core courses and interdisciplinary / multidisciplinary courses from other disciplines, ability enhancement courses (language courses), skill enhancement courses, and a set of value added courses. Vocational courses are also added which will help the students to equip with job- oriented skills. The minimum credit requirements for each component for 3-year BCA and 4-year BCA (Hons.) are given in Table 5. The distribution of credits across semesters for BCA programme is given in Table 4.

Table 3: Category Wise Minimum Credit Requirements

S.No.	Broad Category of Course	Minimum Credit Requirement	
		3-year BCA	4-Year BCA (Hons.)
1	Core Courses (CCT/ CCP/PCE)	114	124
2	Multidisciplinary Courses	09	09
3	Ability Enhancement Courses (AEC)	08	08
4	Skill Enhancement Courses (SEC)	08	10
5	Value Added Courses (VA)	08	08
6	Summer Internship (SI)	04	04

7	Major/ Minor Project (PRJ)	06	22
	Total	**157**	**185**

The student is required to complete one Minor Project in the sixth semester, Major Project-1 in seventh semester and Major Project-2 in eight semesters, all from any emerging technologies.

Table 4: Distribution of Credits across Semesters for BCA Programme

S.No.	Broad Category of Course	Semester (Credits)							
		I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**
1	CCT/ CCP/PCE	20	21	20	16	17	20	10	-
2	Multidisciplinary Courses	-	-	3	3	3	-	-	-
3	Ability Enhancement Courses (AEC)	3	3	-	2	-	-	-	-
4	Skill Enhancement Courses (SEC)	1	-	4	2	-	1	2	-
5	Value Added Courses (VA)	2	2	2	-	-	2	-	-
6	Summer Internship (SI)	-	-	-	-	4	-	-	-
7	Major/ Minor Project (PRJ)	-	-	-	-	-	6	6	10
	Total	**26**	**26**	**29**	**23**	**24**	**29**	**18**	**10**

***Multidisciplinary Generic Elective (GE) for BCA Students**

GE-1 (choose any One)

(i) Principles of Management & Organizational Behaviour

(ii) Any One Paper Offered as open elective by other School /Department / Programme

GE-2 (choose any One)

(i) Digital Marketing

(ii) Principles of Accounting

(iii) Any One Paper Offered as open elective by other School / Department / Programme

GE-3

(i) Introduction to Management & Entrepreneurship Development

(ii) MOOC Course

Vocational Courses Recommendations:

The objective of encouraging the students to undertake a vocational course during summer break after First Year (Second semester) and, also after third year (Sixth semester) for four years programme are

- To ensure the development of capabilities across a range of disciplines including sciences, social

sciences, arts, humanities, languages, as well as vocational subjects, a student can undertake programmes /courses of study relating to Languages, Literature, Music, Philosophy, Art, Dance, Theatre, Statistics, Pure and Applied Sciences, Sports, etc., and other such subjects needed for a multidisciplinary and stimulating learning environment

- To prepare professionals in cutting-edge areas that are fast gaining prominence, such as Artificial Intelligence (AI), 3-D machining, big data analysis, and machine learning, Block chain Technology, Full stack web development, Robotic Process Automation or any other emerging technology with important applications to health, environment, and sustainable living the students are also encouraged to undergo training in the emerging technologies which are not part of their curriculum.
- To find a job for those students who exit before completing the programme.

Summer Internship Recommendations

Students can undertake internships with local industry, businesses etc., or with faculty and researchers at their own or other Higher Educational Institutes (HEIs).
Summer Training (Conducted at the end of the 4th Semester and evaluation to be carried in 5th Semester) Report and Viva – Voce: Students will undergo summer training/industry visit/In-house training/In-house project during the summer break after the completion of 4th semester. This will help the students to engage with all aspects of their learning and facilitate their improvement in the employability. A report of the Summer Internship is required to be submitted to the College/ Institution. Viva-voce examination will be conducted based on the report submitted by the student. A panel of examiner will be appointed by the HOD/ Director of the Institution for internal evaluation out of 40 marks. External evaluation of 60 marks will be conduct by the examination division of the university.

Generic (Open) Electives for other undergraduate programmes

The following Core courses (as mentioned in Table 5) of BCA programme may be offered as Generic Elective for other undergraduate programmes. Maximum number of students from other School / Department / Programme should not exceed 20% of total intake for the programme.

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

S.No.	Semester	Subject Code	Subject Name
1	I	BCA 105T BCA 105P	Web Technologies Web Technologies Lab
2	II	BCA 102T BCA 102P	Database Management System Database Management System Lab
3	III	BCA 201T BCA 201P	Python Programming Python Programming Lab

Major/ Minor Project Recommendations

The student shall undertake Minor Project in 6th Semester, Major Project -1 in 7th Semester and Major Project-2 in 8th Semester, all in any of the emerging areas. Four year students not undertaking Major Project-2 will do an industry internship throughout the eighth semester in lieu of a Major project-2 and will be awarded BCA (Hons.). The students who secure 185 credits, including 22 credits from Minor Project, Major Project-1 and Major Project-2 / internship, shall be awarded BCA (Hons.).

The semester wise evaluation scheme of BCA Programme are mentioned from Table 6 to Table 13.

Table 6: FIRST SEMESTER

Code No.	Paper	Course Category	L	T/P	Credits	Marks Internal	Marks External	Max Marks
Core Course Theory (CCT)								
BCA 101T	Programming for Problem Solving using C	**CCT**	4	-	4	40	60	100
BCA 103T	Fundamental of Information Technology	**CCT**	4	-	4	40	60	100
BCA 105T#	Web Technologies#	**CCT**	4	-	4	40	60	100
BCA 107T	Mathematical Foundation for Computer Science	**CCT**	4	-	4	40	60	100
Core Course Practical (CCP)								
BCA 101P	Programming for Problem Solving using C Lab	**CCP**	-	4	2	40	60	100
BCA 103P	Fundamental of Information Technology Lab	**CCP**	-	4	2	40	60	100
Ability Enhancement Course (AEC)								
BCA 141T	Writing Skills	**AEC**	3	-	3	40	60	100
Skill Enhancement Course (SEC)								
BCA 105**P#**	Web Technologies Lab	**SEC**	-	2	1	40	60	100
Value Added Course (VA)								
BCA 191T*	Understanding India*(NUES)	**VA**	2	-	2	100	-	100
Bridge Course (Mandatory for Students from Non Mathematics background)								
BCA 181T^{+}	Bridge Course in Mathematics+(NUES)	Mandatory for Students from Non Mathematics background	2	-	-	Pass Grade	-	-
	Total				**26**			**900**

*NUES (Non – University Examination Subject) – Only Internal Assessment by the Institute)

$^{+}$ NUES Non Credit subject mandatory for the students who do not have mathematics in 12th std.

Passing is mandatory for the student by obtaining at least pass marks (40%). The examination of this paper shall be conducted by the concerned teacher teaching the course / paper as Teacher's Continuous Evaluation for a total 100 marks. Only the Pass / Fail status is to be specified on the marksheet of the examination and the result of the student.

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

SEMESTER WISE EVALUATION SCHEME

Table 7: SECOND SEMESTER

Code No.	Paper	Course Category	L	T/P	Credits	Marks Internal	Marks External	Max Marks
Core Course Theory (CCT)								
BCA 102T#	Database Management System (DBMS)	**CCT**	4	-	4	40	60	100
BCA 104T	Object Oriented Programming using Java	**CCT**	4	--	4	40	60	100
BCA 106T	Data Structures and algorithms	**CCT**	4	-	4	40	60	100
BCA 108T	Software Engineering	**CCT**	4	-	4	40	60	100
Core Course Practical (CCP)								
BCA 102P#	DBMS Lab	**CCP**	-	2	1	40	60	100
BCA 104P	Object Oriented Programming using Java Lab	**CCP**	-	4	2	40	60	100
BCA 106P	Data Structures and algorithms Lab	**CCP**	-	2	1	40	60	100
BCA 108P	Software Engineering Lab	**CCP**	-	2	1	40	60	100
Ability Enhancement Course (AEC)								
BCA 142T*	Soft Skills *(NUES)	**AEC**	3	-	3	100	-	100
Value Added Course (VA)								
BCA 192T	Environment Studies	**VA**	2	-	2	40	60	100
	Total				**26**			**1000**

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

*NUES (Non – University Examination Subject) – Only Internal Assessment by the Institute)

** Students must complete one work based vocational course of 4 credits after the second semester during the summer vacation of the first year for which evaluation will be conducted in the third semester. (As mentioned in the scheme of the Third Semester). Vocational course will be held for 4 weeks after the end of the second semester and its evaluation will be conducted in the third semester.

Table 8: THIRD SEMESTER

Code No.	Paper	Course Type	L	T/P	Credits	Marks Internal	Marks External	Max Marks
Core Course Theory(CCT)								
BCA 201T	Python Programming	**CCT**	4	--	4	40	60	100
BCA 203T#	Dynamic Web Designing	**CCT**	4	--	4	40	60	100
BCA 205T	Computer Organization and Architecture	**CCT**	4	--	4	40	60	100
BCA 207T	Discrete Mathematics	**CCT**	4	-	4	40	60	100
Core Course Practical (CCP)								
BCA 201P	Python Programming Lab	**CCP**	-	4	2	40	60	100
BCA 203P#	Dynamic Web Designing Lab	**CCP**	-	2	1	40	60	100
BCA 205P	Computer Organization and Architecture Lab	**CCP**	-	2	1	40	60	100
Skills Enhancement Course (SEC)*								
BCA 261***	Vocational Course***	**SEC**	-	-	4	100	-	100
Multidisciplinary (Generic Elective) (Choose any One)**								
BCA 221T	Principles of Management & Organizational Behavior	**GE-1**	3	-	3	40	60	100
BCA 223T	Open Elective offered by other Department/School /Programme	**GE-1**	3	-	3	40	60	100
Value Added Course (VA)								
BCA 291T***	Human Values and Ethics***(NUES)	**VA**	2	-	2	100	-	100
	Total				**29**			**1100**

* Students must complete one work based vocational course of 4 credits after second semester during the summer vacation of the first year for which evaluation will be conducted in third semester.
** Choose one subject from list of GE-1
***NUES (Non – University Examination Subject) – Only Internal Assessment by the Institute)
Generic Elective (GE) for other undergraduate programmes (Refer Table 5 for details)

Table 9: FOURTH SEMESTER

Code No.	Paper		Course Type	L	T/P	Credits	Marks Internal	Marks External	Max Marks
Core Course Theory (CCT)									
BCA 202T	Operating Systems		**CCT**	4	--	4	40	60	100
BCA 204T	Software Testing		**CCT**	4	--	4	40	60	100
Core Course Practical (CCP)									
BCA 202P	Operating Systems Lab		**CCP**	-	2	1	40	60	100
BCA 204P	Software Testing Lab		**CCP**	-	2	1	40	60	100
Ability Enhancement Course (AEC)									
BCA 232	Introduction to Logic & Critical Thinking		**AEC**	-	4	2	100	-	100
Skill Enhancement Course (SEC)									
BCA 234*	Health & Wellness, Yoga Education and Sports & Fitness *(NUES)		**SEC**	-	4	2	100	-	100
(Choose Any One Theory and Respective Practical) Programme Core Elective (PCE)									
BCA 212	BCA 212T	Introduction to Data Science and	**PCE**	4	-	4	40	60	100
	BCA 212P	Data Science Lab	**PCE**	-	4	2	40	60	100
BCA 216	BCA 216T	Introduction to Security, Acts and Cyber Laws and	**PCE**	4	-	4	40	60	100

		Cyber Security							
	BCA 216P	Introduction to Security, Acts and Cyber Laws and Cyber Security Lab	**PCE**	-	4	2	40	60	100
BCA 218	BCA 218T	Web Development Using Python	**PCE**	4	-	4	40	60	100
	BCA 218P	Web Development Using Python Lab	**PCE**	-	4	2	40	60	100
BCA 220	BCA 220T	Information Security	**PCE**	4	-	4	40	60	100
	BCA 220P	Information Security Lab	**PCE**	-	4	2	40	60	100
Multidisciplinary (Generic Elective) (Choose any One)									
BCA 222T	Digital Marketing		**GE-2**	3	-	3	40	60	100
BCA 224T	Principles of Accounting		**GE-2**	3	-	3	40	60	100
BCA 226T	Open Elective offered by other Department/ School /programme***		**GE-2**	3	-	3	40	60	100
	Total					**23**			**900**

* NUES (Non – University Examination Subject) – Only Internal Assessment by the Institute) i.e. the assessment shall be conducted by the institution for all 100 marks as Teacher's Continuous Assessment
*** Choose one subject from list of GE-2

Summer Training (Conducted at the end of the 4th Semester and evaluation to be carried in 5th Semester) Report and Viva – Voce: Students will undergo summer training/industry visit/In-house training/In-house project during the summer break after the completion of 4th semester. Report of the same is required to be submitted to the College/ Institution. Viva-voce examination will be conducted based on the report submitted by the student. A panel of examiner will be appointed by the HOD/ Director of the Institution for internal evaluation out of 40 marks. External evaluation of 60 marks will be conduct by the examination division of the university.

BCA Syllabus

Applicable from Batch Admitted in Academic Session 2024-25 onwards

FIRST SEMESTER SYLLABUS

Applicable from Batch Admitted in Academic Session 2024-25 onwards

Course Code: BCA 101T **L T C**
Course Name: Programming for Problem Solving using C **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

This course will provide the learners the following:-

1. Understanding of the syntax and the semantics of C programming language
2. Building of their logics for solving a given problem.

PRE-REQUISITES: None

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO #	Detailed Statement of the 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	Program Outcomes (Scale – 1:very low,2: low,3:medium,4:high)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	4	4	4	__2	-	2	1	_-	-	2
CO2	4	4	4	__2	-	2	1	_-	-	2
CO3	4	4	4	__2	-	2	1	_-	-	2
CO4	4	4	4	__2	-	2	1	_-	-	2

UNIT – I

No. of Hours: 12 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, Jump Statements: break, continue, goto statement and exit statement.

UNIT II

No. of Hours: 13 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.

Storage Classes: automatic, external (global), static & registers. Arrays: Arrays (1D, 2D), strings, Pointers:Pointers Basics, pointer arithmetic, Pointer to Pointer, array & pointer relationship, array of pointers, pointers to functions and returning pointers, Dynamic memory allocation.

UNIT – III

No. of Hours: 11 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, typedef, difference between structure and union, self-referential structure (Introduction).

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: 08 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.

TEXT BOOKS:

TB1. Yashwant Kanetkar, "Let us C" 17th edition, 2020.

TB2. E. BalaGuruswamy, "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

Course Code: BCA 103T **L T C**

Course Name: Fundamental of Information Technology **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

The objectives of this course is to provide the learners:

1. Awareness of evolution of Computers, various types of computers its characteristics, usage, and limitations.
2. Identification of different categories of computers, their peripherals and memory.
3. Knowledge about operating system, their types, MS-Office various software.
4. Understanding of computer network fundamentals and various communication networks.
5. Overview of emerging technologies in IT i.e. AI and Machine Learning, IOT, Data Analytics etc.

PRE-REQUISITES: None

COURSE OUTCOMES(COs):

After completion of this course, the learners will be able to:-

CO#	Detailed Statement of the 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	Program Outcomes (Scale – 1:very low,2: low,3:medium,4:high)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	4	4	4	4	-	2	1	-	-	1
CO2	4	4	4	2	-	2	-	-	-	1
CO3	4	4	4	4	-	2	2	-	-	3
CO4	4	4	4	4	-	2	2	-	-	2

UNIT–I

No. of Hours: 12 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: 12 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 Programming and Languages: Algorithms, flow chart, decision tables, pseudo code, Low level languages and introduction to high level languages.

UNIT–III

No. of Hours: 12 Chapter/Book Reference: TB1 [Chapters:3,5,4]; TB2 [Chapters:5]; RB1[Chapter:2]

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

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

UNIT–IV

No. of Hours: 10 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 Types (LAN, WAN and MAN), Overview of Network devices Hub, Switch, Router, Gateway, Firewall

Basics of Internet: Terminologies related to Internet: Protocol, Domain name, IP address, URL, World Wide Web. Introduction to Client-Server Model, Search Engine Applications of Information Technology in various domains

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.

Course Code: BCA 105T **L T C**
Course Name: Web Technologies **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

The objective of this course is to provide the learners the following:

1. Knowledge about the semantic structure of HTML, Javascript, CSS, XML and bootstrap.
2. Ability to compose forms and tables using HTML, Javascript, CSS and Bootstrap.
3. Expertise to design static web pages
4. Skills to create dynamic user interface and perform Client-Side validations using JavaScript

PRE-REQUISITES: Nil

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO #	Detailed Statement of the 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	Program Outcomes (Scale – 1:very low,2: low,3:medium,4:high)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	4	1	4	4	2	4	2	1	1	4
CO2	4	1	4	2	2	4	2	1	1	4
CO3	4	1	4	4	2	4	3	1	1	4
CO4	4	1	4	4	2	4	3	1	1	4

UNIT – I

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

World Wide Web: Introduction, Web page, Home page, Web site, Static and Dynamic website, Client Server computing concepts. Web Client and Web Server, Web Browser, Client Side and server side Scripting Languages.

HTML Overview: Introduction to HTML, HTML Document structure tags, HTML comments, Text formatting, inserting special characters, anchor tag, adding images and Sound, lists types of lists, tables, frames and floating frames, Developing Forms, Image maps.

UNIT – II

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

Cascading Style Sheet: Types of Style Sheets – Internal, inline and External style sheets, creating styles, link tag, CSS Properties, CSS Styling, Style Selector- Id, class name and Pseudo Class.

BootStrap Basics: Introduction to Bootstrap, Responsive web design, Linking with Bootstrap, container class, grids, tables, images, buttons, typography classes, jumbotron, glyphicons,

UNIT – III

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

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

UNIT – IV

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

XML: Introduction, Features, XML Naming rules, Building block of XML Document, Difference between HTML & XML, XML Parser, 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 DeitelDeitel Nieto.

Course Code: BCA 107T **L T C**
Course Name: Mathematical Foundation for Computer Science **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

The objectives of this course are to provide the learners with the following:

1. The Knowledge of mathematical probability
2. Understanding of various numerical techniques
3. Familiarity with the Linear Programming and it's applications

PRE-REQUISITES: Basic Concepts of Mathematics

COURSE OUTCOMES(COs):

After completion of this course, the learners will be able to:-

CO#	Detailed Statement of the 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	Understand various techniques to solve linear simultaneous equations
CO4	Analyse and evaluate the accuracy of common Numerical Methods

Course Outcomes	Program Outcomes (Scale – 1:very low,2: low,3:medium,4:high)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	-	2	1	2	-	-	1	-	-	-
CO2	-	2	1	2	-	-	1	-	-	-
CO3	-	2	1	2	-	-	1	-	-	-
CO4	-	2	1	2	-	3	1	-	-	-

UNIT -I

No. of Hrs. 12 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, Bayes 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. 10 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 NONLINEAR EQUATIONS: Bisection Method, False Position Method, Newton – Raphson Method for Solving Equation Involving One Variable only.

UNIT -III

No. of Hrs. 10 Chapter/Book Reference: TB1 [chapters 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.

UNIT -IV

No. of Hrs. 12 Chapter/Book Reference: TB1 [chapters 6], TB3 [chapters 10, 11]

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.)

TEXT BOOKS:

TB1. S.S. Sastry, "Numerical Analysis"; Prentice Hall of India, 1998.

TB2. Johnson, R., Miller, I. and Freunds, J., Miller and Freund's "Probability and Statistics for Engineers, Pearson Education (2005) 7th Ed.

TB3. Singh J P "Probability and Numerical Methods" ANE Books, 4th Edition 2019

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, KantiSwarup "Introduction to Management science operations research" Sultan Chand and Sons

Course Code: BCA 141T **L T C**
Course Name: Writing Skills **3 0 3**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

This course will provide the learners the following:

1. Understanding the correct use of English Language.
2. The student will improve in oral as well as written communication skills.

PRE-REQUISITES: Nil

COURSE OUTCOMES(COs):

After completion of this course, the learners will be able to:-

CO#	Detailed Statement of the 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	Program Outcomes (Scale – 1:very low,2: low,3:medium,4:high)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	-	2	-	2	1	-	1	2	1	2
CO2	-	2	-	2	1	-	1	2	1	2
CO3	-	2	-	2	1	-	1	2	1	2
CO4	-	2	-	2	1	3	1	2	1	2

UNIT–I

No. of Hours: 10 Chapter/Book Reference: TB1, TB2, TB3, TB4

Overview of Technical Writing:Definition and Nature of Technical Writing, Basic Principles of Technical Writing, Styles in Technical Writing. Sentense, Phrase, Kinds of sentences, Parts of sentence and parts of speech

UNIT-II

No. of Hours: 12 Chapter/Book Reference: TB1, TB2, TB3

Note Making, Notice, E-mail Writing. Writing Letters: Business letters, Persuasive letters- Sales letters and complaint letters

Office memorandum, Good news and bad news letters

Report Writing**:** Definition & importance; categories of reports, Elements of a formal report, style and formatting in report

UNIT-III

No. of Hours: 12 Chapter/Book Reference: TB1, TB2, TB3, TB4

Special Technical Documents Writing: Project synopsis and report writing, Scientific Article and Research Paper writing, Dissertation writing: Features, Preparation and Elements Technical Proposal Writing: Purpose, Types, characteristics and structure

UNIT-IV

No. of Hours: 10 Chapter/Book Reference: TB3, RB1, RB3

Preparing for Job Application, Components of a Formal Application Letter, Formats and Types of official, employment, Resume vs Bio Data, Profile, CV and others, Types of resume, Writing effective resume for employment, Model Letter of Application (Cover Letter) with Resume, Emails, Blog Writing, Memos (Types of Memos) and other recent communication types

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.

TB5. Raymond Murphy, "Essential English Grammar- A self study reference and practice

REFERENCES:

RB1. 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.

Course Code: BCA 191T (NUES) **L T C**
Course Name: Understanding India **2 0 2**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

i. To have an understanding on history and culture of ancient India.
ii. The students will be acquainted with the literature, philosophy, art and architectural developments in India during the period concerned.
iii. To understand ancient India Knowledge system
iv. The students will also get to know about their constitutional rights and duties.

PRE-REQUISITES: Nil

COURSE OUTCOMES(COs):

After completion of this course, the learners will be

CO#	Detailed Statement of the CO
CO1	Familiar with the History and culture of Ancient India
CO2	Understanding the ancient Indian literature
CO3	Having awareness of the ancient knowledge system of India
CO4	Aware of Basic features of our constitution

Course Outcomes	Program Outcomes (Scale – 1:very low,2: low,3:medium,4:high)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	-	-	-	-	-	-	-	3	3	-
CO2	-	-	-	-	-	-	-	3	3	-
CO3	-	-	-	-	-	-	-	3	3	-
CO4	-	-	1	-	-	3	-	3	3	-

UNIT I

Introducing India : The People of India: demography and languages, The Name of our Country: Jambudvipa, Sindhu (Indus), Inde, Hind, Hindustan, BharatIndia
The idea of Bharatvarsha; Ancient Indian literature Sanskrit, Pali, Prakrit, Tamil
Religions and philosophies of ancient India-Vedic, Buddhism, Jainism

UNIT II

Science, Technology and Medicine: A general survey of the progress of science, technology and medicine in ancient India

The Knowledge System of India: Traditional Knowledge System: Gurukuls, Pathsalas, Tols, Maktabs, Madrasas

Beginnings of Modern Education: Main features of British Government's educational policies Growth of higher and technical education in India

UNIT III

The Indian Economy :Features of the Indian economy from past to present (agriculture, industry and trade)

UNIT IV

The Making of Contemporary India The struggle for Independence (1885-1947)

Basic features of Indian constitution: Basic Structure, Doctrine, Fundamental rights, and duties, Directive principles,Federal Structure, Independence of Judiciary and the Parliamentary system

TEXT BOOKS:

TB1. A.L. Basham,The Wonder that Was India, Picador India,1971
TB2. R.S.Sharma,India'sAncientPast, NewDelhi, OUP, 2007
TB3. Upinder Singh, The History of the Ancient and Early Medieval India, Pearson, 2008
TB4. Satish Chandra, History of Medieval India, Arihant Publication, 2020.

REFERENCES:

RB1. Durga Das Basu, Introduction to the Constitution of India, Lexis Nexis, 2018 2003
RB2. Tirthankar Ray, The Economic History of India 1857-1947, OUP, 2006
RB3. Vijay Joshi and I.M.D. Little, India's Economic Reforms, 1991-2001, OUP, 1996
RB4. Dr. Prabhakiran Jain & R. Sharma, Understanding India, Mahavir Publication

Course Code: BCA 181T **L TC**
Course Name: Bridge Course in Mathematics **2 - -**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

Aim: To build mathematical aptitude of the students for understanding the basic concepts of core courses of mathematics of the programme.

LEARNING OBJECTIVES:

The objectives of this course is to provide the learners

- The knowledge about the matrices, determinants and limits.
- Familiarity with basic concepts of differential and integral calculus.

COURSE OUTCOMES(COs):

After completion of this course, the learners will be able to:-

CO #	Detailed Statement of the 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	Program Outcomes (Scale – 1:very low,2: low,3:medium,4:high)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	-	2	-	2	1	-	1	2	1	2
CO2	-	2	-	2	1	-	1	2	1	2
CO3	-	2	-	2	1	-	1	2	1	2
CO4	-	2	-	2	1	3	1	2	1	2

UNIT-I

MATRICES: Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operations on matrices: Addition, multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication, invertible matrix.

DETERMINANTS: Determinant of a square matrix (up to 3 x 3 matrices), properties of determinants, minors, co-factors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix, solving system of equations using matrix method, Cramer rule (only two and three unknown).

UNIT-II

INTRODUCTION TO TRIGONOMETRIC FUNCTIONS: Degree and radian measurements of an angle, Quadrant system, allied angles, and Simple problems based: on Sum/difference of angles of t functions, C and D Formulae, t functions of multiple angles.

UNIT-III

LIMITS, CONTINUITY AND DIFFERENTIABILITY: Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, Continuity and differentiability, derivative of composite functions, chain rule, derivative of implicit functions. Concept of exponential and logarithmic functions. Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms.

UNIT-IV

INTEGRATION: Integral as Limit of Sum, Riemann Sum, Fundamental Theorem of Calculus, Indefinite Integrals, Simple problems based on Methods of Integration Substitution, By Parts, Partial Fractions, Integration of Algebraic and transcendental Functions.

TEXT BOOKS:

TB1. Mathur A B, Jaggi V P "A Textbook of Engineering Mathematics" Khanna Publishers,

TB2. Dass H K "Applied Mathematics for polytechnics" CBS publishers

TB3. Singh J P "Calculus" ANE Books

REFERENCE BOOKS:

RB1. Kresyig E., "Advanced Engineering Mathematics", 5th Edition, John Wiley & Sons

RB2. H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Company

RB3. Grewal B S, "Elementary Engineering Mathematics"

Course Code: BCA 101P	L	T/P	C
Course Name: Programming for Problem Solving using C Lab	0	4	2

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to:

1. Understanding of the syntax and the semantics of C programming language
2. Building of their logics for solving a given problem.

PRE-REQUISITES:

None

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the 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.

List of Practicals

S. No.	Detailed Statement	Mapping to CO #
	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.	CO1
2	Write a program to find the greatest number among 3 numbers given by the user.	CO1
3	Write a program to check if a given number is a prime number or not.	CO1
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	CO1
5	Write a program to input marks of 50 students using an array and display the average marks of the class.	CO2
6	Write a program to search for a number entered by the user in a given array and display the array in ascending order.	CO2
7	Write a program to check if a string is palindrome or not.	CO2
8	Write a program to add, subtract, multiply and divide two numbers using pointers.	CO2
9	Write a program to create a structure for employees containing the following data members: Employee ID,	CO3

	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.	CO3
Application Based Practicals (Implement minimum 5 out of 10 practicals)		
1	Write a menu driven program to construct a calculator for following arithmetic operations: addition, subtraction, multiplication, division, average and percentage.	CO1
2	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	CO1
3	Write a program to convert a hexadecimal number into a binary number.	CO1
4	Write a program to calculate factorial of a number and display fibonacci series upto N terms using recursive functions.	CO2
5	Write a program to perform matrix addition, (ii) matrix multiplication, and (iii) Matrix transpose) on 2D arrays.	CO2
6	Write a program to make use of arrays with structures in the following ways: (i) Use array as a structure data member (ii) Create array of structure variables	CO3
7	Write a program to compare the contents of two files by taking names of the files through command line arguments.	CO3, CO4
8	WAP to perform I/O and make use of file positioning functions on Binary files. (using fseek, ftell, rewind functions)	CO4
9	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 Copy nth character string to another	CO4
10	Write a program to read time in string format and extract hours, minutes and second also check time validity	CO4

Note:
1. In total 15 practicals to be implemented. 2 additional practicals 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.

Course Code: BCA 103P	L	T/P	C
Course Name: Fundamental of Information Technology Lab	**0**	**4**	**2**

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to:

1. Awareness of evolution of Computers, various types of computers its characteristics, usage, and limitations.
2. Identification of different categories of computers, their peripherals and memory.
3. Knowledge about operating system, their types, MS-Office various software.
4. Understanding of computer network fundamentals and various communication networks.
5. Overview of emerging technologies in IT i.e. AI and Machine Learning, IOT, Data Analytics etc.

PRE-REQUISITES:

None

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the 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

List of Practicals

S. No.	Detailed Statement	Mapping to CO #
	Core Practicals (Implement minimum 10 out of 15 practical)	
1	To explore the System settings - Personalisation, System, Devices, Apps, Network & Internet.	CO1
2	To practice basic DOS commands like cd, md, dir, erase, cls, copy, date etc.	CO2
3	To explore Windows Explorer functionalities like create, rename, move, delete folder and files etc.	CO2
4	To practice the use of basic formatting features - Format Painter, Indentation, Line spacing, background color, find, replace, dictate commands.	CO2
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.	CO2
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.	CO2
7	To practice the use of Layout Features – Margins, Orientation, Size, Columns, Indent, Spacing etc.	CO2

8	To practice the use of Mail Merge Feature to generate Envelops and Labels.	CO2
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.	CO3
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.	CO3
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.	CO3
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.	CO4
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.	CO4
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.	CO4
15.	To practice the use of Slide Show Features – Custom Slide Show, Rehearse Timing etc.	CO4
Application Based Practicals (Implement minimum 5 out of 8 practicals)		
1	Create a Folder by your name in your system, store all the work done in this semester inside that folder.	CO1
2	Create your Resume using basic formatting features like : table, bullets, wordart etc	CO2
3	Design an Invitation to Birthday Party using mail merge features send the invitation to 10 friends.	CO2
4	Write an Article for Magazine with 3 columns and hyperlink.	CO2
5	Create your own marksheet using basic formatting features.	CO3
6	Create a list of marks of 10 students create charts and pivot table.	CO3
7	Prepare a Sales summary and use features like sort, filter etc. to manipulate the data.	CO3
8	Create a Power Point Presentation on any topic of your choice using animation and transition features.	CO4

Note:
1. In total 15 practicals to be implemented. 2 additional practicals 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.

Course Code: BCA 105P	L	T/P	C
Course Name: Web Technologies Lab	0	2	1

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to:

1. Knowledge about the semantic structure of HTML, Javascript, CSS, XML and bootstrap.
2. Ability to compose forms and tables using HTML, Javascript, CSS and Bootstrap.
3. Expertise to design static web pages
4. Skills to create dynamic user interface and perform Client-Side validations using JavaScript

PRE-REQUISITES:

None

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the 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

List of Practicals

S. No.	Detailed Statement	Mapping to CO #
	Core Practicals (Implement minimum 10 out of 15 practical)	
1.	Make following five different web pages: i. Formatting Styles and Headings: Include Bold, italics, Underline, Strike, Subscript, superscript and all six type of headings ii. Font Styles and Image tag iii. Marquee: Move text, image and hyperlink iv. Other tags: br, hr, pre, p Include following specifications: • In all these web pages only mention about use, attributes apply them. • Insert a background image on home page • Make all the topics as hyperlinks and go to some other page for description • Insert a marquee showing HTML Tutorial as moving text. • Use different font style for different topics On every page, make a hyperlink for going back to home page and internal link also.	CO1, CO3

<table>
<tr><td>2.</td><td>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.</td><td>CO1, CO3</td></tr>
<tr><td>3.</td><td>Design a table with row span and column span and make use of attributes
colspan, rowspan, width, height, cellpadding, cellspacing etc.</td><td>CO1, CO3</td></tr>
<tr><td>4.</td><td>Design following frame:
<table><tr><td rowspan="2">MAIN MENU
Topic 1
Topic 2
Topic 3</td><td>Explanation
- - - - - - - - - - -
- - - - - - - - - - -
View Example</td></tr><tr><td>Example</td></tr></table></td><td>CO1, CO3</td></tr>
<tr><td>5.</td><td>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.</td><td>CO1, CO3</td></tr>
<tr><td>6.</td><td>Design Student registration form for admission in college.</td><td>CO1, CO3</td></tr>
<tr><td>7.</td><td>Create a webpage and show the usage of inline and internal style sheet and external style sheet?</td><td>CO1, CO3</td></tr>
<tr><td>8.</td><td>Create a webpage containing a background image and apply all the background styling attributes?</td><td>CO1, CO3</td></tr>
<tr><td>9.</td><td>Create a web page showing the usage of font styling attributes</td><td>CO1, CO3</td></tr>
<tr><td>10.</td><td>Create a web page and apply all Text styling attributes use Id and class selector.</td><td>CO1, CO3</td></tr>
<tr><td>11.</td><td>Create a webpage and implement all list styling attributes.</td><td>CO1, CO3</td></tr>
<tr><td>12.</td><td>Create a Webpage with three equal columns.</td><td>CO1, CO3</td></tr>
<tr><td>13.</td><td>Create a webpage containing bootstrap table.</td><td>CO1, CO3</td></tr>
<tr><td>14.</td><td>Create a webpage containing various types of images.</td><td>CO1, CO3</td></tr>
<tr><td>15.</td><td>Create a webpage containing various types of buttons</td><td>CO1, CO3</td></tr>
<tr><td>16.</td><td>Create a webpage containing various, typography classes.</td><td>CO1, CO3</td></tr>
<tr><td>17.</td><td>Create a webpage containing to display the heading using. Jumbotron.</td><td>CO1, CO3</td></tr>
<tr><td>18.</td><td>Write a program to show the usage of inbuilt functions and dialog boxes.</td><td>CO2</td></tr>
<tr><td>19.</td><td>Write a program to show the usage of alert box and confirm box</td><td>CO2</td></tr>
<tr><td>20.</td><td>Write a program to implement event handling using onclick, onmouseover and onmouseout events.</td><td>CO2</td></tr>
<tr><td>21.</td><td>Write a program to show the usage of all the date, math and string object functions</td><td>CO2</td></tr>
</table>

22.	WAP to display the bookstore details in XML with CSS and internal DTD.	CO1, CO3
23.	WAP to format the Teacher details in XML with CSS using external DTD	CO1, CO3
Application Based Practicals (Implement minimum 5 out of 8 practicals)		
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).	CO4
25.	Design a website and apply all the features of HTML, css, javascript and bootstrap to make the website attractive.	CO4
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.	CO2
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.	CO2
28.	Create a Questionnaire related to any topic of your choice by using Form Elements.	CO4

Note:
1. In total 15 practicals to be implemented. 2 additional practicals 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.

SECOND SEMESTER SYLLABUS

Applicable from Batch Admitted in Academic Session 2024-25 onwards

Course Code: BCA 102T **L T C**
Course Name: Database Management System (DBMS) **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

The paper aims to introduce the concept of Back end, data storage in computers, design of a DBMS, Queries to construct database, store and retrieve data from the database. The objective of this course is to provide the learners expertise in the following:

1. Understanding of the requirement of database management System for storing data and its advantages over file management system.
2. Designing the database conceptually, physically and finally implementing the creation of database for any application.
3. Learning of queries in SQL for creating database and performing various operations for manipulating data in the database.
4. Knowledge of database utilities i.e. backup, recovery, transaction processing.

PREREQUISITE: Basic knowledge of data storage and file management system

COURSE OUTCOMES (COS):

After completion of this course, the learners will be able to: -

CO #	Detailed Statement of the 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	**Program Outcomes (Scale – 1:very low,2: low,3:medium,4:high)**									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	4	1	4	4	2	4	2	1	1	4
CO2	4	1	4	2	2	4	2	1	1	4
CO3	4	1	4	4	2	4	3	1	1	4
CO4	4	1	4	4	2	4	3	1	1	4

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.: 13] Chapter/Book Reference: TB1 [Chapter 8]; TB2 [Chapter 2];
Introduction to SQL: Overview, Characteristics of SQL. Advantage of SQL, SQL data types and literals.
Types of SQL commands: DDL, DML, DCL. Basic SQL Queries.
Logical operators: BETWEEN, IN, AND, OR and NOT
Null Values: Disallowing Null Values, Comparisons Using Null Values
Integrity constraints: Primary Key, Not NULL, Unique, Check, Referential key
Introduction to Nested Queries, Correlated Nested Queries, Set-Comparison Operators, Aggregate Operators: The GROUP BY and HAVING Clauses,
Joins: Inner joins, Outer Joins, Left outer, Right outer, full outer joins.
Overview of other SQL Objects: Views, Sequences, Indexes, Triggers and stored procedure.

UNIT – III

[No. of Hrs.: 12] 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 **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.: 9] 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, NoSqldatabses

TEXT BOOKS:

TB1. R. Elmarsi and SB Navathe, "Fundamentals of Database Systems", Pearson, 5th Ed.

TB2. Singh S.K., "Database System Concepts, design and application", Pearson Education

[TB3] **TB3.** Ramakrishnan and Gherke, "Database Management Systems", TMH.

TB4. Bipin Desai, "An Introduction to Database Systems", Galgotia Publications, 1991.

REFERENCE BOOKS:

RB1. Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database Systems Concepts", 6th Edition, McGraw Hill, 2010.

RB2. Jim Melton, Alan Simon, "Understanding the new SQL: A complete Guide", Morgan Kaufmann Publishers, 1993.

RB3. A. K. Majumdar, P. Battacharya, "Database Management Systems', TMH, 2017.

RB4. Bipin Desai, "An Introduction to Database Systems", Galgotia Publications, 1991

Course Code: BCA 104T **L T C**
Course Name: Object Oriented Programming using Java **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:

1. Learn how to implement Object Oriented concepts through Java.
2. Identify and apply the Java thread model to program Java applications.
3. Develop GUI applications using Java swings

PRE-REQUISITES:

1. Programming fundamental
2. Object-Oriented concepts

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO #	Detailed Statement of the 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. To apply the Java Thread model to develop multithreading applications.

Course Outcomes	Program Outcomes (Scale – 1:very low,2: low,3:medium,4:high)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	4	4	4	2	-	2	1	-	-	2
CO2	4	4	4	2	-	2	1	-	-	2
CO3	4	4	4	2	-	2	1	-	-	2
CO4	4	4	4	2	-	2	1	-	-	2

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.

Course Code: BCA 106T **L T C**
Course Name: Data Structures and Algorithms **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be provided expertise in

1. Understanding of the basic concepts of data structures and their operations like, insertion, deletion, searching and sorting
2. Design algorithms and pseudo codes of various linear and non-linear data structures

PRE-REQUISITES:

1. C Programming Skills
2. Discrete Mathematics

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the 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	Program Outcomes (Scale – 1:very low,2: low,3:medium,4:high)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	4	1	4	4	2	4	2	1	1	4
CO2	4	1	4	2	2	4	2	1	1	4
CO3	4	1	4	4	2	4	3	1	1	4
CO4	4	1	4	4	2	4	3	1	1	4

UNIT – I

No. of Hours: 14 Chapter / Book Reference: TB1 [Chapters 1, 4, 9], TB2 [Chapters 1, 6, 7], TB3 [Chapters 1, 2,6,10]

Linear Data Structures- Static: Introduction to Algorithms- Attributes, Design Techniques, Time Space Trade Off, Data Structures, Classification and Operations of Data Structures.

Arrays: Single Dimension, Two-Dimension and Introduction to Multi Dimensions, Memory Representation, Address Calculation, Sparse Matrices- Types, Representation.

Searching and Sorting: Linear and Binary Search, Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, Elementary Comparison of Searching and Sorting Algorithms.

Hashing: Hash Table, Hash Functions, and Collision Resolution.

UNIT – II

No. of Hours: 10 Chapter / Book Reference: TB1 [Chapter 5], TB2 [Chapter 4], TB3 [Chapter 3]

Linear Data Structures- Dynamic

Introduction: Dynamic Memory Allocation**,** Dynamic Memory versus Static Memory Allocation.

Linked List Types: Singly Linked List, Circular Linked List**,** Doubly Linked List. **Operations:** Creation, Insertion, Deletion, Modification, Searching, Sorting, Reversing, and Merging.

UNIT – III

No. of Hours: 10 Chapter / Book Reference: TB1 [Chapter 6], TB2 [Chapters 2, 4], TB3 [Chapters 4, 5]

Abstract Data Types:

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.

UNIT – IV

No. of Hours: 10 Chapter / Book Reference: TB1 [Chapters 7, 8], TB2 [Chapters 5, 8], TB3 Chapters 7, 8]

Non Linear Data Structures:

Introduction to Graphs: Notations & Terminologies, Representation of Graphs- Adjacency Matrix, Incidence Matrix and Linked Representation.

Trees: Notations & Terminologies, Memory Representation, Binary Trees Types- Complete, Full, Strict, Expression Binary Tree, Tree Traversals (Recursive), Binary Search Tree and Basic Operations

Introduction and Creation (Excluding Implementation): AVL Tree, Heap Tree, M- Way Tree, and B Tree.

TEXT BOOKS:

TB1. Schaum's Outline Series, "Data Structures", TMH, Special Indian Ed., Seventeenth Reprint, 2014.

TB2. Y. Langsam, M. J. Augenstein and A.M. Tanenebaum, "Data Structures using C and C++", Pearson Education India, Second Edition, 2015.

TB3. D. Samanta, "Classic Data Structures", PHI, Second Edition, 2009.

REFERENCE BOOKS:

RB1. Ashok N kamthane “Introduction to Data Structures in C”, Pearson

RB2. E. Horowitz and S. Sahni, “Fundamentals of Data Structures in C”. Universities Press,

RB3. D. Malhotra and N. Malhotra, “Data Structures and Program Design using C“, Laxmi Publications, Indian adapted edition from Mercury Learning and Information-USA,

RB4. Y. Kanetkar“ Data Structures through C”, BPB Publication,

RB5. R.F Gilberg, and B AFrouzan- “Data Structures: A Pseudocode Approach with C”, Thomson Learning,

RB6. A. K. Rath, and A.K. Jagadev, “Data Structures and Program Design Using C”, Scitech Publications,

Course Code: BCA 108T **L T C**
Course Name: Software Engineering **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

The paper aims to understand the importance, limitations and challenges of processes involved in software development. In this course, the learners will be able to develop expertise related to the following:

1. To gain knowledge of various software models.
2. To gain knowledge of various software design activities.
3. To learn cost estimation, software testing, Maintenance and debugging.

PRE-REQUISITES:

Nil

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO #	Detailed Statement of the CO
CO1	Instantiating into the process of designing, coding and testing a software module. Implementing Software Development Life Cycle (SDLC) to develop a software module
CO2	Organizing a software product along with its complete documentation.
CO3	To analyze the use of techniques, skills and modern engineering tools necessary for software development.
CO4	Organizing a complete software module according to SDLC

Course Outcomes	Program Outcomes (Scale – 1:very low,2: low,3:medium,4:high)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	4	2	4	4	1	4	1	1	1	4
CO2	4	2	4	2	1	4	1	1	1	4
CO3	4	2	4	4	1	4	1	1	1	4
CO4	4	2	4	4	1	4	3	2	1	4

UNIT – I

No. of Hours: 12 Chapter/Book Reference: TB1 [Chapters - 1, 3], TB2 [Chapters - 3, 5]

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

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

UNIT – II

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapter - 1, 4]

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

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapter - 5, 6], TB2 [Chapter - 24]

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.

UNIT – IV

No. of Hours: 12 Chapter/Book Reference: TB1 [Chapter 8, 9], TB2 [Chapter 8]

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.

TEXT BOOKS:

TB1. K. K. Aggarwal & Yogesh Singh, "Software Engineering", 2nd Ed., New Age International, 2005.

TB2. I. Sommerville, "Software Engineering", 9th Edition, Pearson Edu.

REFERENCE BOOKS:

RB1. Jibitesh Mishra and Ashok Mohanty, "Software Engineering", Pearson

RB2. R. S. Pressman, "Software Engineering – A practitioner's approach", 5th Ed., McGraw Hill **RB3.** James Peter, W. Pedrycz, "Software Engineering: An Engineering Approach", John Wiley & Sons

Course Code: BCA 142T (NUES) **L T C**
Course Name: Soft Skills **3 0 3**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

This course will provide the learners the following:

To know about various aspects of soft skills and learn ways to develop personality

1. Understand the importance and type of communication in personal and professional environment.
2. To provide insight into much needed technical and non-technical qualities in career planning.
3. Learn about Leadership, team building, decision making and stress management

PRE-REQUISITES: **Nil**

COURSE OUTCOMES(COs):

CO#	Detailed Statement of the CO
CO1	The student will become familiar with the basics of soft Skills and its importance in their career and life
CO2	To improve the business communication skills
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	Program Outcomes (Scale – 1:very low,2: low,3:medium,4:high)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	-	2	-	2	1	-	1	2	1	2
CO2	-	2	-	2	1	-	1	2	1	2
CO3	-	2	-	2	1	-	1	2	1	2
CO4	-	2	-	2	1	3	1	2	1	2

UNIT–I

No. of Hours: 10 Chapter/Book Reference: TB1, TB2, TB3, TB4

Foundations Of Soft Skills: Soft Skills as Essential Life Skills, Meaning, Definition, Types, and Scope of Soft Skills, Prospects and Significance of Developing Soft Skills, Differentiating Skills, Knowledge, Attitudes, and Beliefs, Understanding Technical, Human, and Conceptual Skills

Soft Skills in Career Prospects: Exploring the Role of Soft Skills in Career Success, Implications and Benefits of Incorporating Soft Skills, Coordinating Conceptual and Practical Aspects of Soft Skill Development, Human Values and Work Ethics as Integral Soft Skills

UNIT-II

No. of Hours: 10 Chapter/Book Reference: TB1, TB2, TB3

Communication And Interpersonal Proficiency:

Effective Communication: Meaning and Significance of Effective Communication, Elements of the Communication Process-Verbal and Non-verbal Communication Skills

Overcoming Communication Barriers: Identifying Barriers and Misinterpretations, Strategies to Overcome Communication Challenges, Importance of Active Listening, Conflict Resolution and Negotiation, Problem Solving and Conflict Handling Techniques, Applying Negotiation skills for Effective Outcomes, Role of Communication in Conflict Resolution

UNIT-III

No. of Hours: 10 Chapter/Book Reference: TB1, TB2, TB3, TB4

Professional Skills Development:

Group Discussion: Introduction, Definitions, Purpose and Types of Group Discussions Characteristics of Effective Group Discussions Dos and Don'ts of participating in Group Discussion

Interview Skills: Interview Concept and Definition, Purpose/Objective of Interview, Types of Interviews Guidelines for Successful Interview Preparation and Execution

Presentation Skills Importance of Effective Presentations, Essentials for Successful Presentations, Utilizing PowerPoint for Impactful Presentations

UNIT-IV

No. of Hours: 10 Chapter/Book Reference: TB3, RB1, RB3

Personal And Wellness Skills: Self-Development and Awareness, Exploring the Role of the Self in Personal Growth, Stages of Development and Sigmund Freud's Layers of the Self Emotional Intelligence and Critical Thinking: Importance of Emotional Intelligence, Self-Awareness, Self-Regulation, Motivation

Empathy: Utilizing Critical Thinking for Problem Solving

Stress and Time Management: Recognizing Stress- Signs, Symptoms, and Impact Strategies for Stress Management and Prevention Effective Time Management Techniques

TEXTBOOKS:

TB1. Alex, Dr. K, Soft Skills Know Youself and Know The World, S Chand & Company.
TB2. Kavita Tyagi and Padma Misra, "Advanced Technical Communication", PHI,
TB3. Personality Development and Soft Skills, Barun K. Mitra, Oxford Higher Education
TB4. Goleman, D., Emotional intelligence: Why it can matter more than IQ,Bantam Books.
TB5. Nelson-Jones, R., Life skills, A Handbook, Trowbridge, Wilts: Detesios Ltd.

REFERENCES:

RB1. Kaul, Asha. (2009). Business Communication (2nd edition) PHI Learning..

RB2. Tuhovsky, Ian. Communication Skills Training Rupa Publication India.
RB3. Kavita Tyagi and Padma Misra, "Basic Technical Communication", PHI, 2011.
RB4. Herta A Murphy, Herbert W Hildebrandt and Jane P Thomas, "Effective Business 3.

Course Code: BCA 192T **L T C**
Course Name: Environment Studies **2 0 2**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:

1. Development of critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.
2. Acquisition of values and attitudes towards understanding complex environmental economic-social challenges, and active participation in solving current environmental problems and preventing the future ones.
3. Encouraging adoption of sustainability as a practice in life, society, and industry.

PRE-REQUISITES: Basic awareness about the natural environment.

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO#	Detailed Statement of the 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.

Course Outcomes	Program Outcomes (Scale – 1:very low,2: low,3:medium,4:high)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	-	-	1	2	1	2	-	2	4	2
CO2	-	-	1	2	1	2	-	1	4	2
CO3	-	-	3	2	1	2	-	1	4	1
CO4	-	-	1	2	1	3	-	1	4	2

UNIT–I

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

Introduction to Environmental Studies

Multidisciplinary nature of environmental studies; components of environment: atmosphere, hydrosphere, lithosphere, and biosphere.

Scope and importance; Concept of sustainability and sustainable development

Emergence of environmental issues: Climate change, Global warming, Ozone layer depletion, Acid rain etc.

International agreements and programmer: Earth Summit, UNFCCC, Montreal and Kyoto protocols, Convention on Biological Diversity(CBD), Ramsar convention, The Chemical Weapons Convention (CWC), UNEP, CITES, etc

UNIT–II

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

Ecosystems and Natural Resources

Definition and concept of Ecosystem

Structure of ecosystem (biotic and abiotic components); Functions of Ecosystem: Physical (energy flow), Biological (food chains, food web, ecological succession), ecological pyramids and homeostasis.

Types of Ecosystems: Tundra, Forest, Grassland, Desert, Aquatic (ponds, streams, lakes, rivers, oceans, estuaries); importance and threats with relevant examples from India Ecosystem services (Provisioning, Regulating, Cultural, and Supporting); Ecosystem preservation and conservation strategies; Basics of Ecosystem restoration

Energy resources: Renewable and non-renewable energy sources; Use of alternate energy sources; Growing energy needs; Energy contents of coal, petroleum, natural gas and bio gas; Agro-residues as a biomass energy source

UNIT–III

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

Biodiversity and Conservation

Definition of Biodiversity; Levels of biological diversity: genetic, species and ecosystem diversity

India as a mega-biodiversity nation; Biogeographic zones of India; Biodiversity hotspots; Endemic and endangered species of India; IUCN Red list criteria and categories

Value of biodiversity: Ecological, economic, social, ethical, aesthetic, and informational values of biodiversity with examples.

Threats to biodiversity: Habitat loss, degradation, and fragmentation; Poaching of wildlife; Man-wildlife conflicts; Biological invasion with emphasis on Indian biodiversity; Current mass extinction crisis

Biodiversity conservation strategies: in-situ and ex-situ methods of conservation (National Parks, Wildlife Sanctuaries, and Biosphere reserves.
Case studies: Contemporary Indian wildlife and biodiversity issues, movements, and projects (e.g., Project Tiger, Project Elephant, Vulture breeding program, Project Great Indian Bustard, Crocodile conservation project, Silent Valley movement, Save Western Ghats movement, etc)

UNIT–IV

No. of Hours: 9 + 5 for field visit Chapter/Book Reference: TB1 [Chapter5]; TB2 [Chapters7, 20, 21, 23]; TB3 [Chapters25, 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 Publication

Course Code: BCA 102P	L	T/P	C
Course Name: DBMS Lab	0	2	1

LEARNING OBJECTIVES:

The paper aims to introduce the concept of Back end, data storage in computers, design of a DBMS, Queries to construct database, store and retrieve data from the database. The objective of this course is to provide the learners expertise in the following:

1. Understanding of the requirement of database management System for storing data and its advantages over file management system.
2. Designing the database conceptually, physically and finally implementing the creation of database for any application.
3. Learning of queries in SQL for creating database and performing various operations for manipulating data in the database.
4. Knowledge of database utilities i.e. backup, recovery, transaction processing.

PRE-REQUISITES:

Basic knowledge of data storage and file management system

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the 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.

List of Practicals

S. No.	Detailed Statement	Mapping to CO #

Core Practicals (Implement All the mentioned practicals)

The following are two suggestive databases. The students may use any one or both databases for their core practicals. However, the instructor may provide any other databases for executing these practical.

1. **COLLEGE DATABASE**:

STUDENT (USN, SName, Address, Phone, Gender)
SEMSEC (SSID, Sem, Sec)
CLASS (USN, SSID)
SUBJECT (Subcode, Title, Sem, Credits)
IAMARKS (USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)

2. **COMPANY DATABASE:**

EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN, DNo) DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate)

DLOCATION (DNo,DLoc) PROJECT (PNo, PName, PLocation, DNo) WORKS_ON (SSN, PNo, Hours)		
1	Draw an E-R diagram from given entities and their attributes	**CO1**
2	Convert the E-R diagram into a Relational model with proper constraints.	**CO1**
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.	**CO2**
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	**CO4**
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.	**CO5**
6	Create table using following integrity constraints: Primary Key Unique Key Not Null Check Default Foreign Key	**CO3**
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	**CO7**
8	Retrieve data from a table using alias names.	**CO5**
9	Retrieve data of a table using nested queries.	**CO5**
10	Retrieve data from more than one table using inner join, left outer, right outer and full outer joins	**CO5**
11	Create view from one table and more than one table.	**CO6**
12	Create index on a column of a table.	**CO6**
Application Based Practicals		
1	Consider the Insurance company's Database given below. The primary keys are underlined and the data typesare specified. PERSON(driver_id# : string, name : string, address : string)	**CO7**

	CAR(regno : string, model : string, year : int) ACCIDENT(report_number : int, acc_date : date, location : string) OWNS(driver_id# : string, regno : string) PARTICIPATED(driver_id# : string, regno : string, report_number : int, damage_amount :number(10,2)) (i) Create the above tables by properly specified the primary key and the foreign key (ii) Enter at least five tuples for each relation (iii) Demonstrate how you can a. Update the damage amount for the car with a specific regno, the accident with report number 12 to 25000. b. Add a new accident to the database. (iv) Find the total number of people who owned cars that were involved in accident in2002. (v) Find the number of accident in which cars belonging to a specific models were involved	
2	Consider the following schema of a library management system. Write the SQL queries for the questions given below; **Student(Stud_no : integer, Stud_name: string)** **Membership(Mem_no: integer, Stud_no: integer)** **Book_(book_no: integer, book_name:string, author: string)** **lss_rec_(iss_no:integer, iss_date: date, Mem_no: integer, book_no: integer)** (i) Create the tables with the appropriate integrity constraints (ii) Insert around 10 records in each of the tables (iii) Display all records for all tables (iv) List all the student names with their membership numbers (v) List all the issues for the current date with student and Book names (vi) List the details of students who borrowed book whose author is Elmarsi & Navathe (vii) Give a count of how many books have been bought by each student (viii) Give a list of books taken by student with stud_no as 1005 (ix) Delete the List of books details which are issued as of today (x) Create a view which lists out the iss_no, iss _date, stud_name, book name	
3	Use the relations below to write SQL queries to solve the business problems specified. CLIENT (clientno#,name, client_referred_by#) ORDER (orderno#, clientno#, order_date, empid#) ORDER_LINE (orderno#, order line number#, item_number#, no_of_items, item_ cost,shipping_date) ITEM (item_number#, item_type, cost) EMPLOYEE (empid#, emp_type#, deptno, salary, firstname, lastname) Notes: a. Column followed by # is the primary key of the	

table.

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

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

Write queries for the following

(i) Create all the above tables.

(ii) Insert at least five records.

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

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

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

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

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

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

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

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

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

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

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

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

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

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.

Course Code: BCA 104P	L	T/P	C
Course Name: Object Oriented Programming using Java Lab	0	4	2

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:

3. Learn how to implement Object Oriented concepts through Java.
4. Identify and apply the Java thread model to program Java applications.
5. Develop GUI applications using Java swings

PRE-REQUISITES:

3. Programming fundamental
4. Object-Oriented concepts

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the 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. To apply the Java Thread model to develop multithreading applications.

List of Practicals

S. No.	Detailed Statement	Mapping to CO #
	Core Practicals (Implement minimum 10 out of 15 practical)	
1	Write a program declaring a class Rectangle with data member's length and breadth and member functions Input, Output and CalcArea.	**CO1**
2	Write a program to demonstrate use of method overloading to calculate area of square, rectangle and triangle.	**CO1**
3	Write a program to demonstrate the use of static variable, static method and static block.	**CO1**
4	Write a program to demonstrate concept of ``this``.	**CO1**
5	Write a program to demonstrate multi-level and hierarchical inheritance.	**CO2**
6	Write a program to use super() to invoke base class constructor.	**CO2**
7	Write a program to demonstrate run-time polymorphism.	**CO1**
8	Write a program to demonstrate the concept of aggregation.	**CO2**
9	Write a program to demonstrate the concept of abstract class with constructor and ``final`` method.	**CO2**
10	Write a program to demonstrate the concept of interface when two interfaces have unique methods and same data members.	**CO1**
11	Write a program to demonstrate checked exception during file handling.	**CO4**
12	Write a program to demonstrate unchecked exception	**CO4**

13	Write a program to demonstrate creation of multiple child threads.	**CO4**
14	Write a program to use Byte stream class to read from a text file and display the content on the output screen.	**CO3**
15	Write a program to create User defined exception.	**C04**
Application Based Practicals (Implement minimum 5 out of 10 practicals)		
1	Create a class employee which have name, age and address of employee, include methods getdata() and showdata(), getdata() takes the input from the user, showdata() display the data in following format: Name: Age: Address:	**CO1**
2	Write a Java program to perform basic Calculator operations. Make a menu driven program to select operation to perform (+ - * /). Take 2 integers and perform operation as chosen by user.	**CO1**
3	Write a program to make use of BufferedStream to read lines from the keyboard until 'STOP' is typed.	**CO3**
4	Write a program declaring a Java class called SavingsAccount with members ``accountNumber`` and ``Balance``. Provide member functions as ``depositAmount ()`` and ``withdrawAmount ()``. If user tries to withdraw an amount greater than their balance then throw a user-defined exception.	**CO4**
5	Write a program creating 2 threads using Runnable interface. Print your name in ``run ()`` method of first class and "Hello Java" in ``run ()`` method of second thread.	**CO4**

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.

Course Code: BCA 106P	L	T/P	C
Course Name: Data Structures and algorithms Lab	0	2	1

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to:

1. Understanding of the basic concepts of data structures and their operations like, insertion, deletion, searching and sorting
2. Design algorithms and pseudo codes of various linear and non-linear data structures

PRE-REQUISITES:

3. C Programming Skills
4. Discrete Mathematics

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the 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.

List of Practicals

S. No.	Detailed Statement	Mapping to CO #
Core Practicals (Implement minimum 8 out of 10 practical)		
1	WAP to implement following operation on one dimensional array (i) Insertion (ii) Deletion (iii) Traversal (iv) Reverse (v) Merge	CO1
2	WAP to Sort an array using menu driven: (i) BUBBLE SORT (ii) MERGE SORT(iii) INSERTION SORT (iv) SELECTION SORT	CO3
3	WAP to implement a Singly Linked List.	CO2
4	WAP to implement a Circular Linked Lists	CO2
5	WAP to implement Doubly Linked Lists	CO2
6	Write a menu driven program to implement (i) Static Stack (ii) Dynamic Stack.	CO1, CO2
7	WAP to implement a (i) Static (ii) Dynamic Circular Queue	CO1, CO2
8	WAP to implement a (i) Static (ii) Dynamic De-Queue.	CO1, CO2
9	Implement recursive algorithms for the following operations on Binary Search Tree • Insertion • Searching	CO1, CO2, CO3, CO4
10	Implement recursive algorithms for BST traversal- Inorder, Preorder, Postorder.	CO1, CO2, CO3
Application Based Practicals (Implement minimum 5 out of 10 practicals)		
1	WAP to search & display the location of an element specified by the user, in an array using (i) Linear Search (ii) Binary Search technique.	CO1, CO3
2	WAP to accept a matrix from user, find out matrix is sparse or not and convert into triplex matrix.	CO1
3	WAP to implement Polynomial addition operation using	CO2. CO4

	linked list.	
4	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	CO2
5	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'	CO2, CO4
6	Write a program to convert Infix to equivalent (i) Prefix expression (ii) Postfix expression	CO1, CO4
7	Write a program to evaluate (i) Prefix Expression (ii) Postfix Expression using stack.	CO1, CO4
8	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.	CO1, CO2, CO4
9	WAP to implement an expression tree. (For example: (a + b / (c * d) – e))	CO3, CO4
10	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.	CO12, CO4

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.

Course Code: BCA 108P	L	T/P	C
Course Name: Software Engineering Lab	0	2	1

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to:

1. To gain knowledge of various software models.
2. To gain knowledge of various software design activities.
3. To learn cost estimation, software testing, Maintenance and debugging.

PRE-REQUISITES:

None

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the CO
CO1	Instantiating into the process of designing, coding and testing a software module. Implementing Software Development Life Cycle (SDLC) to develop a software module
CO2	Organizing a software product along with its complete documentation.
CO3	To analyze the use of techniques, skills and modern engineering tools necessary for software development.
CO4	Organizing a complete software module according to SDLC

List of Practicals

S. No.	Detailed Statement	Mapping to CO #
1	Select and Write down the problem statement for a real time system of relevance.	CO2, CO3
2	Analyze requirement for a system and develop Software Requirement Specification Sheet (SRS) for suggested system.	CO2, CO3
3	To create the function oriented diagram: Data Flow Diagram (DFD)	CO2, CO3
4	To perform the user‘s view analysis for the suggested system: Use case diagram.	CO2,CO3, CO4
5	To draw the structural view diagram for the system: Class diagram	CO4
6	To draw the behavioral view diagram : State-chart diagram or Activity diagram	CO2, CO3,CO4
7	To perform the behavioral view diagram for the suggested system : Sequence diagram	CO2, CO3,CO4
8	Draw the component diagram	CO2, CO3,CO4
9	Draw the Deployment diagram.	CO2, CO3,CO4
10	Perform Measurement of complexity with Halstead Metrics for chosen system.	CO4

Suggested Applications

(i) Inventory Management
(ii) Library Management
(iii) Result Management
(iv) Hotel Management System

(v) Any Website (vi) Any mobile application (vii) E-Commerce website (viii) Any other application
Note: 1. Students are required to identify an application in the beginning of the semester and conduct all practicals for the same application. 2. In total 10 practicals to be implemented. 3. Students may use any open source software i.e. argoUML for drawing the above diagrams. 4. Students may Use testing tool such as junit. **5.** Student may Use configuration management tool-libra.

THIRD SEMESTER SYLLABUS

Applicable from Batch Admitted in Academic Session 2024-25 onwards

Course Code: BCA 201T **L T C**
Course Name: Python Programming **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

- Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
- Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:-

1. To understand why Python is a useful scripting language for developers.
2. To learn how to design and program Python applications.
3. To define the structure and components of a Python program.

PRE-REQUISITES:

1. Computer Fundamentals
2. Basic Programming Concepts

COURSE OUTCOMES(COs):

After completion of this course, the learners will be able to:-

CO#	Detailed Statement of the 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	Inspects file handling and object- oriented programming techniques.
CO5	To understand the concept of Reusability.

Course Outcomes	ProgramOutcomes (Scale–1:verylow,2:low,3:medium,4:high)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	4	4	4	2	-	-	1	_-	-	2
CO2	4	4	4	2	-	-	1	_-	-	2
CO3	4	4	4	2	-	-	1	_-	-	2
CO4	4	4	4	2	-	-	1	_-	-	2

UNIT–I

No. of Hours: 11 Chapter/Book Reference: T1[Chapters 1,2]; T2[Chapters 1,3,6]

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

Python Programming Introduction: Relational Operators, Logical Operators, Bitwise Operators, Variables and assignment statements, Keywords.

Control Structures: if-conditional statements, if –else condition, if-elif-else condition, nested if-elif-else condition, Iteration (Loop and while statements), Nested Loops, break.
Strings: Slicing, Membership, Built in functions (count, find, capitalize, title, lower, upper and swap case, replace, join, isspace (), isdigit (), split(), startswith(), endswith()).

UNIT–II
No. of Hours: 11 Chapter/Book Reference: T1 [Chapter 3]; T2[Chapters 7,12]

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 and introduction to sets

Tuples: Tuple operations, functions- tuple, count, index.

Dictionary: Dictionary operations, functions- get, update, copy. Deletion in dictionary.

UNIT–III
No. of Hours: 10 Chapter/Book Reference: T1 [Chapters 5, 7]; T2[Chapters 2,8,9]
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 and Modules
File handling: Types of Files (Text file, Binary Files, CSV files), Creation, writing, appending, Insertion, deletion, updating, modification of Data in into the files.

UNIT–IV
No. of Hours: 12 Chapter/Book Reference: T2 [Chapters 10, 11]; T3 [Chapters 4]
Object Oriented Programming: Classes, Objects, Attributes and Methods, Access Specifiers, Constructors, Static Methods, Data Hiding, Encapsulation, Inheritance, Polymorphism.
NumPy Library: Introduction to NumPy, Creation of One-Dimensional Arrays, Reshaping of an Array, Element-wise Operations, Aggregate Operations.
Introduction to Matplotlib: Bar Graphs and Pie Chart

TEXTBOOKS:
TB1. Programming in Python 3: A Complete Introduction to the Python Language (2nd Edition), Mark Summerfield.
TB2. Python Programming: A Modular Approach by Taneja Sheetal, Kumar Naveen, Eleventh Impression, Pearson India Education Services Pvt. Ltd.
TB3. Agile tools for real world data : Python for Data Analysis by Wes McKinney, O'Reilly

REFERENCE BOOKS:
RB1. Let Us Python 2Nd Edn: Python Is Future, Embrace It Fast (Second Edition): Yashvant Kanetkar
RB2. Programming Python, 4th Edition by Mark Lutz Released December 2010 Publisher(s): O'Reilly Media, Inc.
RB3. Python: The Complete Reference by Martin Brown

Course Code: BCA 203T **L T C**
Course Name: Dynamic Web Designing **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

- Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
- Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:-

1. Understand the syntax and semantics of PHP language
2. Design and develop web applications using PHP as a server side language
3. Perform database connectivity using MYSQL as database server.

PRE-REQUISITES:

1. Basic knowledge of HTML, CSS and JavaScript.
2. Able to Design static Webpage.

COURSE OUTCOMES(COs):

After completion of this course, the learners will be able to:-

CO#	Detailed Statement of the 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	Learn how to link and publish web sites

Course Outcomes	Program Outcomes (Scale – 1: Very Low8, 2: Low, 3: Medium, 4: High)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	4	4	3	-	-	-	4	-	-	-
CO2	4	2	3	-	-	-	4	-	-	4
CO3	4	2	3	4	-	-	-	-	-	-

UNIT–I

No. of Hours: 11 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: 11 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 & Sessions Overview, Application State, Query String, Hidden Field.

UNIT–III
No. of Hours: 11 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.
Implementation of Object Oriented Features in PHP : Classes and Objects, Building Classes, Access Modifiers, Inheritance, Polymorphism etc. **&** Implementation of Exception Handling.

UNIT–IV
No. of Hours: 11 Chapter/Book Reference: TB1 [8]
PHP Database Connectivity: Using PHP to Access a Database, Relational Databases and SQL, PHP Data Objects, MySQLi Object Interface

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, Database querying using prepared statements, Checking data errors.

PHP with Ajax: Introduction, Create an PHP Ajax application

TEXTBOOKS:
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

Course Code: BCA 205T **L T C**
Course Name: Computer Organization and Architecture **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

- Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
- Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

The objectives of this course are to provide the learners with the following:

1. Knowledge about various logic gates and design principles of different digital electronic circuits.
2. Implementation and designing of different combinational and sequential circuits.
3. Identify the functional units of the process or and the factors affecting the performance of a computer
4. Understanding about the Input–Output organization of a typical computer

PRE-REQUISITES:

Fundamentals of Computer

COURSE OUTCOMES(COs):

After completion of this course, the learners will be able to:-

CO#	Detailed Statement of the 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	Program Outcomes (Scale – 1: very low, 2: low, 3: medium, 4: high)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	4	4	4	3	-	3	-	-	-	3
CO2	4	4	4	3	-	3	-	-	-	3
CO3	4	4	3	2	-	3	-	-	-	1
CO4	4	3	3	2	-	3	-	-	-	1
CO5	4	3	3	2	-	3	-	-	-	1

UNIT–I

No. of Hours:11 Chapter/Book Reference: TB2[Chapter-2, 3, 4, 5], RB1[Chapter-5,6]

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.

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

UNIT–II

No. of Hours:11 Chapter/Book Reference: TB2[Chapter-6, 7], RB1[Chapter-6,7]

Sequential Circuits: Latch, S-R,D,J-K,T, Clocked Flip-flop, Race around condition, Master slave Flip-Flop, Realisation of one flip-flop using another flip-flop.

Shift Registers

Serial-in-serial-out, serial-in-parallel-out, parallel-in-serial-out and parallel-in-parallel-out.

Counters

Ripple counter, Synchronous Counter, Modulo Counters.

UNIT–III

No. of Hours:11 Chapter/Book Reference: TB1[Chapter-5, 9], RB3 [Chapter-11]

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

No. of Hours:11 Chapter/Book Reference: TB1[Chapter-12,13], RB3[Chapter-7]

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

M**emory Organization:** Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

TEXTBOOKS:

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. WIliam Stallings, Computer Organization and Architecture, 4th Edition, Prentice Hall of India Private Limited, 2001

RB3. Subrata Ghosal, "Computer Architecture and Organization", Pearson2011

RB4. Malvino, "Digital Computer Electronics: An Introduction to Micro-computers", McGraw Hill.

Course Code: BCA 207T **L T C**
Course Name: Discrete Mathematics **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

- Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
- Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

The objective of this course is to provide the learners with the following:
1. Knowledge about sets, relations and functions.
2. Make them familiar with basics of lattices and graphs.
3. Understanding of the concept of propositional logic.

PRE-REQUISITES:

Basic Concepts of Mathematics

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO #	Detailed Statement of the CO
CO1	Understand the basics conceptual math and relations.
CO2	Understand and apply methods of proof and partial order relation
CO3	Compare and design various graphs techniques.
CO4	Appraise and determine the correct logic and solutions for any given real-world problem.

Course Outcomes	Program Outcomes (Scale – 1:very low, 2: low, 3:medium, 4:high)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	-	-	-	-	2	1	2	-
CO2	4	3	-	-	-	-	-	-	-	-
CO3	-	4	3	2	-	3	-	3	2	3
CO4	3	3	4	4	-	3	3	-	3	2

UNIT I

No. of Hours: 13 Chapter/Book Reference: TB1 [Chapter 1], TB2 [Chapters 1, 2, 3], TB3 [Chapters 2, 9]

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.

UNIT II

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters 1, 4], TB2 [Chapter 4], TB 3 [Chapters 1, 5]

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.
Methods of Proof: Direct Proof, Indirect Proof, Proof by Exhaustive Cases, Principle of Mathematical Induction.

UNIT- III
No. of Hours: 11 Chapter/Book Reference: TB1[Chapter 6], TB2 [Chapter 5]
PARTIAL ORDER RELATIONS AND LATTICES: Partial Order Sets, Totally ordered sets, 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.

UNIT -IV
No. of Hours: 10 Chapter/Book Reference: TB1 [Chapter 8], TB2 [Chapters 8, 9], TB3 [Chapter 10]
GRAPHS: Introduction, undirected graph, directed graph, Degree of a vertex, isolated vertex, pendent vertex, in degree, out-degree, Handshaking Theorem
Types of Graphs- Simple graph, null graph, complete graph, regular graph, bipartite graph (complete), Sub graph, Isomorphic graphs, complement of a graph, Matrix representation of a graph: adjacent and incidence matrices.
Walk, trail, path, circuit, cycle, Euler Graph, Seven bridges problem, Hamiltonian graph

TEXT BOOKS:
TB1. Babu Ram, "Discrete Mathematics", Pearson Education, 1st edition 2010
TB2. Singh J. P. "Discrete Mathematics for Undergraduates" ANE Books, 2nd edition, 2023
TB3. Rosen, K.H., Discrete Mathematics and its Applications, McGraw Hill Education, 8th edition 2021
REFERENCE BOOKS:
RB1. Kumar, Vinay. Discrete mathematics. BPB Publications, 2018.
RB2. S.K. Sarkar "A Text Book of Discrete Mathematics" S. Chand Publications, 9th edition 2019
RB3. Kolman, Busby and Ross, "Discrete Mathematical Structures", Pearson, 10th edition 2015
RB4. Tremblay J.P. and Manohar, R "Discrete Mathematical Structures with Applications to Computer Science" Tata McGraw Hill

Course Code: BCA 261 **L T C**
Course Name: Vocational Course **4 0 4**

Learning Objectives:

1. Major Aim for this vocational course in BCA Programme is to give students an integrated experience in studying the emerging trends in IT and its applications.
2. This subject will provide good opportunity for the students to build, enhance and sustain high levels of professional conduct and performs and evolves as problem solver frame of mind in students in early semesters.
3. It will also prepare students to understand the role of new technologies in industry too.

General Guidelines:

1. This paper is to prepare students for cutting-edge areas that are fast gaining prominence, such as 3-D machining, big data analysis, Data Analysis using R, IoT to Big Data, AWS Cloud Computing Certification, Quantum Computing, Wireless Communication, Power BI, 3-D machining, Block chain Technology, Big Data & Hadoop Robotic Process Automation or any other emerging technology with important applications to health & environment. As per the market demand the vocational courses can be added by the institution which are not part of their curriculum.
2. The students may be allowed to take vocational courses ONLY after obtaining permission from Head(s) of college/institute/department.
3. The duration of Vocational Courses should be 30 hours with a combination of theory and practical.
4. Course to be opted can be taken either in-house or outside only after prior approval form the Head(s) of college/institute/department

Evaluation:-

1. Viva Voice/ Written Examination/ Case Study Based/ Small Projects/ Presentations/ Research Papers
2. Certificates** are also to be taken while evaluation if Course is not IN-HOUSE.

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**** Certificates to be submitted to the department before the initiation of Semester-Three.**

Course Code: BCA 221T **L T C**
Course Name: Principles of Management & Organizational Behaviour **3 0 3**

INSTRUCTIONS TO PAPER SETTERS:

- Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
- Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way

LEARNING OBJECTIVES: In this course, the learners will be able to develop expertise related to the following:

1. To get the knowledge about the important management concept sand their applications.
2. To help the students to develop cognizance of the importance of management principles.
3. To have an insight of various functional departments in an organization.
4. To help the organization in understanding Organizational culture.

PRE-REQUISITES: None

COURSE OUTCOMES(COs):

CO#	Detailed Statement of the CO
CO1	To develop basic knowledge about management, management process, managerial roles, levels, skills and decision- making process.
CO2	To give knowledge about planning, organizing, staffing, directing and controlling. To relate all functions of management.
CO3	To discuss about the Organizational behaviour and its application. To describe about the Organizational culture. To learn about the motivation theories.
CO4	To give basic knowledge people management, their Personality, Learning, Perception, Attitude and Leadership. To know Leadership styles.

Course Outcomes	Program Outcomes (Scale–1:verylow,2: low,3:medium,4:high)										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	4	-	-	-	-	-	-	4	4	3
CO2	-	4	-	-	-	-	-	-	4	4	3
CO3	-	2	-	-	-	-	-	-	4	4	3
CO4	-	4	-	-	-	-	-	-	4	4	3

UNIT–I

No. of Hours:12 Chapter/Book Reference: TB1[Chapters–1,2,4]

Management: Meaning & Concept of Management, Management Principles (Fayol & Taylor), Management Process (in brief), Managerial Levels; Skills, Roles and Functions of a Manager; Difference between a Manager, a Leader and an Administrator; SWOT Analysis in Management; Decision making: Concept & Process

UNIT–II

No. of Hours: 10 Chapter/Book Reference: TB1[Chapters– 3, 5,6,8,9]

Planning: Meaning, Purpose, Types & Process; **Organizing**: Process, Departmentation, Decentralization; **Staffing**: Concept, Nature & Importance of Staffing; **Directing**: Meaning; **Controlling**: Nature, Importance & Process of control; Relationship among Planning, Organizing, Staffing, Directing and Controlling.

UNIT–III

No. of Hours:12 Chapter/Book Reference: TB1[Chapters– 10, 14, 7]

Organizational Behavior: Concept and Nature of Organizational Behaviour; Importance and Opportunities of Organizational Behaviour; Challenges of OB in the 21st Century; Organizational Culture: Meaning, Importance and Characteristics of Organizational Culture; **Motivation:** Concept & Theories of Motivation (Maslow's Need Hierarchy, Herzberg Two Factor, McGregor's Theory X & Y, and Alderfer's ERG Theory)

UNIT–IV

No. of Hours:10 Chapter/Book Reference: TB1[Chapters–10, 12, 14]

Managing People: Meaning and Need of Understanding Human Behaviour in Organization; Models of OB; Major Concepts in OB (elementary) - Personality, Learning, Perception, Attitude and Leadership; Leadership Styles

TEXTBOOKS:

TB1. Dr.C. B Gupta "Management Process and Organizational Behaviour" S. Chand&Sons,2018 (ISBN: 978-93-5283-071-8)

REFERENCE BOOKS:

RB1. Stoner, Freeman & Gilbert, "Management"6thEdition, Pearson International.
RB2. David S. Bright, Anastasia H. Cortes, Eva Hartmann, Principles of Management, ISBN:9781998109166, 199810916X
RB3. Ankur Chhabra, "Organisational Behaviour", Sun India Publications, 2009
RB4. Robbins, Stephen P, "Organisational Behaviour". PHI, 2010

Course Code: BCA 291T **L T C**
Course Name: Human Values and Ethics (NUES) **2 0 2**

INSTRUCTIONS TO PAPER SETTERS:

- Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
- Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES: The objectives of this course are:

1. To understand the significance of values in personal and professional life
2. To understand harm on yat all the levels of human living and live accordingly
3. To facilitate the development of a holistic perspective towards life and profession
4. To apply the understanding of harm only in their profession and lead an ethical life.

PRE-REQUISITES:

None

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO#	**Detailed Statement of the CO**
CO1	Understanding the concept of human values and their significance in personal, social, moral, and spiritual contexts
CO2	Developing Self-awareness and Self-exploration Techniques
CO3	Demonstrate knowledge of ethical values in non-classroom activities, such a service learning, internships and field work
CO4	In still Moral & Social Values and appreciate the rights of others
CO5	Comprehend the concept of harmony at all the levels of society and readiness to contribute towards harmony at all levels

Course Outcomes	**Program Outcomes (Scale–1:very low, 2: low, 3:medium, 4:high)**										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	-	-	4	2
CO2	-	-	-	-	-	-	-	-	-	4	2
CO3	-	-	-	-	-	-	-	-	-	4	2
CO4	-	-	-	-	-	-	-	-	-	4	2
CO5	-	-	-	-	-	-	-	-	-	4	2

UNIT–I

No. of Hours: 5 Chapter/Book Reference: TB1[Chapters 1-4], TB2[Chapters-1]

Introduction to Human Values: Understanding Value Education; Understanding Personal Values, Social Values, Moral Values, and Spiritual Values, Self-Exploration as the Process for Value Education; Right understanding- relationship and physical facilities; Understanding the thought-provoking issue-continuous happiness and prosperity.

UNIT-II

No. of Hours:8 Chapter/Book Reference: TB1[Chapters5, 8-10]
Harmony at Various Levels: Understanding the Human being as coexistence of the self with the Body; Harmony in the family - Understanding values in human-human relationships; Harmony in the Society - Understanding Universal Human Order; Harmony in Nature.

UNIT-III
No. of Hours: 5 Chapter/Book Reference: TB1[Chapter 12, 13]
Character, Values and Ethics in Professional Practice: Effects of Thoughts on Character; Core Values for Professional Excellence, Ethics and Profession; Building Trusting Relationships; Respecting the competence of other professions; Ethics at the workplace - cybercrime, plagiarism, sexual misconduct, fraudulent use of institutional resources etc.

UNIT-IV
No. of Hours: 6 Chapter/Book Reference: TB3[Chapters-1, 2]
Indian Ethos in Organizational Culture and Practice: Ethos of Vedanta; Application of Indian Ethos in Organizations; Relevance of Ethics and Values in organizations in current times; Case Studies and Role-Playing Exercises for inculcating values in personal and professional life.

TEXTBOOKS:
TB1. A Foundation Course in Human Values and Professional Ethics by R.R. Gaur, R. Sangal, G.P. Bagaria.
TB2. A Textbook on Professional Ethics and Human Values by R S Naagarazan.
TB3. Indian Ethosand Modern Management by BL Bajpai New Royal Book Co., Lucknow.,2004, Reprinted2008.

REFERENCE BOOKS:
RB1. A N Tripathy, 2003, Human Values, New Age International Publishers
RB2. Human Values and Professional Ethics by Vaishali R Khosla, Kavita Bhagat
RB3. I.C. Sharma. Ethical Philosophy of India Nagin & co Jalandhar
RB4. Kalam, Abdul. My journey –Transforming Dreams into Actions. Rupa Publications, 2013
RB5. Swami Vivekananda, Call to the Youth for Nation Building, Advaita Ashrama, Calcutta, 2018.

Course Code: BCA 201 P	L	T/P	C
Course Name: Python Programming Lab	0	4	2

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to:

6. Basic programming constructs, control flow and functions in Python.
7. Apply the concepts of data structures like List, Tuple, Set and Dictionary in Python applications.
8. Use object-oriented programming features of Python to develop real applications.
9. Learn how to use File handling in applications.

PRE-REQUISITES:

1. Fundaments of Computer and Information Technology.
2. Basics of Programming

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the CO
CO1	Demonstrate the use of operators and mathematical expression in Python.
CO2	Use functions and represent Compound data using Lists, Tuples and Dictionaries. Implement Conditionals and Loops for Python Programs.
CO3	Demonstrate the use of Exception in program and implement the concepts of OOPs.
CO4	Read and write data from & to files in Python and develop application.
CO5	Apply the concepts of Numpy, Pandas and Matplotlib and create real time application.

List of Practicals

S. No.	Detailed Statement	Mapping to CO #
	Core Practicals (Implement minimum 10 out of 15 practicals)	
1	Write a program to demonstrate the use of different operators in python.	CO1
2	Write a program to print Fibonacci Series 0112358…….N	CO1, CO2
3	Write a program to print the sum of first n prime numbers.	CO1, CO2
4	Create a function Pall_n to print of all the palindrome numbers between two ranges.	CO1, CO2
5	Write a Python program to perform the string slicing.	CO1, CO2
6	Write a Python program to demonstrate the use of List, Tuple, Dictionary.	CO1, CO2
7	Write a Python program to demonstrate the use of recursion.	CO1, CO2
8	Write a program illustrating various functions of mathematical library in python	CO1, CO2,CO4
9	Write a program to show the working of Bar Graphs	CO1, CO2,CO3
10	Write a program to show the working of Pie Chart	CO1, CO2,CO3

11	Write a python program to create Class and Object.	CO1, CO2,CO3
12	Write a Python program to copy the contents of a file to another file in a text file.	CO1, CO2,CO3
13	Write a program illustrating load() and dump() in binary file	CO1, CO2,CO3
14	Write a python program to insert data into CSV file and display it.	CO1, CO2,CO4, CO5
15	Write a python program to create a Numpy array and perform the basic matrix operation.	CO1, CO2,CO4, CO5
Application Based Practicals (Implement minimum 5 out of 10 practicals)		
1	Write a program to perform Linear Search	CO1, CO2
2	Write a function to find all duplicates in two different list	CO1, CO2
3	Write a function to print the sum of numbers in list having 3 at their units place.	CO1, CO2
4	Import and use of basics inbuilt package in python	CO1, CO2
5	Write a program to perform binary search using recursion	CO1, CO2,CO3
6	Demonstrate the use of inheritance.	CO1, CO2,CO3
7	Write a Python program that takes a text file as input and returns the number of words of a given text file.	CO1, CO2,CO4,CO5
8	Write a program to read a binary file having employee data in the form of list and search for the record of a particular employee entered by user.	CO1, CO2, CO5
9	Write a program to create an array with 3 rows and 4 columns with each element set to 0 using Numpy.	CO1, CO2, CO5
10	Write a program to perform Transpose using NumPy.	CO1, CO2, CO5

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.

Course Code: BCA 203P	L	T/P	C
Course Name: Dynamic Designing Lab	0	2	1

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to:

1. Understand the syntax and semantics of PHP language
2. Design and develop web applications using PHP as a server side language
3. Perform database connectivity using MYSQL as database server.

PRE-REQUISITES:

1. Knowledge of HTML, CSS, JavaScript, bootstrap and XML.
2. Able to Design Static Website.

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the 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	Learn how to link and publish web sites

List of Practicals

S. No.	Detailed Statement	Mapping to CO #
	Core Practicals	
1.	Write a regular expression including modifiers, operators and metacharacters.	CO1, CO2
2.	Write a program in PHP for Type Casting of the variables	CO1, CO2
3.	Write a program to show the usage of nested if statement.	CO1, CO2
4.	Write a program to create a menu driven program and show the usage of switch-case.	CO1, CO2
5.	Write a program to show the usage of for/while/do while loop	CO1, CO2
6.	Write a program to implement arrays and to perform all four types of sorting	CO1, CO2
7.	Write a program to implement Array-pad(), array_slice(), array_splice(), list() functions. (use foreach wherever applicable)	CO1, CO2
8.	Write a program to show the application of user defined functions.	CO1, CO2
9.	Write a program that passes control to another page (include, require, exit and die functions)	CO1, CO2
10.	Write a program to validate the form data using Filter_var() function.	CO1, CO2
11.	Write a program to show the usage of Cookies.	CO1, CO2
12.	Write a program to show the usage of Sessions.	CO1, CO2
13.	Write a program to implement oops concepts.	CO1, CO2
14.	Do Form handling In PHP Design a personal Information	CO1, CO2

	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	CO1, CO2
16.	Create Admin Login ,Logout form using session variables	CO1, CO2
17.	Write a program to create a file.	CO1, CO2
18.	Write a program that use various PHP library functions, and that manipulate files and directories.	CO1, CO2
19.	Write a program to read and display the content of previously created file.	CO1, CO2
20.	Write a program to modify the content of an existing file.	CO1, CO2
21.	Create a web page and which provides File uploading and downloading a file.	CO1, CO2
22.	Design a from which upload And Display Image in PHP	CO1, CO2
23.	Use phpMyAdmin and perform the following: import, review data and structure, run SQL statements, create users and privileges	CO1, CO2
24.	Write a program to create a mysql database.	CO1, CO2
25.	Write a program to create a table and insert few records into it using form.	CO1, CO2
26.	Write a program to select all the records and display it in table.	CO1, CO2
27.	Write a program to modify (delete/modify/add) a table.	CO1, CO2
28.	Write a PHP script, to check whether the page is called from 'https' or 'http'.	
29.	Create an PHP Ajax application.	CO1, CO2
Application Based Practical		
30.	Write a program to verify text data as per the pattern.	CO3
31.	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. • Perform some validation check. If any of these operations cause an error, stop execution and print the error message. The script should respond differently depending on the situation. Add a “Log Out” button to logout from the system	CO3

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.

Course Code: BCA 205P	L	T/P	C
Course Name: Computer Organization and Architecture Lab	0	2	1

LEARNING OBJECTIVES:

The objective of this course is to provide the learners:

1. Basic knowledge to implementation of all types of digital logic gates
2. Expertise in implementation of Boolean function.
3. Implementation of all sequential circuits and combinational circuits.
4. Verification of truth table of all circuits.

PRE-REQUISITES:

Fundamentals of Computer

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the 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

List of Practicals

S. No.	Detailed Statement	Mapping to CO #
	Core Practicals	
1.	Implement digital Logic gates – AND, OR, NOT	CO1
2.	Implement Logic gates using NAND and NOR gates	CO1
3.	Design and implement Half and Full Adder Using basic gates Using NAND gates	CO1
4.	Design and implement Half and Full Subtractor Using basic gates Using NAND gates	CO1
5.	Design and implement parallel adder/Subtractor	CO1
6.	Implement any Boolean Function using logic gates in both SOP and POS form	CO1, CO2
7.	Design and implement the 4:1 MUX, 8:1 MUX using gates /ICs.	CO2
8.	To verify the truth table of MUX and DEMUX using NAND.	CO2
9.	Design and implement a decoder using gates	CO2
10.	Design and implement a encoder using gates	CO2
11.	Truth Table Verification of JK Master Slave Flip Flop	CO1, CO2
12.	Truth Table Verification of D- Type Flip Flop	CO1, CO2
13.	Truth Table Verification of T- Type Flip Flop	CO1, CO2

14.	Design and implement a 4-bit shift register using Flipflops	CO1, CO2
15.	Design and implement a 3-bit synchronous counter	CO1, CO2

Note:
1. In total 10 practical to be implemented. 2 additional practicals 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.

FOURTH SEMESTER SYLLABUS

Applicable from Batch Admitted in Academic Session 2024-25 onwards

Course Code BCA 202T **L T C**
Course Name: Operating Systems **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

- Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
- Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:-

1. Working and functionalities of operating system
2. Understand the concept of process scheduling, memory management, deadlock and file system
3. Understand basic commands of Linux and shell scripts.

PRE-REQUISITES:

1. Basic understanding of hardware and software of computer organization.

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO#	Detailed Statement of the 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.

UNIT–I

No. of Hours: 12 Chapter/Book Reference: TB1 [Chapter 1]; TB2 [Chapters 1, 2, 3, 4, 5]

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

No. of Hours: 12 Chapter/Book Reference: TB1 [Chapters 3, 5, 6]; TB2 [Chapter 9]

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
No. of Hours: 12 Chapter/Book Reference: TB1 [Chapters 7, 8, 9]

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

UNIT–IV
No. of Hours: 10 Chapter/Book Reference: TB1 [Chapter 10]; TB2 [Chapter 6]

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. Silbersachatz and Galvin, "Operating System Concepts", John Wiley & Sons, 10 th Ed. 2018
TB2. Sumitabha Das, "Unix Concepts and Application", TMH

REFERENCE BOOKS:

RB1. Madnick E., Donovan J., "Operating Systems", Tata McGraw Hill, 2011
RB2. Tannenbaum, "Operating Systems", PHI, 4th Edition, 2015
RB3. Sivaselvan, Gopalan, "A Beginner's Guide to UNIX", PHI Learning

Course Code: BCA 204T **L T C**
Course Name: Software Testing **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

- Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
- Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:-

1. To gain knowledge of various functional and structural testing techniques
2. To gain knowledge of various activities and levels of testing
3. To learn the issues in testing of object oriented and internet-based applications

PRE-REQUISITES:

1. Software Engineering
2. Knowledge and skills of at least one programming language

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO #	Detailed Statement of the 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

UNIT – I
No. of Hours: 11 Chapter/Book Reference: TB1 [1, 2, 4, 5]; TB2[3, 4]; R1 [2, 3, 4]

Introduction: 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.

Course Code: BCA 232 **L T C**
Course Name: Introduction to Logic and Critical Thinking **0 4 2**

INSTRUCTIONS TO PAPER SETTERS:

- Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
- Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:-

1. To cultivate logical and critical thinking abilities in students.
2. To enable to students to apply logical and critical thinking to real world scenarios.

PRE-REQUISITES:

1. Understanding of Logic
2. Research skills

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO #	Detailed Statement of the CO
CO1	Develop an understanding of basic logical principles and apply them to various problem-solving scenarios.
CO2	Apply logical frameworks, such as deductive and inductive reasoning, to analyze and evaluate arguments.
CO3	Communicate ideas and arguments effectively, by employing critical thinking skills.
CO4	Students will develop the ability to critically analyse, identifying, evaluating evidence, and recognizing logical fallacies and apply logical and critical thinking skills to real-world scenario by evaluating arguments.

UNIT – I

No. of Hours: 6 Chapter/Book Reference: TB1 [Chapters 1]; TB2[Chapter 2]

Introduction to Logical and Critical Thinking: Definition of logical and critical thinking, Basic concepts of critical thinking, reasoning, logic and language, issues, claims, arguments, explanations, conclusions, fact and opinion, Importance of logical and critical thinking in academia and professional life.

UNIT – II

No. of Hours: 5 Chapter/Book Reference: TB3 [Chapters 4]; TB2[Chapters 5]; TB3 [Chapters 4]

Concept of logic: Techniques of Arguments, Types of Arguments: Deduction and Induction, Difference between Inductive and Deductive Arguments, Evaluating Argument, Validity and Soundness, Strength and Weakness of Deductive and Inductive Arguments.

UNIT – III

No. of Hours: 4 Chapter/Book Reference: TB2[Chapters 6]; TB3 [Chapters 7]

Concept of Critical Thinking: Meaning of critical thinking, Standards of Critical Thinking, Principles of Critical Thinking, Basic Traits of Critical and Uncritical thinkers.

UNIT – IV

No. of Hours: 6 Chapter/Book Reference: TB1 [Chapter 10]; TB3[Chapters 12 and 13]

Fallacies: Defining Fallacies, formal and informal fallacies, common fallacies in reasoning, identifying and analysis of fallacious arguments, Strategies to avoid fallacious reasoning. Critical Thinking in Information Technology, assessing the validity of arguments in technical documents, Ethical considerations in the IT decision making.

TEXT BOOKS:

TB1. "Critical Thinking: A Concise Guide" by Tracy Bowell and Gary Kemp

TB2. "Critical Thinking: A Student's Introduction" by Gregory Bassham, William Irwin, Henry Nardone, and James Wallace

TB3. The Art of Reasoning: An Introduction to Logic and Critical Thinking" by David Kelley

REFERENCE BOOKS:

RB1. Moore and Parker, Critical Thinking, 10th edition "Introduction to Logic" by Irving M. Copi, Carl Cohen, and Kenneth McMahon

Course Code: BCA 234 **L T C**
Course Name: Health and Wellness, Yoga Education and sports & Fitness **0 4 2**

INSTRUCTIONS TO PAPER SETTERS:

- Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
- Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:

1. To learn exercise strategies that work best for fat loss or weight gain or general fitness.
2 Being fit is a journey not a destination

PRE-REQUISITES:

None

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to

CO#	Detailed Statement of CO
CO 1	To learn exercise strategies that work best for fat loss or weight gain or general fitness.
CO 2	To value our heath and each healthy body part.
CO 3	Identify our fitness goals as per our body requirements
CO 4	Being fit is a journey not a destination
CO 5	Improving flexibility to the mental benefits such as reducing stress, improving self-esteem and confidence.

Unit I

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

Health Vs Fitness an overview: Definition of health & fitness, Nutrition pyramids, Definition of Nutrition and components of health

Lifestyle disorders: Diabetes, obesity, PCOS, Metabolic syndrome

Calorie and energy balance: Calorie deficit, calorie surplus, calorie maintenance and overview

Macro nutrients and Micro nutrients: Proteins, Carbohydrates, fats, vitamins, and minerals and their overview.

Introduction to quantified nutrition: Relevance of quantified nutrition

Unit II:

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

Introduction to exercise and its science: Definition of exercise and its importance, types of exercise,

components of fitness, exercise planning and building its routine, impact of exercise on life style disorders along with basic exercise recommendation for general healthy population.

Unit III

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters 6]; RB2[Chapter 6]

Resistance training and its overview: Definition of Resistance training in addition to its importance.

Introduction to basic muscle groups: Shoulders (Deltoids), Chest (pectorals), Back (Latissimus and Trapezius), Arms (Biceps and triceps), Legs (Quadriceps, gluteal, calves, hamstring)

Unit IV

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters 8]; RB2[Chapter 7]

Introduction to training variables and its importance: Intensity, Repetitions range, Training volume, Tempo and exercise ordering**,** Frequency and interest rest period.

Exercise plan: Basic exercise plan for beginners, Intermediate and advanced athletes.

Introduction to yoga: Importance yoga and its necessity in daily life style, introduction to few asanas that are necessary for fat loss, Diabetes, obesity, PCOS, Metabolic syndrome

TEXTBOOKS:

TB1. Light on Yoga: The Definitive Guide to Yoga Practice by BKS Iyengar
TB2. Fifty Days to Fitness: Be A Fitness Freak and Be Fit for Life by Ravindran
TB3. Faster, Stronger, Higher: A One-Stop Nutrition Framework for Indian Track and Field Athletes by Mihira A R Khopkar
TB4. The Fit Indian by Vishnu Mohan
TB5. The Complete Book of Yoga: Karma Yoga, Bhakti Yoga, Raja Yoga, Jnana Yoga by Swami Vivekananda

REFERENCE BOOKS:

RB1. Science Of Yoga: Understand the Anatomy and Physiology to Perfect your Practice by Ann Swanson MS C-IAYT LMT E-RYT500
RB2. The Running Effect by Sweta Samota
RB3. Hacking Health: The Only Book You'll Ever Need to Live Your Healthiest Life by Mukesh Bansal
RB4. The 12-Week Fitness Project (Updated for 2021 with 12 Extra Guidelines) Rujuta Diwekar
RB5. Know Your Sport by DK

Course Code: BCA 212T **L T C**
Course Name: Introduction to Data Science **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

- Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
- Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:

1. Apply mathematical principles to the analysis of data.
2. Analyze data sets in the context of real-world problems.
3. Develop and implement data analysis strategies base on theoretical principles, ethical considerations, and knowledge of the underlying data

PRE-REQUISITES: None

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO#	Detailed Statement of CO
CO1	Basics of Data Science and Data Collection strategies
CO2	Illustrating statistical analysis of data.
CO3	Working with the data structures of python like series and Data Frames
CO4	Statistical analysis of data with the help of python

UNIT – I
No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters-1, 2,3]

Introduction to data Science: Evolution of Data Science, Data Science Roles, Stages in a Data science Project, Applications of Data Science In various fields, Data security Issues.
Data Collection Strategies, Data Pre-processing overview- Data Cleaning- Data Integration and transformation- Data Reduction- Data Discretization.

UNIT – II
No. of Hours: 11 Chapter/Book Reference: TB2[Chapters 3, 4, 5, 6]; TB3 [Chapters-1, 2, 3]

Why Python? - Essential Python libraries
Introduction to NumPy: NumPy Basics: Arrays and Vectorized Computation- The NumPyndarray- Creating ndarrays- Data Types for ndarrays- Arithmetic with NumPy Arrays- Basic Indexing and Slicing.
Data handling using Pandas in python: Series (creation from ndarray, dictionary; mathematical

operations;Head and Tail functions), Data Frames (creation from dictionary of series, operations on rows and columns) Statistical functions using pandas like min, max, count, sum, quartile, standard deviation, variance & Data Frameoperations like aggregation, group by, Sorting, Deleting, Renaming Index, Pivoting.
Statistics for Data Science: Describing a Single Set of Data.
Descriptive Statistics- Bias, Variance, Mean, Median standard Deviation, Range, Inter quartile range Skewness and Kurtosis, Box plots, Pivot Table, LinearRegression.

UNIT – III
No. of Hours: 11 Chapter/Book Reference: TB2[Chapters-4, 8, 9, 10]; TB3 [Chapters-2, 3, 4, 5]

Bayesian Statistics: Probability theory and Distribution of data [Poisson, exponential & Normal Distribution], Central Limit Theorem.
Inferential Statistics: Correlation Analysis, Regression Analysis, Population, Sample, Types of Sampling, Sampling distributions of mean and variance [Z, t, Chi-Square, F], Hypothesis Testing.

UNIT – IV
No. of Hours: 11 Chapter/Book Reference: TB2[Chapters-3, 4, 5]

Case Studies: Checking different patterns in data, Forecasting demand, investigating clinical data

TEXT BOOKS:
TB1. Joel Grus, "Data Science from Scratch", O'Reilly, 2nd Edition, 2019.
TB2. Data Science and Big Data Analytics, Discovering, Analyzing, Visualizing and Presenting Data, Wiley
TB3. Miller and Freund's - Probability and Statistics for Engineers Paperback – 1 January 2011 by Richard J (Author) is a good book covering above statistics content

REFERENCE BOOKS:
RB1. Python: The Complete Reference by Martin Brown
RB2 Programming Python, 4th Edition by Mark Lutz Released December 2010 Publisher(s): O'Reilly Media, Inc.

Course Code: BCA 216T **L T C**
Course Name: Introduction to Security, Acts and Cyber Laws and Cyber Security 4 0 4

INSTRUCTIONS TO PAPER SETTERS:

- Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
- Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following: -

1. Students will be able to understand and learn the concept of cybercrime and security.
2. Students will be able to understand and learn the concept of cyber laws for cyber security.
3. Students will be able to understand and learn the concept of cyber forensics.
4. To study real-life examples of cybercrimes.

PRE-REQUISITES:

1. Fundamentals of IT.

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to: -

CO #	Detailed Statement of the CO
CO1	Define the basic concepts of cyber security, cybercrime, and cybercriminals.
CO2	Identify various categories of cybercrimes.
CO3	Identify and discuss the ways cybercrimes are perpetuated.
CO4	Discover the appropriate Acts for cybercrimes.
CO5	Evaluate and implement computer forensics.
CO6	Survey recent cybercrime cases focusing on cyber ethics.

UNIT – I
No. of Hours: 11 Chapter/Book Reference: TB1 [1, 2, 3]; TB2[2]

CYBER ETHICS: Cyber ethics and its types, Significance of cyber ethics, Need for cyber ethics.
CYBER CRIME AND CYBER TERRORISM: Introduction and Overview of Cyber Crime and Cyber Terrorism, Cyber Terrorism and Hackers, Sophisticated Cyber Criminal Organizations.

UNIT – II

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

CYBER CRIME: Definition, Types of cybercrimes, White-Collar Crimes, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Viruses and Malicious Code, Victimization and Obscenity on the World Wide Web.
Cyber SECURITY: Introduction to cyber security, Cybercrime and different modes of attack, Intrusion detection system, Cyber security assurance framework, Desktop security and malware, Cyber security initiatives in India, Cyber security strategies and policies

UNIT – III
No. of Hours: 11 Chapter/Book Reference: TB1 [6]; TB2 [5]; RB1 [4]

CONTROLLING CYBER CRIME BY LEGISLATION: Digital Laws and Legislation, Law Enforcement Roles and Responses, The Investigation of Computer-Related Crime, Digital Forensics, Future Trends: A Forecast of Trends and Policy Implications.

UNIT – IV
No. of Hours: 11 Chapter/Book Reference: TB1 [7]; TB2 [6]; RB1 [5]

CYBER LAWS: Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000,

TEXTBOOKS:

TB1. Cyber Crime and Cyber Terrorism, 5th edition, Pearson 2023, Robert W. Taylor University Texas at DallasEric J. Fritsch John R. Liederbach University Texas at Dallas Michael R. Saylor William L. Tafoya. ISBN-13: 9780137914517

TB2. Nina Godbole, Sunita Belapure, "Cyber Security-Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley, 1st Edition, 2020

REFERENCE BOOKS:

RB1. Cyber Security and Cyber Laws, by Nilakshi Jain, Ramesh Menon, Wiley India Publishers, 2020. ISBN-10 : 9390395755, ISBN-13 : 978-9390395750

Course Code: BCA 218 T **L T C**
Course Name: Web Development using Python **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

- Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
- Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:-

1. Open-source web app development framework.
2. Rapid development of a secure web site.

PRE-REQUISITES:

1. Python programming
2. CSS, HTML and basic Web development concepts

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO #	Detailed Statement of the CO
CO1	Creating routes (or views) and template with Django.
CO2	To create Models and to connect them with Templates and Views.
CO3	To serve static content and files using Django
CO4	To connect templates with models to serve data dynamically.
CO5	To handle and validate forms in Django.

UNIT – I
No. of Hours: 10 Chapter/Book Reference: TB1 [Ch-1, 3, 4]

Introduction to Django, Client server architecture, webserver, web browser, basic of HTML concept, basics of CSS, basics of JavaScript, Bootstrap. What is Web framework, The MVT Design Pattern, Django's History? Installation of Django: Installing Python, Setting up a Database, Starting a Project, Development Server, and Django Commands Overview.

UNIT – II
No. of Hours: Chapter/Book Reference: 12 TB1 [Ch. 3, 5, 6]

The Basics of Dynamic Web Pages (Views and URL confs): Creating View, Dynamic Content, and Mapping URLs to Views, processing a Request, URL configurations and Loose Coupling, Django's Error Pages.

The Django Template System:

Django Template System Basics- Template System Basics, template language: variables, Boolean Operators,

for loop, if, Basic Template Tags and Filters, Comments,
Using Templates in Views, Template Loading, Template Inheritance Tags, Creating a Model Manipulating Data (CRUD) Linking Models. Creating Template Objects- Rendering a Template, Playing with Context Objects.

UNIT – III
No. of Hours: 11 Chapter/Book Reference: TB1 [Ch. 7], TB 3 [CH 6]

Understanding Django Apps, Defining Models in Python, Installing the Model, Understanding Model Fields & Options, Creating A Django Model -Adding Model String Representations Making Changes to a Database Schema.
Django Forms: Creating a form using Django Forms, Render HTML Forms (GET & POST), Form Fields, form field custom widgets, Simple Validation

UNIT – IV
No. of Hours: 11 Chapter/Book Reference: TB1 [Ch. 8], TB 3 [Ch. 7, Ch. 15]

Activating the Admin Interface, Using the Admin Interface, Users, Groups and Permissions, Customizing the Admin Interface's Look and Feel, Customizing the Admin Index Page,
When and Why to Use the Admin Interface, Form Processing, Form Validation, Save Form Response.

TEXT BOOKS:
TB1. Django for web app development using Python – Leonardo Luis Lazzoro.
TB2. Django 4 By Example - Fourth Edition, Antonio Mele
TB3. Django for Beginners: Build Websites with Python and Django, William D. Vincent

REFERENCE BOOKS:
RB1. Django official Documentation
(https://django-book-new.readthedocs.io/en/latest/index.html)

Course Code: BCA 220T **L T C**
Course Name: Information Security **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

- Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
- Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

The objective of this course is to provide the learners the following:

1. Identify security threats and analyze security models to understand information security fundamentals.
2. Evaluate cryptographic techniques and their application in securing network communications.
3. Demonstrate proficiency in configuring and managing network security controls such as firewalls and intrusion detection systems.
4. Assess ethical and professional considerations in applying security controls to protect information assets.

PRE-REQUISITES: Nil

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO #	Detailed Statement of the CO
CO1	Understand the fundamentals of information security, including threats, attacks, and security models.
CO2	Analyze network security threats and apply security controls such as firewalls and intrusion detection.
CO3	Describe network security controls and technologies.
CO4	Understand cyber threat intelligence and incident response planning.

UNIT I

No. of Hours: 10 Chapter/ Book Reference: TB1 [Chapters 3, 13]; TB2 [Chapters 1, 13]; RB1 [Chapters 1, 2]

Information Security Fundamentals: Threats, Attacks, Vulnerabilities, Types of security attack, Security Models and Frameworks, Need of security, Risk Management in Information Security.

Cryptography and Secure Communication: Concept of cryptography, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, introduction of steganography, Cryptography Algorithms.

UNIT II

No. of Hours: 10 Chapter/ Book Reference: TB2 [Chapters 16, 17]; RB1 [Chapters 6]

Network security: Threats in network, Risk analysis, Physical security, secure emails, administering security, PKI.

Web security: Web security considerations, Secure Socket Layer (SSL), Transport layer security, secure

electronic transaction.

UNIT III

No. of Hours: 10 Chapter/ Book Reference: TB1 [Chapter 23]; TB2 [Chapter 16]; RB1 [Chapter 9]; RB2 [Chapter 6]

Network Security Controls: Architecture, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security.
Firewalls: Intruders, virus and firewalls, Design and Types of Firewalls, Firewall Technologies, IDS,IPS,VPN, Email Security–PGP(operation, generation and header format), S/MIME.
Database Security: Features, Multi-level security, Ethical issues, Network Traffic Analysis.

UNIT IV

No. of Hours: 10 Chapter/ Book Reference: TB1 [Chapter 24]; TB2 [Chapter 16]; TB3 [Chapters 6, 7]; RB2 [Chapter 3]

Laws and Regulations: Cyber Threat Intelligence and Incident Response, Incident Investigation, Incident Response Simulation.
IT and Cyber Act: Legal Perspective, The Indian IT Act and Amendments, Cyber Crime and punishments, Computer Forensics, Digital Forensics, Network Forensics, Intellectual Property in cyberspace, copyright issues.

TEXT BOOKS:

TB1. William Stallings, "Cryptography and Network Security: Principles and Practices", Pearson Education, latest Edition.
TB2. Forouzan Behrouz A, “Cryptography and Network Security", McGraw Hill, latest edition.
TB3. Nina Godbole, Sunita Belapure, “Cyber Security-Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley, Latest Edition

REFERENCE BOOKS:

RB1. Atul Kahate, “Cryptography and Network security”, McGraw Hill, latest edition.
RB2. Michael E Whitman and Herbert J Mattord, "Principles of information Security", CENGAGE Learning.
RB3. Charles P. Pfleeger and Shari Lawrence Pfleeger, "Security in Computing", PHl.
RB4. Mark Rhodes-Ousley, “Information Security-The Complete Reference”, McGraw Hill Education, 2nd Edition, 2012.

Course Code: BCA 222T **L T C**
Course Name: Digital Marketing **3 0 3**

INSTRUCTIONS TO PAPER SETTERS:

- Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
- Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following: -

1. Understand the basics of Digital Marketing.
2. Comprehend the importance of Digital Marketing Platforms.
3. Gain knowledge about the usefulness of Social Media Marketing (SMM) and Search Engine Optimization (SEO)

PRE-REQUISITES: None

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO #	Detailed Statement of the CO
CO1	Understanding the digital marketing concepts and its usefulness inbusiness.
CO2	Planning steps for digital marketing strategy and successfully executingit.
CO3	Understand the importance of Social Media Platforms and Social MediaMarketing for online communication.
CO4	Applying Search Engine Optimization techniques (SEO) and Search Engine Marketing (SEM) to maximize reach and enhance engagementof users.
CO5	Analyzing web using analytics tools and gaining insights to various toolsfor Social Media Marketing.

UNIT – I

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapter – 1, 2], TB2 [Chapter – 1, 4-9], TB3 [Chapter –1]

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

UNIT – II
No. of Hours: 11 Chapter/Book Reference: TB1 [Chapter –3, 4, 5, 6, 7, 8], TB2 [Chapter – 4], TB3 [Chapter – 8]

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
Email Marketing- Overview of Email Marketing, Creating Effective and Unique Email Content Designing, Marketing Emails.

UNIT – III
No. of Hours: 11 Chapter/Book Reference: TB1 [Chapter – 2, 3, 10]

Search Engine Optimization – Introduction to SEO, On-Page and Off-Page Optimization, Role of Keywords inSEO, 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 Chapter/Book Reference: TB1 [Chapter – 1, 5, 11]

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, Supriya Madan, "Digital Marketing", BPB Publication, 2nd Edition, 2023
TB2. Seema Gupta, "Digital Marketing", McGraw Hill, 2nd Edition, 2018.
TB3. Puneet Singh Bhatia, "Fundamentals of Digital Marketing", Pearson, 2nd Edition, 2020.
REFERENCE BOOKS:
RB1. Ian Dodson, "The Art of Digital Marketing", Wiley, 2017.
RB2. Nitin Kamat, Chinmay Nitin Kamat, "Digital Marketing", Himalaya Publishing House, 1st Edition, 2017.
RB3. Vandana Ahuja, "Digital Marketing", Oxford University Press, 8th Edition, 2019.**RB4.** Judy Strauss, Raymond Frost, "E- Marketing", PHI learning, 5th Edition, 2009. **RB5.** Moutusy Maity, "Internet Marketing", Oxford University Press, 2018.
RB6. Stephanie Diamond, "Digital Marketing", Wiley, 2019.
RB7. T. N. Swaminathan, Karthik Kumar, "Digital Marketing From Fundamentals to Future", Cengage, 1st Edition,2019

Course Code: BCA 224T **L T C**
Course Name: Principles of Accounting **3 0 3**

INSTRUCTIONS TO PAPER SETTERS:

- Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks, including its subparts, if any.
- Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:

1. To get the knowledge about the important concepts & characteristics of accounting.
2. To study the application of accounting in the general business environment.

PRE-REQUISITES:

None.

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO #	Detailed Statement of the 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 of providing depreciation.

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. Introduction of IFRS ,Distinction between Indian Accounting standards and IFRS

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.
IT application in accounting:- Computerized accounting system (using any popular accounting software) Creation of vouchers, recording of transactions, preparing reports , cash books, bankbook, ledger accouunts 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.
IT application in accounting Computerized accounting system (using any popular accounting software) Creation of profit and loss account, balance sheet.

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 InventoriesFIFO, 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., (2023) An Introduction to Accountancy,
Eighth Edition, Vikas Publishing House.
TB2. Tulsian, P.C., (2023) Financial Accountancy, 2nd edition, Pearson Education.
TB3. Goyal, Bhusan Kumar , Basic Financial Accounting, 2022, International Book House Pvt. Ltd.

REFERENCE BOOKS:
RB1. Gupta R. L., & Gupta V.K., “Principles & Practice of Accounting”, Sultan Chand & Sons, 2020.
RB2. Monga J R, “Introduction to Financial Accounting”, Mayur Paperbacks, 2022.
RB3. Raja Sekaran/Lalitha, “Financial Accounting”, Pearsons.
RB4. Goyal V.K. & Goyal Ruchi (2022) Financial accounting, PH

Course Code: BCA 202P	L	T/P	C
Course Name: Operating Systems Lab	0	2	1

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to:

1. Unix/Linux environment
2. Understanding of Linux commands and scripts

PRE-REQUISITES:

Nil

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the CO
CO1	Understand Linux Environment with the help of its architecture.
CO2	Understand the Linux environment by using general Linux Commands.
CO3	Implement Process Related commands.
CO4	Implement File Permission concept.
CO5	Understanding the shell script by combining commands.

List of Practical's

S. No.	Detailed Statement	Mapping to CO #
	Core Practicals	
1.	Connect to the Linux Server and understand the basic Directory Structure of Linux.	CO1
2.	To understand help commands like:- man, info, help, whatis, apropos	CO2
3.	To understand basic directory navigation commands like cat,cd, mv, cp, rm, mkdir,rmdir, file, pwd command.	CO2
4.	To understand basic commands like:- date, cal, echo, bc, ls, who, whoami, hostname, uname, tty, aliase	CO2
5.	To understand vi basics, Three modes of vi Editor, how to write, save, execute a shell script in vi editor.	CO5
6.	To understand process related commands like: -ps, top, pstree, nice, renice in Linux.	CO3
7.	To understand how to examine and change File permissions.	CO4
8.	Set a file to be read-only with the chmod command. Interpret the file permissions displayed by the ls -l command.	CO4
9.	Delete one or more directories with the rmdir command. See what happens if the directory is not empty. Experiment (carefully!) with the rm -r command to delete a directory and its content.	CO2
10.	Change your directory to the directory exercises. Create a file in that directory, named the file as example1 using the cat command containing the following text: water, water everywhere and all the boards did shrink; water, water everywhere, no drop to drink.	CO2
11.	Write basic shell script to display the table of a number.	CO5
12.	Write basic shell script to input a character from user and then check whether it is uppercase, lowercase or digit.	CO5
13.	Write basic shell script to calculate factorial of a number.	CO5
14.	Write basic shell script to input the month number and generate	CO5

	corresponding calendar.	
15.	Write basic shell script to list all directories.	CO5
16.	Write basic shell script to display greatest of three numbers.	CO5
17.	Write basic shell script to check whether the number entered by user is prime or not.	CO5

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.

Course Code: BCA 204 P	L	T	C
Course Name: Software Testing Lab	4	0	4

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to:

1. To gain knowledge of various functional and structural testing techniques
2. To gain knowledge of various activities and levels of testing
3. To learn the issues in testing of object oriented and internet-based applications

PRE-REQUISITES:

1. Software Engineering
2. Knowledge and skills of at least one programming language

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the 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

List of Practicals

S. No.	Detailed Statement	Mapping to CO #
	Core Practicals (Implement minimum 10 out of 15 practicals)	
1	Write a small program in Python or Java with intentional bugs. Identify and classify them as error, fault, or failure.	CO1
2	Create a test case document for a calculator or login form and perform testing.	CO3
3	Create a flowchart or diagram of STLC using online or offline drawing tools.	CO2
4	Write test cases for form validation and explain how it satisfies verification and validation.	CO2
5	Review a piece of code for logic, formatting, and style issues.	CO1
6	Write test cases with different input combinations without looking at the code.	CO3
7	Test a form that accepts age (1–100). Check with values 0, 1, 2, 99, 100, 101.	CO3
8	Test valid and invalid data classes for a mobile number field (10 digits).	CO3
9	Design a decision table for login credentials (valid/invalid username/password).	CO3
10	Write a program and calculate the cyclomatic complexity using online tools.	CO3
11	Write unit test cases for a Java function (e.g., factorial, sum).	CO3
12	Integrate and test two modules (e.g., login + dashboard).	CO3
13	Test the application as a whole (input → output correctness).	CO3

14	Create test cases that simulate client acceptance (UI, behavior).	CO3
15	Draft a test plan covering objectives, scope, resources, responsibilities, and timeline.	CO4

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.

Course Code: BCA 212P	L	T/P	C
Course Name: Data Science Lab	0	4	2

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to:

1. Basic Statistical programming functions in Python.
2. Apply the concepts of data structures like Series and Data Frames in Python applications.

PRE-REQUISITES:

Basics of python.

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the CO
CO1	Demonstrate the use of operators and mathematical expression in Python data structures like Series and Data frames.
CO2	Use statistical functions Python Programs which will help in analysis.
CO3	Read and write data from & to files in Python and develop application.
CO4	Apply the concepts of Pandas in real time application.

List of Practical's

S. No.	Detailed Statement	Mapping to CO #
	Core Practical's (Implement minimum 8 out of 10 practical's)	
1.	Create a pandas series from a dictionary of values and an ndarray.	CO1
2.	Create a Series and print all the elements that are above 75th percentile.	CO1, CO2
3.	Perform sorting on Series data.	CO1, CO2
4.	Program to show sorting on DataFrames	CO1, CO2
5.	Program to shoe Deleting/Renaming Columns/Rows	CO1, CO2
6.	Program to use cumprod(),cumsum(), cummin() and cummax().	CO1, CO2
7.	Write a program to implement pivot() and pivot-table() on a DataFrame.	CO1, CO2,CO3
8.	Write a program to find mean absolute deviation on a DataFrame.	CO1, CO2,CO3
9.	Write a program to show functions on a subset of Dataframe.	CO1, CO2,CO4, CO5
10.	Adding/Modifying a row in DataFrame.	CO1, CO2
	Application Based Practicals (Implement minimum 5 out of 10 practicals)	
11.	Two Series object, Population stores the details of four metro cities of India and another object AvgIncome stores the total average income reported in four years in these cities .Calculate income per capita for each of these metro cities.	CO1, CO2,CO5
12.	Create a DataFrame based on E-Commerce data and generate mean, mode, median.	CO1, CO2
13.	Create a DataFrame based on employee data and generate quartile and variance.	CO1, CO2

14.	Program to implement Skewness on Random data.	CO1, CO2
15.	Create a DateFrame on any Data and compute statistical function of Kurtosis.	CO1, CO2,CO3
16.	Series objects Temp1, temp2, temp3, temp 4 stores the temperature of days of week 1, week 2, week 3, week 4. Write a script to:- 1. Print average temperature per week 2. Print average temperature of entire month	CO1, CO2,CO3,CO5
17.	Write a Program to read a CSV file and create its DataFrame.	CO1, CO2,CO4,CO5
18.	Consider the DataFrame QtrSales where each row contains the item category, item name and expenditure and group the rows by category, and print the average expenditure per category.	CO1, CO2, CO5
19.	Create a DataFrame having age, name, weight of five students. Write a program to display only the weight of first and fourth rows.	CO1, CO2, CO3
20.	Write a program to create a DataFrame to store weight, age and name of three people. Print the DataFrame and its transpose.	CO1, CO2, CO5

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.

Course Code: BCA 216P	L	T/P	C
Course Name: Introduction to Security, Acts and Cyber Laws and Cyber Security Lab	0	4	2

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following: -

1. Students will be able to understand and learn the concept of cybercrime and security.
2. Students will be able to understand and learn the concept of cyber laws for cyber security.
3. Students will be able to understand and learn the concept of cyber forensics.
4. To study real-life examples of cybercrimes.

PRE-REQUISITES:

1. Fundamentals of IT.

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the CO
CO1	Define the basic concepts of cyber security, cybercrime, and cybercriminals.
CO2	Identify various categories of cybercrimes.
CO3	Identify and discuss the ways cybercrimes are perpetuated.
CO4	Discover the appropriate Acts for cybercrimes.
CO5	Evaluate and implement computer forensics.
CO6	Survey recent cybercrime cases focusing on cyber ethics.

List of Practical's

S. No.	Detailed Statement	Mapping to CO #
	Core Practicals	
1.	Install and configure any Antivirus software on System	CO1
2.	Implement prevention mechanisms to protect PC from Cyber Attack	CO1
3.	Implement Steganography Algorithms	CO2
4.	Implement and install the key loggers to understand their working.	CO5
5.	Implement hashing algorithm like MD5, SHA256.	
6.	Implement hiding of Data in image using tools.	CO3
7.	Apply security to Files/ Folder/Applications using access permissions	CO4
8.	Study of System threat attacks - Denial of Services.	CO4
9.	Study of Techniques uses for Web Based Password Capturing.	CO5
10.	Study of Anti-Intrusion Technique – Honey pot.	CO6
11.	Study of Sniffing and Spoofing attacks.	CO6

Note:

1. In total 10 practical's are to be implemented.
2. This is a suggestive list of practical's. However, the instructor may add or change five problem statements as per the requirement.

Course Code: BCA 218P	L	T/P	C
Course Name: Web Development Using Python Lab	0	4	2

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following: -

1. Dynamic web app development framework.
2. Rapid development of a secure web site.

PRE-REQUISITES:

1. Python programming
2. CSS, HTML and basic Web development concepts

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the CO
CO1	Creating routes (or views), template and forms with Django.
CO2	To handle and validate forms in Django.
CO3	To serve static content and files using Django
CO4	To create User models and forms and implement login and registration.
CO5	To develop an application making use of python and Django

List of Practical's

S. No.	Detailed Statement	Mapping to CO #
	Core Practicals	
1.	Install Python including installation of pip, installation and setting up virtual environment, installation of Django. Create a new Django project using command line.	CO1
2.	Create a Django Form using forms.py	CO2
3.	Create a Django app Using Django Templates features i.e. Creating Template Objects , Rendering a Template	CO2
4.	Create a Django app Using Django Templates features i.e. Multiple Contexts, Context Variable Lookup, Template Loading, include Template Tag.	CO2, CO3
5.	App to connect templates with models to serve data dynamically	CO2, CO3
6.	Rendering a model in Django Admin Interface	CO4
7.	Write a Django web app to use parameters in Views.py	CO2
8.	Write a Django web app using control statements (If, for etc.)	CO3
9.	Work with Django Template built in Tags and Filter	CO2
10.	Check to build even or odd number using Django form	CO3
11.	Create a Dynamic Feedback form with validations.	CO3
12.	Creating and using CRUD class based view	CO2
13.	Handling 404, 502 pages	CO2

Note:

1. In total 10 practical's are to be implemented.
2. This is a suggestive list of practical's. However, the instructor may add or change five problem statements as per the requirement.

Course Code: BCA 220P	**L**	**T/P**	**C**

Course Name: Information Security Lab	**0 4 2**

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following: -

1. Identify security threats and analyze security models to understand information security fundamentals.
2. Evaluate cryptographic techniques and their application in securing network communications.
3. Demonstrate proficiency in configuring and managing network security controls such as firewalls and intrusion detection systems.
4. Assess ethical and professional considerations in applying security controls to protect information assets.

PRE-REQUISITES:

Nil

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:

CO #	Detailed Statement of the CO
CO1	Understand the fundamentals of information security, including threats, attacks, and security models.
CO2	Analyze network security threats and apply security controls such as firewalls and intrusion detection.
CO3	Describe network security controls and technologies.
CO4	Understand cyber threat intelligence and incident response planning.

List of Practical's

S. No.	Detailed Statement	Mapping to CO #
	Core Practicals	
1.	To study different open source tools for network security and analysis.	CO1
2.	To perform encryption, decryption using the substitution techniques.	CO1
3.	To perform encryption and decryption using transposition techniques.	CO1
4.	To download the N-Stalker Vulnerability Assessment Tool and explore the features.	CO2
5.	To apply the RSA algorithm.	CO2
6.	To apply the DES algorithm for practical applications.	CO2
7.	To apply the AES algorithm for practical applications.	CO2
8.	Write a program to perform Encryption/Decryption using Diffie-Hellman Key exchange.	CO2, CO3
9.	To implement the Digital Signature algorithm.	CO2, CO3
10.	To implement a hash algorithm.	CO2, CO3
11.	To set up a honey pot and monitor the honeypot on the network (KF - Sensor).	CO3
12.	To set up a simple VPN using free VPN software and discuss its	CO3

	benefits for secure remote access.	
13.	Demonstrate any ten N-map commands.	CO3
14.	Design and configure LAN in CISCO packet tracer.	CO3
15.	To demonstrate Intrusion Detection System (IDS) using Snort software tool.	CO2, CO4

Note:

1. In total 10 practical's are to be implemented.
2. This is a suggestive list of practical's. However, the instructor may add practicals as per the requirement of the course.