

GURU NANAK COLLEGE (AUTONOMOUS)

A Sikh Minority Institution | Unit of Guru Nanak Educational Society (Regd.)

Affiliated to University of Madras | Approved by AICTE

Accredited at A++ Grade by NAAC (CGPA 3.68/4)

Guru Nanak Salai, Velachery, Chennai - 600042



SCHOOL OF INFORMATION TECHNOLOGY BACHELOR OF COMPUTER APPLICATIONS (BCA) (SEMESTER PATTERN WITH CHOICE BASED CREDIT SYSTEM)

Syllabus

(For the UG Batch of 2026-29 and thereafter)

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LOCF - LEARNING OUTCOME BASED CURRICULUM FRAMEWORK

PREAMBLE

1. ABOUT THE PROGRAMME

Bachelor of Computer Applications (BCA) is a 3 Year - undergraduate programme spread over six semesters. By incorporating the most recent developments into the curriculum and providing students with a thorough understanding within a structured framework, this course is intended to bridge the gap between IT industries and Academic institutions.

The corporate landscape is rapidly changing as a result of a number of innovative technologies that have emerged in the IT industry. The difficulties facing the IT industry now differ greatly from those of past few years. Students who want to pursue careers in information technology need to be well-versed in the newest advances due to the ever-changing technological landscape.

The BCA curriculum is specifically created to meet the knowledge and skill demands of the modern industry. It includes theoretical and practical training sessions that can provide students with the skills they need for the lucrative occupations of the future. This course aids students in pursuing further computer science education as well as building a successful career in the field.

2. VISION

To impart essential knowledge in Information technology to the student community, enhance their ability to apply the knowledge gained and be successful in their professional and social life and thrive for the upliftment of the society.

3. MISSION

- Inculcate students and equip them with global technological skills in Information Technology, that enhance them to be innovative, have lateral thinking and be good at problem-solving.
- Increase Industry - Institute Interaction to enlighten the students about the required skills to be successful in their career.
- Train and develop the students as IT professionals with confidence, competence, commitment and character

4. PROGRAMME EDUCATIONAL OBJECTIVS (PEOS)

PEO1: Technical and Professional Excellence: Graduates will demonstrate strong foundations in computer science, software engineering, data management, and emerging technologies, enabling them to excel in industry, academia, and research.

PEO2: Innovation and Problem-Solving: Graduates will apply analytical thinking, creativity, and modern IT tools to design, develop, and implement solutions for complex technological and societal challenges.

PEO3: Ethics and Responsible Computing: Graduates will uphold ethical standards, practice responsible computing, and contribute to sustainable development by leveraging technology for societal benefit.

PEO4: Leadership and Collaboration: Graduates will exhibit effective communication, teamwork, and leadership skills, preparing them to manage diverse projects and collaborate across multidisciplinary environments.

PEO5: Adaptability and Lifelong Learning: Graduates will engage in continuous professional development, research, and upskilling to remain adaptable in dynamic global IT environments and contribute to innovation and knowledge creation.

5. PROGRAMME OUTCOMES(POS)

PO1: Knowledge: Apply the knowledge of computer science fundamentals, programming languages, mathematics, and computing techniques to analyze and solve computing and IT-related problems.

PO2: Problem Solving: Analyze requirements and apply problem-solving skills to develop efficient computing solutions using appropriate methodologies.

PO3: Critical Thinking: Utilize modern computing tools and technologies to apply critical thinking in analyzing, interpreting, and managing data for effective decision-making.

PO4: Individual and Team Work: Perform professional ethics and teamwork while working independently and collaboratively in multidisciplinary environments.

PO5: Communication and Lifelong Learning: Communicate effectively, adapt to emerging technologies, and engage in lifelong learning to develop innovative solutions for IT challenges.

6. PROGRAMME SPECIFIC OUTCOMES (PSOS)

PSO1: Specialized Knowledge: Apply Specialized knowledge of programming, algorithms, and computing systems to analyze problems and develop effective digital solutions in domain-specific applications.

PSO2: Experiential and Modern Tool Usage: Design and develop scalable software applications using modern tools and experiential learning to meet user requirements and industry standards.

PSO3: Investigation and Research: Investigate and analyze structured and unstructured data using appropriate tools for research and data-driven decision making.

PSO4: Employability: Integrate emerging technologies such as cloud computing, artificial intelligence, big data, and data science to enhance employability and develop innovative computing solutions.

PSO5: Interdisciplinary and Multidisciplinary: Exhibit ethical responsibility, communication, teamwork, leadership, and problem-solving in interdisciplinary and multidisciplinary environments.

7. PEO – PO MAPPING

	PEO 1	PEO2	PEO3	PEO4	PEO5
PO 1	3	3	2	2	2
PO 2	2	3	3	2	2
PO 3	1	2	2	2	2
PO 4	2	2	2	3	3
PO 5	2	2	2	2	3

8. PEO – PSO MAPPING

	PEO 1	PEO2	PEO3	PEO4	PEO5
PSO 1	3	3	2	2	2
PSO 2	3	3	2	2	2
PSO3	2	3	2	2	3
PSO 4	3	3	2	2	3
PSO 5	1	2	2	2	2

9. CHOICE BASED CREDIT SYSTEM (CBCS)

The College follows the CBCS with Grades under the Semester pattern. Each course is provided with a credit point based on the quantum of subject matter, complexity of the content and the hours of teaching allotted. This is done after a thorough analysis of the content of each course by the members of the Board of Studies and with the approval of the Academic Council. Students are also offered a variety of Job oriented Elective, Multidisciplinary skill-based courses as part of the curriculum. Students can earn extra credits by opting for Massive Open Online Courses (MOOCs) and Certificate Courses.

The evaluation method under CBCS involves a more acceptable grading system that reflects the

personality of the student. This is represented as Cumulative Grade Point Average (CGPA) and Grade Point Average (GPA) which are indicators of the Academic Performance of the student. It provides students with a scope for horizontal mobility and empowers them with the flexibility of learning at their convenience.

Eligibility for Admission

Candidates admitted to the first year of the **Bachelor of Computer Applications (BCA)** should have passed the higher Secondary Examinations (Academic or Vocational Stream) Mathematics / Business Mathematics / Computer Science / Computer Applications conducted by the Government of Tamil Nadu or an examination accepted as equivalent thereof by the Syndicate of the University of Madras. Students applying for the PG programme should have taken the UG degree in the relevant subject from a recognized university as per the norms of the University of Madras.

Duration of the Course

The UG programme is of three years duration with six semesters and the PG programme is of two years duration with four semesters. The period from June to November is termed as the odd semester and the period from December to April is referred to as the even semester. Each semester must compulsorily have 90 working days before the students appear for the final End Semester Exam.

Course of Study

The main course of study for the Bachelor's Degree shall consist of the following:

Foundation Courses

PART - I: Tamil/ Hindi /Sanskrit/French

PART - II: English

Core Courses

PART - III: Consisting of (a) Core Courses (*Including Project*) (b) Allied Courses (c) Elective Courses related to the main subject of study.

PART – IV: Those who have not studied Tamil up to XII standard and have taken a Non-Tamil language under Part – I, shall opt for Basic Tamil in the first two semesters.

Those who have studied Tamil up to XII standard (State Board) or Tamil up to X Standard (CBSE and other boards) and opted for a Non -Tamil language under Part – I, shall opt for Advanced

Tamil in the first two semesters.

Others, who do not come under either of the clauses mentioned above, can choose a Non-Major Elective (NME) in the first two semesters.

Soft Skills (I, II, III & IV Semesters)

Value Education (I Semester)

Self-Study (Compulsory) Course (III Semester)

Indian Knowledge System (Domain Specific) – (IV Semester)

Summer Internship (After IV Semester)

Environmental Studies (V Semester)

PART - V: Compulsory Extension Services

A Student shall be awarded one credit for compulsory extension service. A student must enroll in NSS / NCC /Sports & Games/ Citizen Consumer Club / Enviro Club or any other service organization in the College and should put in compulsory minimum attendance of 40 hours, which shall be duly certified by the Principal of the College. If a student lacks 40 hours compulsory minimum attendance in the extension services in any Semester, s/he shall have to compensate the same, during the subsequent Semesters.

10. COURSE STRUCTURE

The **Bachelor of Computer Applications (BCA)** programme consists of 20 Core courses with 4 credits each, 4 Allied courses with 4 credits each, 3 Elective courses with 4 credits each, 4 Ability Enhancement Skill courses with two credits each, 2 Non-Major Elective courses with two credits each, 2 Life Skill courses (Value Education and EVS) with two credits each, 1 Self-study course with 2 credits and a domain specific IKS course with one credit. Internship is a compulsory component with 2 credits and Project is a compulsory core course with 4 credits for all the UG & PG programmes. Extension activity is a compulsory component with 1 credit.

Consolidated Credit Structure for all the 3 years

Course component		No. of Courses	Credits
Part I	Language	2	6
Part II	English	2	6
Part III	Core	20	80
	Allied	4	16
	Elective	3	12
Part IV	NME	2	4
	Ability Enhancement skills	4	8
	EVS	1	2
	Value Education	1	2
	Internship	1	2
	Self-study course	1	2
	IKS	1	1
Part V	Extension activity	1	1
Total		43	142

Credit Distribution for Each Semester:

Semester I		Subject	Credit	Hours per week	Marks		Total
Course Component					Internal	External	
Part I	Language	Language – I	3	6	50	50	100
Part	English	English – I	3	4	50	50	100
Part III	Core – I	Programming in C & Digital Logic Fundamentals	4	5	50	50	100
	Core – II	Practical – I: Programming in C & Digital Logic Fundamentals	4	4	50	50	100
	Allied – I	Allied Mathematics	4	5	50	50	100
Part IV	Non-Major Elective - I	Basic Tamil-I/ Advanced Tamil-I/ Web Office Using Google Workspace Lab	2	2	50	50	100
	Life Skills - I	Value Education	2	2	50	50	100
	Ability Enhancement Skills - I	Communication skills and Personality Development skills	2	2	50	50	100
	Total		24	30			
Semester II		Subject	Credit	Hrs/ Week	Marks		Total
Course Component					Internal	External	
Part I	Language	Language – II	3	6	50	50	100
Part	English	English – II	3	4	50	50	100
Part III	Core – III	Web Application Development	4	6	50	50	100
	Core – IV	Practical –II: Web Application Development	4	4	50	50	100
	Allied – II	Statistics	4	6	50	50	100
Part IV	Non-Major Elective - II	Basic Tamil-II/ Advanced Tamil- II/ Data Visualization Using Power BI Lab	2	2	50	50	100
	Ability Enhancement Skills - II	Foundation of Quantitative Aptitude	2	2	50	50	100
Total			22	30			

Semester III		Subject	Credit	Hrs/ Week	Marks		Total
Course Component					Internal	External	
Part III	Core – V	Programming in Java	4	6	50	50	100
	Core -VI	Data Structures and Algorithms	4	6	50	50	100
	Core - VII	System Software and Operating Systems	4	6	50	50	100
	Core -VIII	Practical – III: Programming in Java	4	4	50	50	100
	Allied - III	Accounting Practices	4	6	50	50	100
Part IV	Ability Enhancement Skills - III	Cyber Safety and Digital Ethics	2	2	50	50	100
	Self-Study Course(Compulsory)	Indian Heritage and Knowledge Systems / Contemporary World and Sustainable Development	2	-	-	100	100
Total			24	30			
Semester IV		Subject	Credit	Hrs/ Week	Marks		Total
Course Component					Internal	External	
Part III	Core – IX	Relational Database Management System	4	5	50	50	100
	Core – X	Cloud Computing	4	6	50	50	100
	Core – XI	Prompt Engineering	4	6	50	50	100
	Core – XII	Practical – IV: Relational Database Management System	4	4	50	50	100
	Allied – IV	Operations Research	4	6	50	50	100
Part IV	Indian Knowledge System	Indian Knowledge System with Artificial Intelligence	1	1	50	50	100
	Ability Enhancement Skills - IV	Resume writing and Interview skills	2	2	50	50	100
Total			23	30			

Semester V		Subject	Credit	Hrs/ Week	Marks		Total
Course Component					Internals	External	
Part III	Core – XIII	Programming in Python	4	6	50	50	100
	Core – XIV	Software Engineering and Testing	4	6	50	50	100
	Core – XV	Practical – V: Programming in Python	4	5	50	50	100
	Elective - I IDE (Inter Disciplinary Elective)	Practical: Digital Image Processing (GIMP)/ Data Manipulation using SQL Lab/ Business Intelligence	4	5	50	50	100
	Elective - II	Practical – VI : Platform Engineering/ Information Security /Data Mining	4	6	50	50	100
Part IV	Life Skills – II	Environmental Studies	2	2	50	50	100
	Internship	Internship	2	-	-	-	-
Total			24	30			
Semester VI		Subject	Credit	Hrs/ Week	Marks		Total
Course Component					Internals	External	
Part III	Core – XVI	DevOps Fundamentals and Automation	4	5	50	50	100
	Core – XVII	Data Communication and Networking	4	6	50	50	100
	Core –XVIII	Data Science for Internet of Things	4	5	50	50	100
	Core – XIX	Practical – VII: DevOps Fundamentals and Automation	4	4	50	50	100
	Core – XX	Project	4	4	50	50	100
	Elective – III	Artificial Intelligence / Big Data Analytics / Graphics and Multimedia	4	6	50	50	100
Part V	Extension Activity	Participation in NSS/NCC	1	-	-	-	-
Total			25	30			
Total Credits			142				

11. EXAMINATION

Continuous Internal Assessment (CIA) will be for 50 percent and End Semester Examination (ESE) will be for 50 percent. The CIA marks for the two credit courses (NME, EVS, Value Education and Ability Enhancement skill courses) and one credit course on Indian Knowledge System coming under Part IV, shall be awarded based on the nature of the course or at the course instructor's discretion (Assignment/project/presentation). The mode of examination for IKS will be conducted through CIA with 5 out of 10 questions carrying 20 marks each.

Continuous Internal Assessment (CIA)

Every semester will have a mid-semester examination which will be conducted on completion of 45 working days in each semester. A Model exam for three hours duration will be conducted on completion of 85 working days in each semester. Internship credits will be given in semester V after verification of documents by the respective Heads.

The schedule for these tests is as follows:

CIA	Schedule	Syllabus Coverage
Mid Semester Examination	After 45 working days of the Semester	50%
Model Examination	After 85 working days of the Semester	100%

The components for the CIA (Theory & Practical) are as follows:

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment			5
Workbook / recordbook / notebook			5
Class activity 1			5
Class activity 2			5
Class activity 3			5
Attendance	Marks will be given based on the attendance percentage of respective course		5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

A record of all such assessment procedures will be maintained by the department and is open for clarification. Students will have the right to appeal to the Principal in case of glaring disparities in marking. CIA marks for practical subjects will be awarded by the respective faculty based on the performance of the student in the model practical examination, observation notebook, submission of record books, regularity and attendance for the practical classes. The attendance particulars for practical classes will be maintained by the concerned faculty.

The marks for attendance will be awarded as per the following:

Percentage of General Attendance	Marks Awarded
90-100	5
75-89	4
60-74	3
<60	0

End Semester Examinations (ESE)

After the completion of a minimum of 90 working days each semester, the End Semester Examinations will be conducted. Examinations for all UG and PG programmes will be held for all courses in November/December and April/May. Practical examinations will be conducted only during the end of the odd / even semester before, during or after the commencement of the theory exam. The schedule for ESE Practicals will be notified by the Controller of Examinations in consultation with the Dean (Academics).

Mode of Evaluation

METHODS OF EVALUATION		
Internal Evaluation	Mid Sem Exam (10)	50 Marks
	Model Exam (10)	
	Assignment (10)	
	Class activity (15)	
	Attendance (5)	
External Evaluation	End Semester Examination	50 Marks
Total		100 Marks

Method of assessment

Remembering (K1)	- The lowest level of questions requires students to recall information from the course content - Knowledge questions usually require students to identify information in the textbook. - Suggested Keywords: Choose, Define, Find, How, Label, List, Match, Name, Omit, Recall, Relate, Select, Show, Spell, Tell, What, When, Where, Which, Who, Why
Understanding (K2)	- Understanding off acts and ideas by comprehending organizing, comparing, translating, interpolating and interpreting in their own words. - The questions go beyond simple recall and require students to combined at altogether - Suggested Keywords: Classify, Compare, Contrast, Demonstrate, Explain, Extend,

	Illustrate, Infer, Interpret, Outline, Relate, Rephrase, Show, Summarize, Translate
Application (K3)	• Students have to solve problems by using / applying a concept learned in the classroom. • Students must use their knowledge to determine a exact response. • Suggested Keywords: Apply, Build, Choose, Construct, Develop, Experiment with, Identify, Interview, Make use of, Model, Organize, Plan, Select, Solve, Utilize
Analyze (K4)	• Analyzing the question is one that asks the students to breakdown something into its component parts. • Analyzing requires students to identify reasons causes or motives and reach conclusions or generalizations. • Suggested Keywords: Analyze, Assume, Categorize, Classify, Compare, Conclusion, Contrast, Discover, Dissect, Distinguish, Divide, Examine, Function, Inference, Inspect, List, Motive, Relationships, Simplify, Survey, Take part in, Test for, Theme
Evaluate (K5)	• Evaluation requires an individual to make judgment on something. • Questions to be asked to judge the value of an idea, a character , a work of art, or a solution to a problem. • Students are engaged in decision-making and problem–solving. • Evaluation questions do not have single right answers. • Suggested Keywords: Agree, Appraise, Assess, Award, Choose, compare, Conclude, Criteria, Criticize, Decide, Deduct, Defend, Determine, Disprove, Estimate, Evaluate, Explain, Importance, Influence, Interpret, Judge, Justify, Mark, Measure, Opinion, Perceive, Prioritize, Prove, Rate, Recommend, Rule on, Select, Support, Value
Create (K6)	• The questions of this category challenge students to get engaged in creative and original thinking. • Developing original ideas and problem solving skills • Suggested Keywords: Adapt, Build, Change, Choose, Combine, Compile, Compose, Construct, Create, Delete, Design, Develop, Discuss, Elaborate, Estimate, Formulate, Happen, Imagine, Improve, Invent, Make up, Maximize, Minimize, Modify, Original, Originate, Plan, Predict, Propose, Solution, Solve, Suppose, Test, Theory

SEMESTER I

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – I
COURSE NAME: PROGRAMMING IN C & DIGITAL LOGIC FUNDAMENTALS	COURSE CODE: 26UBCA301
SEMESTER: I	MARKS:100
CREDITS: 4	TOTAL HOURS:75
THEORY	

COURSE OBJECTIVE:

This course aims to enable students to understand C programming concepts, including loops, functions, arrays, control structures, and binary logic with the universal study of logic gates.

COURSE OUTCOMES:

1. Identify and apply the basics of programming in C language, and design and draw flowcharts.
2. Apply programming concepts related to arrays and functions.
3. Use the concepts of Pointers, Files using C.
4. Analyze the fundamentals of Digital Logics, basic conversions and Boolean functions.
5. Formulate the Karnaugh map and flip-flops using Digital Logics.

UNIT I (15 HOURS)

Introduction to C language - How to develop a C program - Algorithms - Flow Chart - C Tokens - Identifiers and Keywords - Constants - Variables - Data types - Operators and Expression.

UNIT II (15 HOURS)

Decision making statements - Arrays - One Dimensional Array - Two Dimensional Array - Multi Dimensional Array - Functions - Structures and Unions.

UNIT III (15 HOURS)

Pointers - Accessing the address of a variable -Accessing a variable through its pointers -Dynamic memory Allocation -File Processing - Defining and opening

UNIT IV (15 HOURS)

Digital Computers and Digital Systems - Binary Numbers - Octal Numbers - Decimal Numbers - Hexadecimal Numbers - Number Base Conversions - Boolean Algebra - Basic theorems and properties of Boolean Algebra - Boolean Functions.

UNIT V (15 HOURS)

Karnaugh Maps – Two Variable, Three Variable, and Four Variable Maps – Combinational Circuits: Half Adder and Full Adder – Sequential Circuits: D Flip-Flop, T Flip-Flop, JK Flip-Flop – Ripple Up/Down Counters – BCD Counters.

RECOMMENDED TEXTBOOKS:

1. Programming in ANSI C by E. Balagurusamy — 9th Edition, 2024, published by McGraw Hill.
2. Digital Design by M. Morris Mano and Michael D. Ciletti — 6th Edition (2024)

REFERENCE BOOKS:

1. Let Us C by Yashavant Kanetkar — 19th Edition, 2022, published by BPB Publications.
2. Tim Warren, 2019, C Programming For Beginners: The Simple Guide to Learning C Programming Language Fast!, Ingram Publishing
3. Digital Design by M. Morris Mano and Michael D. Ciletti — 6th Edition (2024)
4. M. Morris Mano, "Digital Logic and Computer Design", 4th Edition, Pearson Publications.
5. Albert Paul Malvino, Donald P Leach, Digital principles and applicationsTMH,

E-LEARNING RESOURCES:

1. https://onlinecourses-archive.nptel.ac.in/noc19_cs06/preview
2. <https://nptel.ac.in/courses/106105185>
3. https://onlinecourses-archive.nptel.ac.in/noc18_ee33/preview
4. <https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/pages/lecture-notes/>
5. <https://www.geeksforgeeks.org/digital-logic/digital-electronics-logic-design-tutorials/>

GUIDELINES TO THE QUESTION PAPER SETTERS
QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
C	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	2	1	1
III	3	2	1
IV	2	1	2
V	2	2	1
TOTAL	12	7	6
SECTION A – 12		SECTION B – 7	SECTION C - 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	2	2
CO 2	3	3	2	2	2
CO 3	3	3	3	2	2
CO 4	3	2	3	2	2
CO 5	3	3	3	2	2
Ave.	3.0	2.6	2.6	2.0	2.0

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	2	2	2
CO 2	3	3	2	2	2
CO 3	3	3	3	2	2
CO 4	2	2	3	2	2
CO 5	2	3	2	3	2
Ave.	2.6	2.6	2.4	2.2	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Identify and apply the basics of programming in C language, and design and draw flowcharts.	PO1, PO2	PSO1	K3
CO2	Apply programming concepts related to arrays and functions.	PO1, PO2, PO3	PSO1, PSO2	K3
CO3	Use the concepts of Pointers, Files using C.	PO1, PO2, PO3	PSO1, PSO2	K3
CO4	Analyze the fundamentals of Digital Logics, basic conversions and Boolean functions.	PO1, PO2, PO3	PSO1, PSO3	K4
CO5	Formulate the Karnaugh map and flip-flops using Digital Logics.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K4

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: PROGRAMMING IN C & DIGITAL LOGIC FUNDAMENTALS

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Problem solving / coding tasks	10	5
Workbook/recordbook/notebook	Notes maintenance	10	5
Class activity 1	Quiz with MCQ	10	5
Class activity 2	Seminar/Presentation	10	5
Class activity 3	Surprise Class Test	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – II
COURSE NAME: PRACTICAL - I: PROGRAMMING IN C & DIGITAL LOGIC FUNDAMENTALS	COURSE CODE: 26UBCA302P
SEMESTER: I	MARKS:100
CREDITS: 4	TOTAL HOURS:60
PRACTICAL	

COURSE OBJECTIVE:

This course aims to develop problem-solving skills, enhance programming knowledge using C language, and build a strong understanding of digital logic fundamentals.

COURSE OUTCOMES:

1. Analyze and develop various basic computational and searching programs in C.
2. Apply programs using functions, pointers, and logic gates.
3. Illustrate different types of number systems and their conversions.
4. Design various flip flops, shift registers and determining outputs.
5. Leverage programming constructs to adapt to new languages.

LAB EXERCISES:

C Programming

1. C Program to Find the Largest of Two Numbers using if..else Statement.
2. C Program to Perform Basic Arithmetic Operations using switch Statement.
3. C Program to Display Multiplication Table using while and do-while Loops.
4. C Program to Find the Factorial of a Number using for Loop.
5. C Program to Find the Sum and Average of Elements in an Array.
6. C Program to Swap Two Numbers using Call by Value.
7. C Program to Swap Two Numbers using Call by Reference.
8. C Program to Find the Factorial of a Number using Recursion and Pointers

Digital Logic

1. Study of Logic Gates: AND, OR, NOT, NOR, NAND, XOR.
2. Realization of AND, OR, NOT using Universal Gates.
3. Design and realization of Half Adder/Subtractor using NAND Gates.
4. Design and realization of Full Adder using Logic Gates.
5. Design and realization of BCD adder.
6. Realization of R-S and J-K Flip Flop.

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	3	2	2
CO 2	3	3	2	2	2
CO 3	3	2	2	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	3
Ave.	3.0	2.8	2.6	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	3	2
CO 2	3	2	3	3	2
CO 3	3	2	2	2	2
CO 4	3	3	2	3	2
CO 5	2	3	3	3	2
Ave.	2.6	2.4	2.6	2.8	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Analyze and develop various basic computational and searching programs in C.	PO1, PO2, PO3	PSO3, PSO4	K3, K4
CO2	Apply programs using functions, pointers, and logic gates.	PO1, PO2, PO3	PSO1, PSO3	K3
CO3	Illustrate different types of number systems and their conversions.	PO1, PO2, PO3, PO5	PSO1, PSO5	K2, K3
CO4	Design various flip flops, shift registers and determining outputs.	PO1, PO2, PO3, PO4	PSO1, PSO2, PSO4	K4, K5, K6
CO5	Leverage programming constructs to adapt to new languages.	PO1, PO2, PO3, PO5	PSO2, PSO3, PSO4	K4, K5

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: PRACTICAL - I: PROGRAMMING IN C & DIGITAL LOGIC FUNDAMENTALS

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Practical examination with programming/problem-solving tasks for 90 minutes	50	10
Model Examination	Practical examination with programming/problem-solving tasks for 180 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Workbook/recordbook/notebook	Handwritten record of experiments, observations, results, and conclusions	10	5
Class activity 1	Debugging Test	10	5
Class activity 2	Problem-Solving Exercise	10	5
Class activity 3	Quiz with MCQ	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed)			
1) Quiz with MCQ			
2) Case-Study analysis			
3) Debate			
4) Seminar/ Presentation			
5) Peer/Self-Assessment			
6) Role play			
7) Scrap book			
8) Monograph			
9) Puzzle			
10) Group Discussion			
11) Group activity			
12) Surprise class tests			

PROGRAMME: B.Sc. (CS), BCA, B.Sc. (IT)	BATCH: 2026 – 2029
PART: III	COURSE COMPONENT: ALLIED – I
COURSE NAME: ALLIED MATHEMATICS	COURSE CODE: 26UBCA3A1
SEMESTER: I	MARKS:100
CREDITS: 4	TOTAL HOURS: 75
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To improve basics in mathematical and analytical skills.

COURSE OUTCOMES:

1. Recall the basic concepts of matrices, finite difference, trigonometry, differentiation and differential equations.
2. Understand the types of Matrices, interpolation of unknown values, expansion of trigonometric functions, higher order derivatives, solving differential equations.
3. Apply operations of matrix to find eigen value, interpolation formula, expansion of sine series, Jacobian function and complimentary functions.
4. Analyze the verification of Cayley -Hamilton, interpolation for equal intervals, hyperbolic functions, particular solutions.
5. Evaluate inverse using Cayley-Hamilton, interpolation for unequal intervals, inverse hyperbolic, maximum and minimum of a function, general solution for differential equations.

UNIT I

(15 HOURS)

Matrices: Symmetric matrix, skew symmetric matrix, Hermitian matrix, skew Hermitian matrix, orthogonal matrix, unitary matrix, Cayley-Hamilton theorem (statement), eigenvalues and eigen vectors.

Chapter 4, Section 4.1-4.1.6,4.5,4.5.2

UNIT II

(15 HOURS)

Finite Differences: Interpolation, Operators Δ , ∇ and E , difference tables, Interpolation formulae: Newton's forward and backward interpolation formulae for equal intervals, Lagrange's interpolation formula.

Chapter 5

UNIT III

(15 HOURS)

Trigonometry: Expansion of $\sin^n \theta$, $\cos^n \theta$, $\sin^m \theta \cos^n \theta$, expansion of $\sin n\theta$ and $\cos n\theta$, expansions of $\sin \theta$, $\cos \theta$ and $\tan \theta$ in a series of powers of " θ ", hyperbolic and inverse hyperbolic functions.

Chapter 6, section 6.1,6.2,6.3

UNIT IV

(15 HOURS)

Differentiation: Basic differentiation, Successive Differentiation, Jacobian, Maxima and Minima of functions of two variables.

Chapter 1, Section 1.1,1.2, 1.3,1.3.1

UNIT V

(15 HOURS)

Differential Equations: Second order differential equation with constant coefficients, differential equation of the form $(aD^2+bD+c)y = e^{ax} \phi(x)$ where a, b, c are constants,

$\phi(x) = \sin mx$ (or) $\cos mx$ (or) x^m .

Chapter5, Section 5.2,5.2.1

RECOMMENDED TEXTBOOKS:

Treatment and content as in “Allied mathematics” – P. Durai Pandian, Dr .S. Udayabaskaran, Volume I & II S.Chand and company limited, Reprint 2018

REFERENCE BOOKS:

1. Allied Mathematics, S.G.Venkatachalapathy.
2. P. Kandasamy and K. Thilagavathi, Allied Mathematics Volume I and Volume II -- 2004, S.Chand and Co, New Delhi.
3. Ancillary Mathematics Volume 1 and 2 by Balasubramanian & K.G.Subramanian..

E - LEARNING RESOURCES:

1. https://ia801306.us.archive.org/5/items/MIT18.01JF07/ocw-18.01-f07-lec11_300k.mp4
2. <https://nptel.ac.in/courses/111107107>
3. <https://nptel.ac.in/courses/111106146>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions	1 - 12	3	30
B	Answer any 5 out of 7 questions	13 - 19	6	30
C	Answer any 4 out of 6 questions	20 - 25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A		SECTION B		SECTION C	
	THEORY	PROBLEM	THEORY	PROBLEM	THEORY	PROBLEM
I	1	1	-	1	-	1
II	1	1	-	1	-	1
III	-	2	-	1	-	1
IV	-	2	-	1	-	1
V	-	2	-	1	-	1
Any Unit	-	2	-	2	-	1
TOTAL	2	10	-	7	-	6
	SECTION A -12		SECTION B – 7		SECTION C -6	

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	2	2
CO 2	3	2	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	2
Ave.	3.0	2.6	2.6	2.0	2.0

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	3	2	2
CO 2	3	2	3	2	2
CO 3	3	2	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	2
Ave.	3.0	2.4	3.0	2.0	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Recall the basic concepts of matrices, finite difference, trigonometry, basic differentiation and differential equations.	PO1, PO3, PO5	PSO1, PSO3	K1, K2
CO2	Understand the types of Matrices, interpolation of unknown values, expansion of trigonometric functions, higher order derivatives, solving differential equations	PO1, PO2, PO3	PSO1, PSO3, PSO4	K2, K3
CO3	Apply operations of matrix to find eigen value, interpolation formula, expansion of sine series, Jacobian function and complimentary functions.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K3, K4
CO4	Analyze the verification of Cayley-Hamilton, interpolation for equal intervals, hyperbolic functions, particular solutions.	PO1, PO2, PO3	PSO1, PSO3, PSO4	K4, K5
CO5	Evaluate inverse using Cayley-Hamilton, interpolation for unequal intervals, inverse hyperbolic, maximum and minimum of a function, general solution for differential equations.	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO3, PSO4	K5, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyze, K5= Evaluate, K6= Create

COURSE NAME: ALLIED MATHEMATICS

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Monograph / Problem solving assignment	10	5
Workbook/recordbook/notebook	Scrap book / Record book preparation	10	5
Class activity 1	Quiz with MCQ	10	5
Class activity 2	Puzzle	10	5
Class activity 3	Seminar/Presentation	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: For other Programmes except BCA	BATCH: 2026 -2029
PART: IV	COURSE COMPONENT: NON-MAJOR ELECTIVE – I
COURSE NAME: WEB OFFICE USING GOOGLE WORKSPACE LAB	COURSE CODE: 26UNME4A033
SEMESTER: I	MARKS:100
CREDITS: 2	TOTAL HOURS:30
PRACTICAL	

COURSE OBJECTIVE:

To provide hands-on experience in using Google Workspace tools such as Google Docs, Google Slides, Google Sheets, Google Forms, and Google Drive for creating documents, presentations, spreadsheets, and collaborative online resources.

COURSE OUTCOMES:

1. Perform document creation, editing, formatting, and sharing using Google Docs.
2. Create and deliver presentations using Google Slides with themes, animations, and layouts.
3. Use Google Sheets to organize data, perform basic calculations, and generate charts.
4. Formulate online forms and quizzes using Google Forms and analyze the responses.
5. Utilize Google Drive and other Google Workspace tools for collaboration, file management.

LAB EXERCISES:

1. Create a Google account and access Google Drive, organize folders and upload different types of files.
2. Create a document using Google Docs and apply formatting features such as:
 - Fonts and paragraph styles
 - Page layout
 - Bullets and numbering
3. Insert tables, images, hyperlinks, and comments in a Google Docs document and share the document with another user.
4. Create a Google Slides presentation with at least 5 slides using:
 - Themes and layouts
 - Images and shapes
 - Slide transitions and animations
5. Prepare a Google Sheets worksheet and perform:
 - Data entry
 - Sorting and filtering
 - Basic formulas (SUM, AVERAGE, COUNT)
6. Create charts and graphs in Google Sheets using sample data.
7. Design a Google Form for collecting feedback or survey responses.
8. Create a quiz using Google Forms with automatic grading and view response summaries.

9. Share documents, spreadsheets, and forms through Google Drive and manage access permissions.
10. Use Google Meet and Google Calendar to schedule an online meeting and invite participants.
11. Create a simple Google Classroom course, upload materials, and assign tasks.
12. Explore an LMS platform (Moodle / Canvas / Edmodo) and demonstrate course creation and resource upload.

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	3	2	3
CO 2	2	2	3	2	3
CO 3	3	3	3	1	3
CO 4	2	2	3	2	3
CO 5	2	2	3	3	3
Ave.	2.4	2.2	3.0	2.0	3.0

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	3	2	2	3
CO 2	2	3	2	3	3
CO 3	3	3	3	2	3
CO 4	2	3	3	3	3
CO 5	2	3	3	3	3
Ave.	2.2	3.0	2.6	2.6	3.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Perform document creation, editing, formatting, and sharing using Google Docs.	PO1, PO2, PO3, PO5	PSO2, PSO5	K2, K3
CO2	Create and deliver presentations using Google Slides with themes, animations, and layouts.	PO1, PO2, PO3, PO4, PO5	PSO2, PSO4	K2, K3
CO3	Use Google Sheets to organize data, perform basic calculations, and generate charts.	PO1, PO2, PO3	PSO1, PSO3, PSO4	K3, K4
CO4	Formulate online forms and quizzes using Google Forms and analyze the responses.	PO2, PO3, PO4, PO5	PSO2, PSO3, PSO4	K3, K4
CO5	Utilize Google Drive and other Google Workspace tools for collaboration, file management.	PO1, PO2, PO3, PO4, PO5	PSO2, PSO5	K2, K3

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: WEB OFFICE USING GOOGLE WORKSPACE LAB

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Practical examination with programming/problem-solving tasks for 90 minutes	50	10
Model Examination	Practical examination with programming/problem-solving tasks for 180 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Workbook/recordbook/notebook	Handwritten record of experiments, observations, results, and conclusions	10	5
Class activity 1	Debugging Test	10	5
Class activity 2	Problem-Solving Exercise	10	5
Class activity 3	Quiz with MCQ	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed)			
1) Quiz with MCQ			
2) Case-Study analysis			
3) Debate			
4) Seminar/ Presentation			
5) Peer/Self-Assessment			
6) Role play			
7) Scrap book			
8) Monograph			
9) Puzzle			
10) Group Discussion			
11) Group activity			
12) Surprise class tests			

PROGRAMME: ALL UG	BATCH: 2026 – 2029
PART: IV	COURSE COMPONENT: LIFE SKILLS – I
COURSE NAME: VALUE EDUCATION	COURSE CODE: 26UVED401
SEMESTER: I	MARKS:100
CREDITS: 2	TOTAL HOURS: 30
THEORY	

COURSE OBJECTIVE:

To inculcate human values, ethical principles, social responsibility, and awareness of responsible technology use for holistic personal and societal development.

COURSE OUTCOMES:

On completion of the course, the students will be able to:

1. Recall core value systems and their relevance to real-life situations and ethical decision- making in personal and social contexts.
2. Describe the role of culture and civilization in shaping individual and collective identities.
3. List salient values for life such as forgiveness, sacrifice, self-esteem, teamwork, and creative thinking.
4. Describe the role of human rights, social values, and ethical use of Artificial Intelligence in addressing contemporary social issues.
5. Recall the teachings of Guru Nanak Dev Ji and describe their connection to values and sustainable living.

UNIT I - EDUCATION AND VALUES

(6 HOURS)

Definition, Concept, Classification, Theory, Criteria and Sources of values Aims and objectives of value education Role and Need for value education in the contemporary society, Role of education in transformation of values in society Role of parents, teachers, society, peer group and mass media in fostering values

UNIT II - VALUE EDUCATION AND PERSONAL DEVELOPMENT

(6 HOURS)

Human Values: Truthfulness, Sacrifice, Sincerity, Self-Control, Altruism, Scientific Vision, relevancy of human values to good life. Character Formation towards Positive Personality Modern challenges of adolescents: emotions and behavior Self-analysis and introspection: sensitization towards gender equality, differently abled, Respect for - age, experience, maturity, family members, neighbors, strangers, etc.

UNIT III - HUMAN RIGHTS AND MARGINALIZED PEOPLE

(6 HOURS)

Concept of Human Rights – Principles of human rights – human rights and Indian constitution – Rights of Women and children – violence against women – Rights of marginalized People – like women, children, minorities, transgender, differently abled etc. Social Issues and Communal Harmony Social issues – causes and magnitude - alcoholism, drug addiction, poverty, unemployment – communal harmony –concept –religion and its place in public

domain –secular civil society

UNIT IV - VALUE EDUCATION TOWARDS NATIONAL AND GLOBAL DEVELOPMENT (6 HOURS)

Constitutional Values :(Sovereign, Democracy, Socialism, Secularism, Equality, Justice, Liberty, Freedom, Fraternity)

Social Values: (Pity and Probity, Self-Control, Universal Brotherhood).

Professional Values :(Knowledge Thirst, Sincerity in Profession, Regularity, Punctuality, Faith).

Religious and Moral Values: (Tolerance, Wisdom, character).

Aesthetic Values: (Love and Appreciation of literature, fine arts)

Environmental Ethical Values, National Integration and international understanding.

Need of Humanistic value for espousing peace in society.

Conflict of cross-cultural influences, cross-border education.

Emerging Technologies and Human Values: (Ethical and responsible use of Artificial Intelligence, digital citizenship, privacy, academic integrity and technology for social good).

UNIT V (6 HOURS)

Guru Nanak Devji's Teachings

Relevance of Guru Nanak Devji's teachings' relevance to Modern Society

The Guru Granth sahib

The five Ks Values and beliefs

Rights and freedom (Right of equality, Right to Education, Right to Justice, Rights of women, Freedom of religion, Freedom of culture, Freedom of assembly, Freedom of speech), Empowerment of women, Concept of Langar, Eminent Sikh personalities

REFERENCES BOOKS:

1. Dr.AbdulKalam. My Journey-Transforming Dreams into Actions. Rupa Publications, 2013.
2. Steven R Covey, 8th Habit of Effective People (From Effectiveness to Greatness), Free Press, NewYork, 2005.
3. Prem Singh, G.J. (2004). 'Towards Value Based Education', University News. Vol. 42 (45): P.11-12.
4. V.R. Krishna Iyer. Dialectics & Dynamics of Human Rights in India (Tagore Law Lectures) The Yesterday, Today and Tomorrow, Eastern Law House (1999, Reprint 2018)
5. <http://www.ncert.nic.in/rightside/links/pdf/framework/english/nf2005.pdf>
6. Saptarsi Goswami, Amit Kumar Das and Amlan Chakrabarti, AI for Everyone: A Beginner's Handbook for Artificial Intelligence (AI), Pearson India Education Services Pvt. Ltd., First Edition, 2024. ISBN: 978-9361590832.

QUESTION PAPER PATTERN: MCQ

PROGRAMME: ALL UG	BATCH: 2026 – 2029
PART: IV	COURSE COMPONENT: ABILITY ENHANCEMENT SKILLS - I
COURSE NAME: COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT SKILLS	COURSE CODE: 26USKL401
SEMESTER: I	MARKS:100
CREDITS: 2	TOTAL HOURS: 30
THEORY	

COURSE OBJECTIVE:

To build communication skills for personal and professional development.

COURSE OUTCOMES:

1. Demonstrate the ability to actively listen to others, understand diverse perspectives, and paraphrase key points accurately, enhancing their comprehension skills in various personal and professional contexts.
2. Articulate thoughts, ideas, and information clearly and concisely, using appropriate language and structure to convey messages effectively in both written and verbal communication
3. Develop confidence in expressing opinions, asserting boundaries, and advocating for themselves and others, leading to enhanced self-assurance and effectiveness in interpersonal and group communication.
4. Demonstrate their communication style and approach based on the audience, context, and purpose of communication, fostering flexibility and versatility in interacting with diverse individuals and groups.
5. Acquire techniques for resolving conflicts, managing disagreements, and negotiating mutually beneficial outcomes through effective communication strategies, promoting constructive problem-solving and collaboration in personal and professional settings.

UNIT I Types of Communication

(6 HOURS)

Verbal Communication - Nonverbal Communication - Visual Communication - Written Communication - Interpersonal Communication - Group Communication - Mass Communication - Digital Communication- Barriers – Language- Cultural- Psychological- Semantic- Technological Barriers

UNIT II Etiquette & Ethical Practices in Communicatio

(6 HOURS)

Active Listening - Respectful Language - Clarity and Conciseness – Truthfulness-Professionalism-Tone -Timeliness - Constructive Feedback - Confidentiality - Cultural Sensitivity - - Emotional Intelligence-Social Intelligence- Social Etiquettes-Accountability

UNIT III Self Actualization

(6 HOURS)

SWOC Analysis- Self Regulation-Self Evaluation, Self-Monitoring, Self- Criticism, Self-Motivation, Self-awareness and Reflection:

UNIT IV Leadership and Teamwork

(6 HOURS)

Leadership Skills: Leadership styles- Goal-setting and decision-making- Motivation and influence- Team Dynamics: Team building activities- Conflict resolution- Collaborative problem-solving

UNIT V Stress and Time Management

(6 HOURS)

Definition of Stress, Types of Stress, Symptoms of Stress, Stress coping ability, Stress Inoculation Training, Time Management and Work-Life Balance: Self-discipline Goal-setting

RECOMMENDED TEXTBOOKS

1. Goleman, Daniel (2006) *Emotional Intelligence*, Bantam Books
2. Linden, Wolfgang (2004) *Stress Management- From Basic Science to Better Practice*- University of British Columbia, Vancouver, Canada.
3. Hasson, Gill (2012) *Brilliant Communication Skills*. Great Britain: Pearson Education.
4. Monippally, Matthukutty, M. *Business Communication Strategies*. New Delhi: Tata McGraw-Hill Publishing Company Ltd., 2001.
5. Raman, Meenakshi & Sangeetha Sharma (2011) *Communication Skills*, Oxford University Press.

REFERENCE BOOKS

1. N.Krishnaswamy *Current English for College* (1st Edition) - Trinity Press
2. Wood, Julia T (2015) *Interpersonal Communication: Everyday Encounters* 8th Edition, Cengage Learning.

E-LEARNING RESOURCES

1. <http://www.albion.com/netiquette/corerules.html>
2. <http://www.englishdaily626.com/c-errors.php>
3. <https://www.helpguide.org/articles/relationships-communication/nonverbal-communication.htm>
4. <https://www.communicationtheory.org/verbal-vs-non-verbal-communication-with-examples/>
5. <https://letstalkscience.ca/educational-resources/backgrounders/digital-citizenship-ethics>
6. <https://www.switchboard.app/learn/article/teamwork-leadership-skills>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

Section	Question Component	Numbers	Marks	Total
A	Answer any 5 out of 7 questions (answer in 50 words)	1-7	2	10
B	Answer any 4 out of 6 questions (answer in 300 words)	8-13	5	20
C	Answer any two(Internal (Choice)	14-15	10	20
	Internal & Viva Voce		50	50

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	----
II	2	1	1
III	1	1	1
IV	1	1	1
V	1	1	1
TOTAL	12	6	4
SECTION A – 12		SECTION B – 6	SECTION C – 4

SEMESTER II

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – III
COURSE NAME: WEB APPLICATION DEVELOPMENT	COURSE CODE: 26UBCA303
SEMESTER: II	MARKS:100
CREDITS: 4	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To understand the development of modern web applications and to acquire practical knowledge of client-side scripting, API integration, and emerging web technologies.

COURSE OUTCOMES:

1. Design responsive web pages using HTML5 and CSS3.
2. Develop interactive web applications using JavaScript.
3. Apply DOM manipulation and API integration techniques.
4. Build component-based web applications using React.
5. Analyze the fundamentals of Full Stack Development and Version Control.

UNIT 1

(18 HOURS)

Introduction to Web Technologies – HTML5 Structure – Semantic Elements – Forms and Input Types – Multimedia Elements – CSS3 Fundamentals – Selectors – Box Model – Flexbox – Grid Layout – Responsive Web Design – Media Queries – Bootstrap Basics.

UNIT II

(18 HOURS)

Introduction to JavaScript – Variables and Data Types – Operators and Expressions – Decision Making Statements – Looping Statements – Arrays – Functions – Objects – Event Handling – Form Validation.

UNIT III

(18 HOURS)

Document Object Model (DOM) – DOM Manipulation – Browser Events – Local Storage – Session Storage – JSON – Introduction to REST APIs – Fetch API – Asynchronous Programming – API Integration.

UNIT IV

(18 HOURS)

Introduction to React – Components – JSX – Props – State – Event Handling – Conditional Rendering – React Hooks – React Router – Simple CRUD Concepts.

UNIT V

(18 HOURS)

API Integration in React – Introduction to Full Stack Development – Client-Server Architecture – Introduction to Node.js – Web Application Deployment Concepts – Version Control using Git and GitHub.

RECOMMENDED TEXTBOOKS:

1. HTML and CSS: Design and Build Websites – Jon Duckett, Wiley, 2011
2. JavaScript and JQuery: Interactive Front-End Web Development – Jon Duckett, Wiley, 2014

REFERENCE BOOKS:

1. Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics – Jennifer Niederst Robbins, O'Reilly Media, 5th Edition, 2018
2. Eloquent JavaScript: A Modern Introduction to Programming – Marijn Haverbeke, No Starch Press, 3rd Edition, 2018
3. React: Up and Running – Stoyan Stefanov, O'Reilly Media, 2nd Edition, 2021
4. Node.js Design Patterns – Mario Casciaro & Luciano Mammino, Packt Publishing, 3rd Edition, 2020
5. Full Stack React Projects – Shama Hoque, Packt Publishing, 2nd Edition, 2020

E-LEARNING RESOURCES:

1. <https://nptel.ac.in/courses/106106156>
2. <https://nptel.ac.in/courses/106105191>
3. <https://javascript30.com>
4. <https://react.dev/learn>
5. <https://developer.mozilla.org/en-US/docs/Learn>

GUIDELINES TO THE QUESTION PAPER SETTERS
QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
C	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	1
II	3	1	1
III	2	1	1
IV	2	2	2
V	2	1	1
TOTAL	12	7	6
SECTION A - 12		SECTION B – 7	SECTION C – 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	3	2	3
CO 2	3	3	2	2	3
CO 3	3	3	3	2	3
CO 4	3	3	3	2	3
CO 5	3	3	3	2	3
Ave.	3.0	3.0	2.8	2.0	3.0

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	2	2	3
CO 2	3	3	2	2	3
CO 3	3	3	3	2	3
CO 4	3	3	2	3	3
CO 5	3	3	3	3	3
Ave.	3.0	3.0	2.4	2.4	3.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COUSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Design responsive web pages using HTML5 and CSS3	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO5	K3, K4
CO2	Develop interactive web applications using JavaScript.	PO1, PO2, PO3	PSO1, PSO2	K3
CO3	Apply DOM manipulation and API integration techniques.	PO1, PO2, PO3, PO5	PSO2, PSO3	K3, K4
CO4	Build component-based web applications using React.	PO1, PO2, PO3, PO4, PO5	PSO2, PSO4	K3, K4
CO5	Analyze the fundamentals of Full Stack Development and Version Control.	PO1, PO2, PO3, PO4, PO5	PSO3, PSO4, PSO5	K4, K5

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: WEB APPLICATION DEVELOPMENT

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Problem solving / coding tasks	10	5
Workbook/recordbook/notebook	Notes maintenance	10	5
Class activity 1	Quiz with MCQ	10	5
Class activity 2	Case Study Analysis	10	5
Class activity 3	Seminar/Presentation	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – IV
COURSE NAME: PRACTICAL - II: WEB APPLICATION DEVELOPMENT	COURSE CODE: 26UBCA304P
SEMESTER: II	MARKS:100
CREDITS: 4	TOTAL HOURS:60
PRACTICAL	

COURSE OBJECTIVE:

To provide hands-on experience in developing modern web applications by applying HTML5, CSS3, JavaScript, DOM manipulation, API integration, React, and Full Stack Development concepts through structured practical exercises.

COURSE OUTCOMES:

1. Construct responsive web pages using HTML5, CSS3, Flexbox, Grid, and Bootstrap.
2. Demonstrate interactive features using JavaScript, arrays, functions, and form validation.
3. Examine DOM manipulation, browser storage, and REST API integration using Fetch API.
4. Develop component-based applications using React with props, state, hooks, and routing.
5. Design and deploy a full stack application using React, Node.js, and Git version control.

LAB EXERCISES:

1. Create a personal profile webpage using HTML5 semantic elements (header, nav, section, footer).
2. Design a responsive student registration form using HTML5 input types and CSS3 styling
3. Build a responsive portfolio layout using CSS Flexbox and Grid with media queries.
4. Develop a Bootstrap-based college homepage with navbar, carousel, and cards.
5. Write JavaScript programs for basic operations: calculator, temperature converter, and simple quiz.
6. Implement array operations and form validation using JavaScript (registration form with error messages).
7. Create an interactive to-do list using DOM manipulation (add, delete, mark complete).
8. Build a theme switcher (dark/light mode) using Local Storage to save user preference.
9. Fetch and display live data from a public REST API (weather or country info) using Fetch API
10. Develop a React application with functional components, props, and state (student mark display).
11. Build a React form with controlled components, validation, and conditional rendering.
12. Create a React application using React Hooks (useState, useEffect) to display and filter a product list.
13. Implement client-side routing using React Router (Home, About, Contact pages).
14. Build a simple CRUD application in React that connects to a public REST API (add, view, delete records).
15. Create a full-stack mini project: React frontend + Node.js backend with Git version control and deployment.

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	2	2	2
CO 2	3	2	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	2	2	2
CO 5	3	3	2	2	2
Ave.	3.0	2.8	2.2	2.0	2.0

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	2	2	2
CO 2	3	2	2	2	2
CO 3	3	3	3	3	2
CO 4	3	3	2	3	2
CO 5	3	3	2	3	2
Ave.	3.0	2.8	2.2	2.6	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COUSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Construct responsive web pages using HTML5, CSS3, Flexbox, Grid, and Bootstrap.	PO1, PO2, PO3	PSO1, PSO2, PSO4	K3
CO2	Design effective prompts using various prompting techniques and frameworks.	PO1, PO2	PSO1, PSO2	K6
CO3	Apply advanced prompting strategies to solve real-world tasks.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K3
CO4	Develop prompt-based solutions for content generation, coding, and academic applications.	PO1, PO2, PO3	PSO1, PSO2, PSO4	K3
CO5	Evaluate prompt engineering practices for ethical and responsible AI usage	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO4	K3

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: PRACTICAL - II: WEB APPLICATION DEVELOPMENT

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Practical examination with programming/problem-solving tasks for 90 minutes	50	10
Model Examination	Practical examination with programming/problem-solving tasks for 180 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Workbook/recordbook/notebook	Handwritten record of experiments, observations, results, and conclusions	10	5
Class activity 1	Debugging Test	10	5
Class activity 2	Problem-Solving Exercise	10	5
Class activity 3	Quiz with MCQ	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: B.Sc. (CS), BCA, B.Sc. (IT)	BATCH: 2026 – 2029
PART: III	COURSE COMPONENT: ALLIED – II
COURSE NAME: STATISTICS	COURSE CODE: 26UBCA3A2
SEMESTER: II	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To understand about data and use various statistical techniques to measure and compare the relation between data points.

COURSE OUTCOMES:

1. Recall the basics of statistical data, meaning of correlation and regression and probability.
2. Understand the concept of Statistical data representation in graph, location of measure, difference between correlation and regression and concept of probability.
3. Apply the concepts of data in various types of graphical representation, various types of averages and deviations, relation between correlation and regression, real world problems into probability models.
4. Analyze graphical representation, measures of central tendency and dispersion, correlation and regression, Addition and multiplication theorem in probability.
5. Evaluate different types of graphical methods, measures of central tendency and dispersion, correlation and regression and Baye's Theorem applications in problems.

UNIT I

(18 HOURS)

Introduction to statistics: Definition, Characteristics, Graphical Representation of data: Bar charts, Pie Diagrams, Histograms, Frequency polygon, Ogives.

Volume I: Chapter 1, Chapter 6

UNIT II

(18 HOURS)

Measures of Central Tendency: Mean, Median, Mode, graphical location of median, quartiles, deciles, percentiles, relation among arithmetic mean, geometric mean and harmonic mean.

Volume I: Chapter 7

UNIT III

(18 HOURS)

Measures of Dispersion: Range, Mean deviation, Quartile deviation, Standard deviation, Coefficient of variation, Inter quartile deviation, Mean Absolute deviation.

Volume I : Chapter 8

UNIT IV

(18 HOURS)

Correlation and Regression: Correlation: Meaning, Applications, types of degree of correlation, Scatter diagram, Karl Pearson's Coefficient of Correlation, Spearman's Rank Correlation. Regression: Meaning, uses, Difference between correlation and regression, linear regression equations.

Volume I : Chapter 10 and Chapter 11

UNIT V

(18 HOURS)

Probability: Basic probability, axioms of probability, independent events, Addition and Multiplication theorem (Statement only), Baye's theorem

Volume II : Chapter 1

RECOMMENDED TEXTBOOKS:

Treatment and content as in "Statistical Methods" – S.P. Gupta, Sultan Chand & Sons 45th Edition (2017)

REFERENCE BOOKS:

1. New Mathematical statistics - Sanjay Arora & Bansilal (2002), Meerat Publications, New Delhi
2. Fundamentals of Mathematical Statistics - Gupta, S.C. and Kapoor, V.K. (2000): 10/e, Sultan Chand & Sons
3. Basic Statistics - Agarwal .B.L (1996): e , New Age International (P) Ltd.,
4. Statistics for Business and Economics - Hooda.R.P. (2003): 3/e, MacMillan.

E - LEARNING RESOURCES:

1. <https://www.digimat.in/nptel/courses/video/110107114/L01.html>
2. <https://ocw.mit.edu/courses/14-30-introduction-to-statistical-method-in-economics-spring-2006/>
3. www.e-booksdirectory.com
4. www.bookboon.com/en/statistics-and-mathematics-ebooks

GUIDELINES TO THE QUESTION PAPER SETTERS
QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions	1 – 12	3	30
B	Answer any 5 out of 7 questions	13 – 19	6	30
C	Answer any 4 out of 6 questions	20 – 25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS FOR THEORY AND PROBLEMS

UNITS	SECTION A		SECTION B		SECTION C	
	THEORY	PROBLEM	THEORY	PROBLEM	THEORY	PROBLEM
I	2	-	-	1	-	1
II	1	1	-	1	-	1
III	-	2	-	1	-	1
IV	1	1	-	1	-	1
V	1	1	-	1	-	1
Any Unit	-	2	-	2	-	1
TOTAL	5	7	-	7	-	6
	SECTION A -12		SECTION B – 7		SECTION C -6	

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	2	2
CO 2	3	2	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	3
Ave.	3.0	2.6	2.6	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	2	2	2
CO 2	3	2	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	3	2
Ave.	3.0	2.6	2.6	2.2	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Recall the basics of statistical data, meaning of correlation and regression and probability.	PO1	PSO1, PSO3	K1
CO2	Understand the concept of Statistical data representation in graph, location of measure, difference between correlation and regression and concept of probability.	PO1, PO3	PSO1, PSO2, PSO3	K2
CO3	Apply the concepts of data in various types of graphical representation, various types of averages and deviations, relation between correlation and regression, real world problems into probability models.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K3
CO4	Analyze graphical representation, measures of central tendency and dispersion, correlation and regression, Addition and multiplication theorem in probability.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K4
CO5	Evaluate different types of graphical methods, measures of central tendency and dispersion, correlation and regression and Baye's Theorem applications in problems.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K5

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: STATISTICS

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Monograph / Problem solving assignment	10	5
Workbook/recordbook/notebook	Scrap book / Record book preparation	10	5
Class activity 1	Quiz with MCQ	10	5
Class activity 2	Case Study Analysis	10	5
Class activity 3	Puzzle	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: For other Programmes except BCA	BATCH: 2026 – 2029
PART: IV	COURSE COMPONENT: NON-MAJOR ELECTIVE – II
COURSE NAME: DATA VISUALIZATION USING POWER BI LAB	COURSE CODE: 26UNME4B033
SEMESTER: II	MARKS:100
CREDITS: 2	TOTAL HOURS:30
PRACTICAL	

COURSE OBJECTIVE:

To provide training of data visualization using Power BI.

COURSE OUTCOMES:

1. Explain about features of MS-Excel.
2. Perform numerical operations on data.
3. Apply statistical operations on data.
4. Interpret to perform data analysis and data modeling.
5. Create data visualization using Power BI.

LAB EXERCISES

1. Explore the features of MS-Excel.
2. Get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND)
3. Perform statistical operations – Mean, Median, Mode and Standard deviation, Variance, Skewness
4. Perform data import/export operations for different file formats
5. Perform data pre-processing operations i) Handling Missing data ii) Normalization
6. Perform bivariate and multivariate analysis on the dataset.
7. Explore the Features of PowerBi Desktop
8. Develop the Data Model
9. Design a Report
10. Create a Dashboard and perform data Analysis

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	2	2
CO 2	3	3	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	3
Ave.	3.0	2.8	2.6	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	1	2	2
CO 2	3	3	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	3	2
CO 5	3	3	3	3	2
Ave.	3.0	2.8	2.4	2.4	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Explain about features of MS-Excel.	PO1	PSO1, PSO2	K2
CO2	Perform numerical operations on data.	PO1, PO2	PSO1, PSO2, PSO3	K3
CO3	Apply statistical operations on data.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K3
CO4	Interpret to perform data analysis and data modeling.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K4
CO5	Create data visualization using Power BI.	PO1, PO3, PO5	PSO1, PSO2, PSO3, PSO4	K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: DATA VISUALIZATION USING POWER BI LAB

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Practical examination with programming/problem-solving tasks for 90 minutes	50	10
Model Examination	Practical examination with programming/problem-solving tasks for 180 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Workbook/recordbook/notebook	Handwritten record of experiments, observations, results, and conclusions	10	5
Class activity 1	Debugging Test	10	5
Class activity 2	Problem-Solving Exercise	10	5
Class activity 3	Quiz with MCQ	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: ALL UG	BATCH: 2026 – 2029
PART: IV	COURSE COMPONENT: ABILITY ENHANCEMENT SKILLS – II
COURSE NAME: FOUNDATIONS OF QUANTITATIVE APTITUDE	COURSE CODE: 26USKL402
SEMESTER: II	MARKS:100
CREDITS: 2	TOTAL HOURS: 30
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

Develop learners' problem-solving skills and critical thinking abilities in the context of recruitment aptitude tests.

COURSE OUTCOME:

1. Apply the concepts of number systems, divisibility rules, and number series to solve numerical problems.
2. Compute HCF and LCM of numbers using prime factorization method.
3. Apply percentage concepts to solve problems involving profit, loss, cost price, and selling price.
4. Compare simple interest and compound interest to solve financial problems.
5. Interpret data from tables and graphs to draw meaningful conclusions.

UNIT I: Number system and Number series

(6 HOURS)

Numbers: Numbers and their classification, test for divisibility of numbers, General properties of divisibility, division and remainder, remainder rules.

Number Series: Number series, three steps to solve a problem on series, two-line number series, sum rules on natural numbers.

UNIT II: HCF and LCM of Numbers

(6 HOURS)

Factors, Multiples, Principle of Prime factorization, Highest Common Factor (HCF) and Least Common Multiple (LCM), Product of two numbers, Difference between HCF and LCM.

UNIT III: Percentage, Profit and Loss

(6 HOURS)

Percentage: Introduction, fraction to rate percent, rate percent to fraction, rate percent of a number, express a given quantity as a percentage of another given quantity, convert a percentage into decimals and convert a decimal into percentage.

Profit and Loss: Gain/Loss and % gain and % loss, relation among Cost price, Sale price, Gain/Loss and % gain and % loss.

UNIT IV: Simple Interest and Compound Interest**(6 HOURS)**

Simple Interest: Definition, effect of change of P , R and T on Simple Interest, amount.

Compound Interest: Introduction, conversion period, basic formula, to find the Principal/Rate/Time, Difference between Simple Interest and Compound Interest.

UNIT V: Data interpretation**(6 HOURS)**

Tabulation, Bar Graphs, Pie Charts, Line Graphs, average.

RECOMMENDED TEXTBOOKS:

1. Quantitative Aptitude by R.S. Agarwal

REFERENCE BOOKS:

1. Quantitative Aptitude by Abhijit Guha, Fourth Edition.
2. Quantitative Aptitude by Ramandeep Singh.

E - LEARNING RESOURCES:

1. <https://byjus.com/maths/numeralsystem/#:~:text=crore%20is%207.International%20Numerical%20System,8%20%E2%80%93%20Ones>
2. <https://byjus.com/maths/hcf-and-lcm/>
3. <https://byjus.com/maths/profit-loss-percentage/>
4. <https://www.vedantu.com/jee-main/maths-difference-between-simple-interest-and-compound-interest>
5. <https://sites.utexas.edu/sos/guided/descriptive/descriptivec/frequency/>

GUIDELINES TO THE QUESTION PAPER SETTERS
QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Multiple Choice Questions: Answer 20 out of 20 questions (each question carries one mark)	1 – 20	20	20
B	Answer any 5 out of 7 questions (each question carries 6 marks)	21 – 27	6	30
TOTAL MARKS				50

BREAK UP OF QUESTIONS FOR PROBLEMS

UNITS	SECTION A	SECTION B
I	4	1
II	4	1
III	4	1
IV	4	1
V	4	1
Any Unit	-	2
TOTAL	20	7

SEMESTER III

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – V
COURSE NAME: PROGRAMMING IN JAVA	COURSE CODE: 26UBCA305
SEMESTER: III	MARKS:100
CREDITS: 4	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To introduce the concepts of Object-Oriented Programming in JAVA.

COURSE OUTCOMES:

1. Recall basic OOP concepts and the evolution and features of Java.
2. Explain classes, objects, constructors, inheritance, and string handling in Java.
3. Apply interfaces, packages, and multithreading to develop Java applications.
4. Analyze exception handling, applet lifecycle, and graphics in Java programs.
5. Illustrate GUI design using JavaFX controls and event handling.

UNIT 1

(18 HOURS)

Object-Oriented Paradigm – Basic Concepts of Object-Oriented Programming – Java Evolution: History - Features of Java - How Java differs from C and C++ - Overview of Java: Program Structure - Java Tokens – Statements – Data Types - Constants – Variables - Type Conversion and Casting -Arrays - Operators – Expressions - Control Statements: Branching and Looping Statements.

UNIT II

(18 HOURS)

Classes, Objects and Methods - Constructors – this keyword – Garbage collection - Overloading Methods – Inheritance - Overriding Methods - Object as parameter and returning objects - Nested and Inner classes - Final Keyword - Abstract Class and Methods – Array - String Handling: Various String operations - StringBuffer Class - Vectors.

UNIT III

(18 HOURS)

Interfaces – Packages - Creating Packages - Accessing a Package - Multithreaded Programming- Creating Threads - Stopping and Blocking a Thread - Life Cycle of a Thread - Using Thread Methods - Thread Priority – Synchronization - Implementing the Runnable Interface.

UNIT IV

(18 HOURS)

Managing Errors and Exceptions: Types of Errors – Exceptions - Syntax of Exception Handling Code - Using Finally Statement - Throwing Our Own Exceptions - Applet Programming - Applet Life Cycle- Graphics Programming.

UNIT V

(18 HOURS)

GUI Programming with JavaFX: JavaFX Event Handling - Event basics - Handling Key & Mouse Events; UI Controls: Label, Button, Checkbox, ToggleButton, RadioButtons, ListView, ComboBox, ChoiceBox, TextField, ScrollPane; Layouts: FlowPane, HBox & VBox, BorderPane, StackPane, GridPane; Menus: Menu, MenuBar, MenuItem.

RECOMMENDED TEXTBOOKS:

1. Herbert Schildt , Java: The Complete Reference, McGraw Hill Education, Oracle Press 11th Edition, 2019
2. Programming with Java – A Primer – E. Balagurusamy, 5th Edition, TMH.
3. Oracle Corporation. JavaFX – Getting Started with JavaFX (Release 8)
4. Eck, David J. Introduction to Programming Using Java – Version 9, JavaFX Edition. 2022.
5. Ball, Robert. Introduction to JavaFX for Beginner Programmers.

REFERENCE BOOKS:

1. Y. Daniel Liang, 2003, An Introduction to JAVA Programming, Prentice – Hall of India Pvt. Ltd.
2. The Complete Reference Java 2 – Patrick Naughton & Hebert Schildt, 3rd Edition, TMH
3. S. Sree Priya, - Java Programming (for java beginners)”, First Edition, Volume 1, 2021, VR1 Publications, Chennai.
4. Cay S. Horstmann and Gary Cornell, 2005, Core Java™2 Volume I, Fundamental 7th Edition, Pearson Education.
5. Programming with Java – John R. Hubbard, 2nd Edition, TMH.

E-LEARNING RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc24_cs43/preview
2. <https://www.coursera.org/specializations/java-programming>
3. <https://www.coursera.org/learn/object-oriented-java>
4. <https://www.javacodegeeks.com/wp-content/uploads/2016/08/JavaFX-Programming-Cookbook.pdf>
5. <https://icarus.cs.weber.edu/~rball/JavaBook/JavaFXBook.pdf>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions(each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions(each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions(each in 1200 words)	20-25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	1
II	3	1	2
III	2	2	1
IV	2	1	1
V	2	1	1
TOTAL	12	7	6
SECTION A – 12		SECTION B – 7	SECTION C – 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	1	2	2
CO 2	3	3	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	2
Ave.	3.0	2.8	2.4	2.0	2.0

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	1	2	2
CO 2	3	3	2	2	2
CO 3	3	3	2	3	2
CO 4	3	3	3	3	2
CO 5	3	3	3	3	2
Ave.	3.0	2.8	2.2	2.6	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Recall basic OOP concepts and the evolution and features of Java.	PO1	PSO1	K1
CO2	Explain classes, objects, constructors, inheritance, and string handling in Java.	PO1, PO2	PSO1, PSO2	K2
CO3	Apply interfaces, packages, and multithreading to develop Java applications.	PO1, PO2, PO3	PSO1, PSO2, PSO4	K3
CO4	Analyze exception handling, applet lifecycle, and graphics in Java programs.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K4
CO5	Illustrate GUI design using JavaFX controls and event handling.	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO4	K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: PROGRAMMING IN JAVA

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Problem solving / coding tasks	10	5
Workbook/recordbook/notebook	Notes maintenance	10	5
Class activity 1	Quiz with MCQ	10	5
Class activity 2	Seminar/Presentation	10	5
Class activity 3	Surprise Class Test	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – VI
COURSE NAME: DATA STRUCTURES AND ALGORITHMS	COURSE CODE: 26UBCA306
SEMESTER: III	MARKS:100
CREDITS: 4	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To introduce fundamental data structures, algorithms, and abstract data types and its usages

COURSE OUTCOMES:

1. Describe the complexity of algorithms in data structure.
2. Explain applications for linear and nonlinear data structure.
3. Categorize various tree and graph traversing algorithm.
4. Identify the Shortest Path in the Graph using algorithms.
5. Apply sorting algorithms such as bubble, insertion, selection, heap, and quick sort.

UNIT 1

(18 HOURS)

Definition of a Data structure – Basic Terms - primitive and composite Data Types, Asymptotic Notations-Big Oh, Omega, Theta notations. Arrays: Operations on Arrays: Insertion, Deletion and Traversal with algorithms - Order list: Definition, Operations

UNIT II

(18 HOURS)

Stacks – Operations on stack: PUSH, POP. Applications of Stack - Infix to Postfix Conversion, Recursion and Maze Problems - Queues - Operations on Queues: ENQUEUE AND DEQUEUE. Queue Applications, Circular Queue: Operations on Circular Queue.

UNIT III

(18 HOURS)

Singly Linked List – Operations: Insertion, Deletion and Traversal- Application - Representation of a Polynomial, Polynomial Addition; Doubly Linked List – Representation – Operations: Insertion, Deletion, Insert Last, Insert After, Delete Last and Display operation - Applications

UNIT IV

(18 HOURS)

Trees and Graphs: Binary Trees – Basic Terminologies in Trees - Representation - Conversion of Forest to Binary Tree, Operations - Tree Traversals; Graph - Definition, Basic Terms – Basic Operations - Types of Graphs, Hashing Tables and Hashing Functions, Traversal: BFS and DFS- Shortest Path: Dijkstra's Shortest Path Algorithm.

UNIT V

(18 HOURS)

Algorithm - Definition - Examples - Complexity: Time Complexity, Space Complexity Divide and Conquer - Binary Search - Maximum and Minimum with example - Merge Sort and Quick Sort with example - **Case Studies: Real-world applications of sorting and searching algorithms.**

RECOMMENDED TEXTBOOKS:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 4th Edition, Pearson, 2014.
2. Reema Thareja, Data Structures Using C, 2nd Edition, Oxford University Press, 2014.

REFERENCE BOOKS:

1. Cormen, Leiserson, Rivest and Stein, Introduction to Algorithms, 4th Edition, MIT Press, 2022.
2. Robert Sedgewick and Kevin Wayne, Algorithms, 4th Edition, Addison-Wesley, 2011.
3. Narasimha Karumanchi, Data Structures and Algorithms Made Easy, 5th Edition, CareerMonk Publications, 2020.
4. Goodrich, Tamassia and Goldwasser, Data Structures and Algorithms in Python, Wiley, 2013.
5. Steven S. Skiena, The Algorithm Design Manual, 3rd Edition, Springer, 2020.

E-LEARNING RESOURCES:

1. <https://nptel.ac.in/courses/106102064>
2. <https://www.coursera.org/specializations/data-structures-algorithms>
3. <https://www.coursera.org/learn/algorithms-part1>
4. <https://brilliant.org/wiki/shortest-path-algorithms/>
5. https://www.tutorialspoint.com/data_structures_algorithms/

GUIDELINES TO THE QUESTION PAPER SETTERS
QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions(each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions(each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions(each in 1200 words)	20-25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	1
II	3	1	2
III	2	2	1
IV	2	1	1
V	2	1	1
TOTAL	12	7	6
SECTION A – 12		SECTION B - 7	SECTION C – 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	2	2
CO 2	3	3	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	2
Ave.	3.0	2.8	2.6	2.0	2.0

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	2	2	2
CO 2	3	3	2	2	2
CO 3	3	3	3	3	2
CO 4	3	3	3	3	2
CO 5	3	3	3	3	2
Ave.	3.0	2.8	2.6	2.0	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Describe the complexity of algorithms in data structure.	PO1, PO2	PSO1	K1, K2
CO2	Explain applications for linear and nonlinear data structure.	PO1, PO2	PSO1	K2, K4
CO3	Categorize various tree and graph traversing algorithm.	PO1, PO2, PO3	PSO1, PSO3	K3, K4
CO4	Identify the Shortest Path in the Graph using algorithms.	PO1, PO2, PO3	PSO1, PSO3	K3, K4, K5
CO5	Apply sorting algorithms such as bubble, insertion, selection, heap, and quick sort.	PO1, PO2, PO3	PSO1, PSO2	K4, K5

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: DATA STRUCTURES AND ALGORITHMS

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Algorithm design & problems	10	5
Workbook/recordbook/notebook	Notes maintenance	10	5
Class activity 1	Puzzle	10	5
Class activity 2	Quiz with MCQ	10	5
Class activity 3	Group Discussion	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – VII
COURSE NAME: SYSTEM SOFTWARE AND OPERATING SYSTEMS	COURSE CODE: 26UBCA307
SEMESTER: III	MARKS:100
CREDITS: 4	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To understand the processing of programs on a computer system to design and in-depth understanding of the operating system concepts

COURSE OUTCOMES:

1. Outline the structure of system software and its architecture.
2. Describe the concept of machine dependent compiler features and compiler design.
3. Analyze the process management & thread, processor scheduling and its criteria.
4. Apply the concept of multiprogramming system and how to avoid deadlock in operating system.
5. Prioritize the issues and challenges of main memory, virtual memory and file systems.

UNIT 1

(18 HOURS)

Introduction to System Software, Programming languages and language processors: procedure oriented and Problem oriented programming languages, Program execution: Program Translation, Program Interpretation.

UNIT II

(18 HOURS)

Assemblers: Assembly Language Statements - Machine dependent compiler features – Intermediate form of the program – Machine dependent code optimization – Machine independent compiler features – Compiler design options – Division into passes – Interpreters – p-code compilers – Compiler-compilers.

UNIT III

(18 HOURS)

Introduction: Views– Goals–OS Structure–Components–Services–System Design and Implementation. Process Management: Process - Process Scheduling – Cooperating Process – Threads - Interprocess Communication. CPU Scheduling: CPU Schedulers – Scheduling criteria – Scheduling Algorithms.

UNIT IV

(18 HOURS)

Deadlock: Characterization – Methods for handling Deadlocks – Prevention, Avoidance, and Detection of Deadlock - Recovery from deadlock. Memory Management: Address Binding:

Logical and Physical Address Space Contiguous Allocation – Internal & External Fragmentation. Non-Contiguous Allocation: Paging and Segmentation schemes Implementation – Sharing - Fragmentation.

UNIT V

(18 HOURS)

Virtual Memory: Demand Paging – Page Replacement - Page Replacement Algorithms – Thrashing. – File System: Concepts – Access methods – Directory Structure –Protection Consistency Semantics – File System Structures – Allocation methods – Free Space Management.

RECOMMENDED TEXTBOOKS:

1. Operating System Concepts – Silberschatz, Galvin & Gagne, Wiley, 2018.
2. Modern Operating Systems – Tanenbaum & Bos, Pearson, 2022.
3. System Software: An Introduction to Systems Programming – Leland L. Beck & D. Manjula, Pearson, 2007

REFERENCE BOOKS:

1. Silberschatz, A., Galvin, P. B., & Gagne, G., Operating System Concepts, 10th Edition, Wiley, 2018.
2. Tanenbaum, A. S., & Bos, H., Modern Operating Systems, 5th Edition, Pearson, 2022.
3. Stallings, W., Operating Systems: Internals and Design Principles, 10th Edition, Pearson, 2024.
4. Beck, L. L., & Manjula, D., System Software: An Introduction to Systems Programming, 3rd Edition, Pearson.
5. Cooper, K., & Torczon, L., Engineering a Compiler, 3rd Edition, Morgan Kaufmann, 2022.

E-LEARNING RESOURCES:

1. <https://nptel.ac.in/courses/106106144>
2. https://onlinecourses.nptel.ac.in/noc24_cs108/preview
3. <https://www.coursera.org/learn/os-power-user>
4. <https://uotechnology.edu.iq/ce/Lectures/Dr-Shaima-Sys-Prog/lec1-2-3-4.pdf>
5. https://www.vssut.ac.in/lecture_notes/lecture1423726024.pdf

GUIDELINES TO THE QUESTION PAPER SETTERS QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions(each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions(each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions(each in 1200 words)	20-25	10	40
		73	TOTAL MARKS	100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	2
II	3	1	1
III	2	1	1
IV	2	2	1
V	2	1	1
TOTAL	12	7	6
SECTION A – 12		SECTION B - 7	SECTION C – 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	1	2	1
CO 2	3	3	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	3
Ave.	3.0	2.8	2.4	2.0	2.0

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	1	1	2
CO 2	3	3	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	3	2
CO 5	3	3	3	3	2
Ave.	3.0	2.8	2.4	2.2	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Outline the structure of system software and its architecture.	PO1	PSO1	K2
CO2	Describe the concept of machine dependent compiler features and compiler design.	PO1, PO2	PSO1, PSO2	K2
CO3	Analyze the process management & thread, processor scheduling and its criteria.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K4
CO4	Apply the concept of multiprogramming system and how to avoid deadlock in operating system	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K3
CO5	Prioritize the issues and challenges of main memory, virtual memory and file systems	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K5

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: SYSTEM SOFTWARE AND OPERATING SYSTEMS

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Concept-based & numerical problems	10	5
Workbook/recordbook/notebook	Notes + diagrams	10	5
Class activity 1	Case Study Analysis	10	5
Class activity 2	Seminar/Presentation	10	5
Class activity 3	Quiz with MCQ	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – VIII
COURSE NAME: PRACTICAL - III: PROGRAMMING IN JAVA	COURSE CODE: 26UBCA308P
SEMESTER: III	MARKS:100
CREDITS: 4	TOTAL HOURS:60
PRACTICAL	

COURSE OBJECTIVE:

To provide hands on training in JAVA programming.

COURSE OUTCOMES:

1. Identify Java syntax and structure using classes, objects, constructors, and basic I/O.
2. Explain OOP features such as inheritance, overloading, overriding, abstraction, interfaces, and packages.
3. Apply exception handling, multithreading, string manipulation, and random number generation in Java.
4. Differentiate execution behavior of threads, inheritance, and event handling in Java.
5. Formulate event-driven GUI applications using JavaFX controls, layouts, and menus.

LAB EXERCISES

APPLICATIONS

1. Write a java program to read student marks for five subjects and print the total and average using class and objects.
2. Write a java program to display the employee details using Scanner class.
3. Write a java program to implement inheritance in java using Super Keyword
4. Write a java program for Method overloading and Constructor overloading.
5. To implement the concept of method overriding.
6. Write a java program using this Keyword.
7. Write a java program to represent Abstract class.
8. Write a java program using Inner Class.
9. Write a java program to implement Interface using extends keyword.
10. Write a java program to create a user defined package.
11. Write a java program for creating multiple catch blocks.
12. Write a Java program that implements a multi-thread application that has three threads.
13. Write a Java program for substring Removal from a String using StringBuffer Class.
14. Write a Java program to determine the order of numbers generated randomly using Random class.

JavaFX

1. Write a JavaFX program to create a simple GUI with a label and a button.
2. Write a JavaFX program that handles both key press and mouse click events.
3. Write a JavaFX program to perform addition of two numbers using GridPane layout.
4. Write a JavaFX program to display multiple text fields inside a ScrollPane.
5. Write a JavaFX program to create a simple menu with “New” and “Exit” options.

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	1	2	1
CO 2	3	3	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	3
Ave.	3.0	2.8	2.4	2.0	2.0

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	1	2	2
CO 2	3	3	2	2	2
CO 3	3	3	3	3	2
CO 4	3	3	3	3	2
CO 5	3	3	3	3	2
Ave.	3.0	2.8	2.4	2.6	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Identify Java syntax and structure using classes, objects, constructors, and basic I/O.	PO1	PSO1	K3
K2,	Explain OOP features such as inheritance, overloading, overriding, abstraction, interfaces, and packages.	PO1, PO2	PSO1, PSO2	K2
CO3	Apply exception handling, multithreading, string manipulation, and random number generation in Java.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K3
CO4	Differentiate execution behavior of threads, inheritance, and event handling in Java.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K4
CO5	Formulate event-driven GUI applications using JavaFX controls, layouts, and menus.	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO3, PSO4	K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyze, K5= Evaluate, K6= Create

COURSE NAME: PRACTICAL - III: PROGRAMMING IN JAVA

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Practical examination with programming/problem-solving tasks for 90 minutes	50	10
Model Examination	Practical examination with programming/problem-solving tasks for 180 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Workbook/recordbook/notebook	Handwritten record of experiments, observations, results, and conclusions	10	5
Class activity 1	Debugging Test	10	5
Class activity 2	Problem-Solving Exercise	10	5
Class activity 3	Quiz with MCQ	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: ALLIED - III
COURSE NAME: ACCOUNTING PRACTICES	COURSE CODE: 26UBCA3A3
SEMESTER: III	MARKS:100
CREDITS: 4	TOTAL HOURS:90
THEORY AND PROBLEMS	

COURSE FRAMEWORK:

To Introduce the Accounting Principles and Procedures, Depreciation, Analysis of Cost, Overheads, Procedure and Practices, Management Perspective Accounting.

COURSE OUTCOMES:

1. Explain accounting concepts and preparation of final accounts.
2. Describe methods of depreciation.
3. Apply cost accounting concepts using cost sheets.
4. Analyze marginal costing techniques for decision making.
5. Interpret management accounting and statement analysis.

UNIT I

(15 HOURS)

Meaning and Scope of Accounting, Objectives of Accounting – Basic Accounting Concepts and Conventions – Objectives of Accounting – Accounting Transactions: Difference Between Financial Accounting and Cost Accounting – Difference Between Cost Accounting and Management Accounting; Double Entry – Book Keeping, Types of Accounts, Accounting Terminology – Journal – Ledger – Preparation of Trail Balance (Simple Problems, Excluding Suspense Accounts).

UNIT II

(19 HOURS)

Preparation of Final Accounts and Adjustments to Final Accounts; Closing Stock, Accrued Income, Income Received in Advance, Outstanding Expenses, Prepaid Expenses, Depreciation, Bad Debts, Provision for Bad and Doubtful Debts.

UNIT III

(19 HOURS)

Cost Accounting Definition, Meaning, Objectives, Nature, Scope: Preparation of Cost Sheet, Tender, Quotation (Simple Problems).

UNIT IV

(18 HOURS)

Management Accounting Definition, Meaning, Objectives, Nature, Scope: Financial Statement Analysis: Meaning, Nature, Scope – Techniques of Financial Statement Analysis - Comparative Financial Statements, Common Measurement or Size Statement, Trend Analysis.

UNIT V

(19 HOURS)

Marginal Costing – Cost-Volume-Profit (CVP) Analysis – profit-volume ratio – Break Even Point – Margin of Safety – Sales Required to Earn derived Profit – Product Mix – Make or Buy Decision – Key Limiting Factor.

THEORY: 20% PROBLEMS: 80%

RECOMMENDED TEXTBOOKS:

1. Gupta. R.L & Gupta V.K, 2005, Financial Accounting, Sultan Chand & Sons, New Delhi, 6th edition.
2. Reddy T.S & Murthy. A, 2007, Financial Accounting, Margham Publications, Chennai, 5th edition.
3. Dr. S. Manikandan, Financial Accounting, Scitech Publications, Chennai.
4. Jain S.P. and Narang K.L., Cost Accounting, Kalyani Publishers, Ludhiana, Eighth Edition
5. Reddy T.S. and Hari Prasad Reddy Y., Cost Accounting, Margham Publications, Chennai, Fourth Edition
6. Maheswari, D. S., “Principles of Management Accounting” Sultan Chand & Sons. Delhi 53, 17th edition
7. Reddy, T. S., & Y. Hariprasad Reddy, Management Accounting. Margham Publication, 15th Edition.

REFERENCE BOOKS:

1. Goel. D. K and Shelly Goel, 2018, Financial Accounting, Arya Publications, 2nd edition.
2. Jain. S.P & Narang. K, 1999, Financial Accounting, Kalyani Publishers, Ludhiana, 4th edition.
3. Dr. Maheswari S.N, Principles of Cost Accounting, Sultan Chand & Sons, New Delhi
4. Shukla M.C., Grewal T.S. and Dr. Gupta M.P., Cost Accounting, S.Chand, New Delhi
5. Khanna B.S., Pandey I.M. Ahuja G.K. and Arora M.N.– Practical costing.
6. N.K. Prasad and V.K .Prasad– Cost Accounting.
7. Khan, M.Y., & Jain ,P.K.(2017). Management Accounting and Financial Analysis.

E-LEARNING RESOURCES:

1. <https://www.accountingtools.com/articles/2017/5/15/basic-accounting-principles>
2. https://en.wikipedia.org/wiki/Single-entry_bookkeeping_system
3. <https://www.profitbooks.net/what-is-depreciation/>
4. <http://www.yourarticlelibrary.com/cost-accounting/cost-accounting-meaning>
5. <http://www.accountingnotes.net/cost-accounting/cost-sheet/cost-sheet-meaning advantages and preparation/7505>

GUIDELINES TO THE QUESTION PAPER SETTERS
QUESTION PAPER PATTERN

Section	Question Component	Numbers	Marks	Total
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	1-12	3	30
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	13-19	6	30
C	<i>Answer any 2 out of 4 questions</i>	20-23	20	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

Distribution of Questions: (Problem Paper)

Sections	Units	No. of Questions	
		Theory	Problems
Section A (Answer any 10 out of 12 questions) 3 marks each	1	2	1
	2	1	1
	3	1	2
	4	1	1
	5	1	1
Section B (Answer any 5 out of 7 questions) 6 marks each	1	1	1
	2	-	1
	3	-	1
	4	1	1
	5	-	1
Section C (Answer any 2 out of 4 questions) 20 marks each	1	-	1
	2	-	1
	3	-	1
	4	-	1
	5	-	-

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	2	2
CO 2	3	2	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	3
Ave.	3.0	2.6	2.6	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	1	2	2
CO 2	3	2	1	2	2
CO 3	3	3	2	2	2
CO 4	3	3	3	3	2
CO 5	3	3	3	3	2
Ave.	3.0	2.6	2.0	2.4	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Explain accounting concepts and preparation of final accounts.	PO1	PSO1, PSO4	K2
CO2	Describe methods of depreciation.	PO1, PO2	PSO1, PSO4	K2
CO3	Apply cost accounting concepts using cost sheets.	PO1, PO2	PSO1, PSO2, PSO4	K3
CO4	Analyze marginal costing techniques for decision making.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K4
CO5	Interpret management accounting and statement analysis.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K4

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: ACCOUNTING PRACTICES

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Written test (theory + problem solving)	50	10
Model Examination	Full written exam (theory + numerical problems)	100	10
Assignment	Accounting problem solving / financial statement preparation	10	5
Workbook/recordbook/notebook	Class notes + worked-out accounting problems	10	5
Class activity 1	Quiz with MCQ	10	5
Class activity 2	Case Study Analysis	10	5
Class activity 3	Seminar/Presentation	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 – 2029
PART: IV	COURSE COMPONENT: ABILITY ENHANCEMENT SKILLS - III
COURSE NAME: CYBER SAFETY AND DIGITAL ETHICS	COURSE CODE: 26USKL407
SEMESTER: III	MARKS: 100
CREDITS: 2	TOTAL HOURS: 30
THEORY	

COURSE OBJECTIVE:

To equip students with knowledge and skills to recognize cyber threats, practice safe online behavior, and uphold ethical, legal, and responsible digital citizenship.

COURSE OUTCOMES:

1. Identify common cyber threats and online risks.
2. Practice safe and secure use of digital devices and the internet.
3. Apply ethical principles in digital communication and data usage.
4. Understand cyber laws and legal responsibilities.
5. Demonstrate responsible digital citizenship.

UNIT I:

(6 HOURS)

Introduction to Cyber Safety: Cyberspace and digital environment - Importance of cyber safety - Common cyber threats: malware, phishing, hacking, identity theft - Cybercrime: meaning and types.

UNIT II:

(6 HOURS)

Safe Internet Practices: Password management and authentication - Safe browsing and secure online transactions - Social media safety and privacy settings - Email security and spam management.

UNIT III:

(6 HOURS)

Cyber Ethics and Digital Responsibility: Digital ethics: concepts and importance - Ethical issues in cyberspace - Responsible use of social media and digital communication - Netiquette and online behavior.

UNIT IV:**(6 HOURS)**

Cyber Laws and Legal Aspects: Overview of cyber laws - Information Technology Act, 2000 (India) – basics - Cyber offenses and penalties - Intellectual Property Rights (IPR) in the digital world.

UNIT V:**(6 HOURS)**

Data Protection and Digital Citizenship: Personal data protection and privacy - Digital footprints and online reputation - Cyber safety for mobile devices and cloud services - Role of individuals in promoting a safe digital society.

RECOMMENDED TEXTBOOKS:

1. Pavan Duggal, Cyber Law in India, 4th Edition, Saakshar Law Publications, New Delhi, 2017.
2. Nina Godbole and Sunit Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, 1st Edition, Wiley India Pvt. Ltd., 2011.

REFERENCE BOOKS:

1. Charles P. Pfleeger & Shari Lawrence Pfleeger, Security in Computing, 5th Edition, Pearson/Prentice Hall, 2015.
2. Michael E. Whitman & Herbert J. Mattord, Principles of Information Security, 7th Edition, Cengage Learning, 2021.
3. Deborah G. Johnson, Computer Ethics, 4th Edition, Pearson Education, 2008.
4. William Stallings, Cryptography and Network Security: Principles and Practice, 8th Edition, Pearson Education, 2022.
5. Simson Garfinkel, Practical UNIX and Internet Security, O'Reilly Media. Simson Garfinkel, Gene Spafford & Alan Schwartz, Practical UNIX and Internet Security, 3rd Edition, O' Reilly Media, 2003.

E-LEARNING RESOURCES:

1. <https://www.ndl.gov.in/>
2. https://nptel.ac.in/courses/106106248?utm_source=chatgpt.com
3. <https://www.cert-in.org.in/>
4. <https://cybercrime.gov.in/>
5. <https://club.ndl.iitkgp.ac.in/>

QUESTION PAPER PATTERN: MCQ

PROGRAMME: COMMON TO ALL	BATCH: 2026-2029
PART: IV	COURSE COMPONENT: SELF-STUDY COURSE(COMPULSORY)
COURSE NAME: INDIAN HERITAGE AND KNOWLEDGE SYSTEMS	COURSE CODE: 26USSP401
SEMESTER: III	MARKS:100
CREDITS: 2	TOTAL HOURS: SELF-STUDY
THEORY	

Course Description:

Delving into Indian Heritage, this course focuses on South Indian cultures and ancient knowledge like Yoga, Ayurveda, and Siddha, shaping the Nation's identity.

Course Objectives:

Analyzing Indian heritage's impact on national identity, South India's culture, and holistic traditions like Yoga, Ayurveda, Siddha, Jyotish, and Natya Shastra.

Course Outcomes:

1. Recall the key features of Indian heritage and its role in shaping cultural identity.
2. Identify the artistic, architectural, and literary achievements of South India and other regions.
3. List traditional practices preserved through folklore across India.
4. Recall the principles of ancient Indian sciences related to physical, mental, and spiritual well-being.
5. Describe the connections between spiritual, medicinal, and artistic elements in Indian heritage.

Course Structure:

Unit 1: Introduction to Indian Heritage

- a. **Concept of Heritage:** Definition, the importance of studying heritage, and its diverse forms.
- b. **Cultural Landscape of India:** Overview of major cultural zones in India, with a focus on South India.

Key Concepts: Cultural heritage, diversity, tangible heritage (e.g., monuments), intangible heritage (e.g., traditions, practices).

Unit 2: Cultural Tapestry of South India

- **Literature:** The classical Tamil literature of *Sangam poetry*, the epic Kannada works like the "*Kuvempu Ramayana*," the Telugu compositions of *Annamacharya*, and the poetic Malayalam works of Kerala's rich literary tradition.
- **Painting:** The intricate gold leaf work of *Tanjore painting*, the intricate patterns of *Mysore painting*, hand-painting or block-printing of *Kalamkari*.
- **Theatre:** The ancient art form of *Koothu* and the elaborate dance-dramas of *Bhagavata Mela* in Tamil Nadu, and the colourful folk theatre of *Yakshagana* in Karnataka.
- **UNESCO Indian Heritage Sites:** *Great Living Chola Temples* artistry, *Hampi-Virupaksha Temple* and the *Vijaya Vittala Temple*, *Mahabalipuram*- a treasure trove of Pallava art, *Mysore Palace*-Indo-Saracenic architecture, *Periyar National Park*- Western Ghats, *Kanchipuram*-City of Thousand Temples

Unit 3: Tamil Nadu Folklores

- **Origins and Significance:** Historical background of Tamil Nadu folklore and its cultural significance.
- **Folk Dances:** Exploration of traditional Tamil folk dances like *Karakattam*, *Kolattam*, and *Kummi*.

- Folk Music: **Overview of folk music traditions in Tamil Nadu, including *Parai Attam* and *Villu Paatu*.**
- Rituals and Festivals: **Understanding the role of folklore in Tamil Nadu's rituals and festivals- *Pongal* and *Jallikattu*.**

Key Concepts: **Karakattam, Kolattam, Parai Attam, Villu Paatu, Tamil folk tales, cultural rituals.**

Unit 4: Unveiling the Knowledge Systems

- **Cultural Landscape of India:** Overview of major cultural zones in India, with a focus on South India.
- **Yoga:** Exploring the various aspects of Yoga - its philosophy, Eight Limbs, practices (e.g., Asanas, Pranayama), and benefits for physical and mental well-being.
- **Ayurveda:** Understanding the core principles of Ayurveda - its focus on holistic health, diagnosis, and treatment methods.

Key Concepts: Yoga philosophy, Asanas, Pranayama, Tridosha theory (Ayurveda), Doshas (Vata, Pitta, Kapha), Panchakarma, herbal medicine, Ayurvedic lifestyle.

Unit 5: Siddha Tradition and Other Knowledge Systems

- **Siddha Tradition:** Origins, philosophy, medicinal practices, and spiritual aspects.
- **Other Important Knowledge Systems:** Jyotish Shastra (Indian astrology), Natya Shastra (Treatise on performing arts).

Key Concepts: Siddha literature, alchemy, and spirituality in Siddha tradition. Pancha Boothas (Siddha), herbal remedies, Planetary influences, elements of classical Indian dance and music, and aesthetics in Natya Shastra.

QUESTION PAPER PATTERN: MCQ

PROGRAMME: COMMON TO ALL	BATCH: 2026-2029
PART: IV	COURSE COMPONENT: SELF-STUDY COURSE(COMPULSORY)
COURSE NAME: CONTEMPORARY WORLD AND SUSTAINABLE DEVELOPMENT	COURSE CODE: 26USSP402
SEMESTER: III	MARKS:100
CREDITS: 2	TOTAL HOURS: SELF-STUDY
THEORY	

Course Overview:

Delving into global dynamics, this course highlights Asia and India's pivotal role in achieving global sustainability objectives.

Course Objectives:

Exploring global challenges, Asian politics, conflict resolution, sustainability, and India's SDG efforts, with a focus on Tamil Nadu.

Course Outcomes:

1. Identify the key actors and institutions that shape the contemporary world order.
2. Describe the political, economic, and security challenges in major Asian regions.
3. Recall the causes and human impact of recent wars and conflicts.
4. Describe the principles of sustainable development and their relevance at local, national, and global levels.
5. Identify India's contributions to the SDGs through Tamil Nadu's programs.

Course Structure:

Unit 1: Global Governance and Institutions

- **State & Non-State Actors:** Definition, types (nation-states, failed states), functions.

Key Actors: International states, Intergovernmental organizations (IGOs), nongovernmental organizations (NGOs), multinational corporations (MNCs).

- **United Nations (UN):** Structure, key organs (General Assembly, Security Council), functions, WB, & others.

Key Concepts: United Nations General Assembly, United Nations Security Council.

- **Regional Organizations:** European Union (EU), African Union (AU), North Atlantic Treaty Organization (NATO)

Key Concepts: European Union Commission, African Union Commission, North Atlantic Treaty Organization.

- **International Law and Treaties:** Significance, role in addressing global challenges.

Key Concepts: International Court of Justice, International Criminal Court, Geneva Conventions.

Unit 2: Contemporary Asia

Major Geographical Regions

- **Middle East:** Characterized by rich oil reserves, Complex political dynamics, and ongoing conflicts.

Key countries: Iran, Iraq, Israel, Saudi Arabia, Syria, Turkey

- **Southeast Asia:** Rapid economic growth, Challenges- maritime security and environmental degradation.

Key countries: Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam

- **Far East:** Major economic powerhouses and Potential flashpoints.

Key countries: China, Japan, North Korea, South Korea

- **Rise of China:** Political-South China Sea, Territorial disputes and Competition for Resources. Economic- China's Belt and Road Initiative (BRI)

- **Major Economic Centers:** **Singapore-** Global financial hub, **Hong Kong-** Special Administrative Region of China, **United Arab Emirates (UAE)-** Diversified economy driven by oil and gas, tourism, and trade.

Regional Organizations:

- Association of Southeast Asian Nations (ASEAN)
- South Asian Association for Regional Cooperation (SAARC)
- Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)

- Asia-Pacific Economic Cooperation (APEC)
- Shanghai Cooperation Organization (SCO)

Unit 3: Recent Wars of the World

- **Syrian Civil War (2011-present):** Bashar al-Assad regime, Syrian opposition groups, ISIS.

Key Concepts: Origins of the conflict, humanitarian crisis, foreign intervention, refugee crisis.

- **Yemeni Civil War (2015-present):** Houthi rebels, Yemeni government, Saudi-led coalition.

Key Concepts: Proxy war dynamics, humanitarian crisis, role of Iran and Saudi Arabia, UN peace efforts.

- **Ukraine Conflict (2014-present):** Ukrainian government, Russian-backed separatists, Russia.

Key Concepts: Annexation of Crimea, Donbas region conflict, Minsk agreements, NATO-Russia tensions.

- **Ethiopia Civil War (2020-present):** Ethiopian government, Tigray People's Liberation Front (TPLF), Eritrean forces.

Key Concepts: Tigray conflict, humanitarian crisis, regional implications, efforts for ceasefire and peace talks.

- **Nagorno-Karabakh War (2020):** Armenia, Azerbaijan, Russia.

Key Concepts: Conflict over Nagorno-Karabakh region, ceasefire agreement, role of Turkey, peace negotiations.

- **Myanmar Civil War (2021-present):** Myanmar military (Tatmadaw), ethnic armed groups, and Civilian resistance.

Key Concepts: Coup aftermath, Rohingya crisis, ethnic conflicts, ASEAN mediation efforts.

Unit 4: Sustainable Development Goals

- **Definition of Sustainable Development:** Balancing economic, social, and environmental needs.

Key Concepts: United Nations Development Programme (UNDP), World Wildlife Fund (WWF), Sustainable Development Solutions Network (SDSN).

- **UN Sustainable Development Goals (SDGs):** Overview, targets.

Key Concepts: United Nations, national governments, NGOs, private sector.

- **Challenges and Opportunities:** Achieving sustainability, global cooperation.

Key Concepts: United Nations, national governments, civil society organizations, multinational corporations.

Unit 5: India's Role in Achieving Sustainable Development Goals (SDGs) with Tamil Nadu Initiatives

Addressing Basic Needs:

- **Goal 1: No Poverty**
 - National Rural Employment Guarantee Act (NREGA)
 - Kalaignar Kanchi Thalaiyalar Scheme
 - Ungal Thozhil Udhayanam (UTOY)
- **Goal 2: Zero Hunger**
 - National Food Security Act (NFSA)
 - Nutritious Noon Meal Programme
 - Annadhanam Scheme
 - Amma Unavagam
- **Goal 3: Good Health and Well-being**
 - National Health Mission (NHM)
 - Health Insurance of Tamil Nadu
 - Chief Minister's Comprehensive Health Insurance Scheme
 - Maruthuva Mitri
 - Amma Mini Clinics

Ensuring Essential Services:

- **Goal 4: Quality Education**
 - Sarva Shiksha Abhiyan (SSA)
 - Rashtriya Madhyamik Shiksha Abhiyan (RMSA)
 - Namakkal District Library Scheme
 - Pudhumai Penn Scheme under Higher Education Assurance Scheme (HEAS)
 - Free Coaching for Competitive Exams
- **Goal 6: Clean Water and Sanitation**
 - Swachh Bharat Mission (Clean India Mission)
 - National Rural Drinking Water Programme (NRDWP)
 - Jal Jeevan Mission Tamil Nadu
 - Namakku Naathey Scheme
 - Kudimaramathu Scheme
- **Goal 7: Affordable and Clean Energy**
 - National Solar Mission

- Tamil Nadu Solar Energy Policy
- Green House Scheme

Building Sustainable Communities:

- **Goal 11: Sustainable Cities and Communities**
 - Smart Cities Mission
 - Atal Mission for Rejuvenation and Urban Transformation (AMRUT)
 - Adi Dravidar Housing Scheme
- **Goal 13: Climate Action**
 - National Action Plan on Climate Change (NAPCC)
 - International Solar Alliance
 - Tamil Nadu Wind Energy Policy 2019
- **Goal 17: Partnerships for the Goals**
 - Development Assistance Programmes (DAPs)
 - International Development Cooperation (IDC)

QUESTION PAPER PATTERN: MCQ

SEMESTER IV

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – IX
COURSE NAME: RELATIONAL DATABASE MANAGEMENT SYSTEM	COURSE CODE: 26UBCA309
SEMESTER: IV	MARKS:100
CREDITS: 4	TOTAL HOURS: 75
THEORY	

COURSE OBJECTIVE:

To introduce the basic knowledge about DML, DDL operations and to develop a Database with enhanced models and Techniques in RDBMS.

COURSE OUTCOMES:

1. Analyze the database design methodology.
2. Interpret knowledge in fundamentals of database management system.
3. Compare the difference between traditional file system and DBMS.
4. Use the different database languages.
5. Create various data models for DBMS using SQL queries.

UNIT 1

(15 HOURS)

DBMS Definition – Characteristics of DBMS – Application and advantages of DBMS– Instances – Schemas and Database States – Three Levels of Architecture – Data Independence – DBMS languages– Data Dictionary– Database Users– Data Administrators.

UNIT II

(15 HOURS)

Data Models– Types and their comparison– Entity Relationship Model– Entity Types– Entity Sets– Attributes and its types– Keys– E-R Diagram– Data Integrity– RDBMS: Concept– Components and Codd’s rules.

UNIT III

(15 HOURS)

Relational Algebra (Selection, Projection, Union, Intersection, Cartesian product) - Different types of Joins: Theta join, Equi-join, Natural join, Outer join. Normalization: 1NF, 2NF, 3NF, BCNF, 4NF and 5NF, Transaction Management – Concurrency Control.

UNIT IV

(15 HOURS)

Introduction to SQL, DDL, DML, and DCL statements– Creating Tables– Adding Constraints– Altering Tables, Update, Insert, Delete Tables & various form of SELECT- Simple, Using Special Operators for Data Access– Aggregate functions– Joining Multiple Tables (Equi Joins) – Joining a Table to itself (self Joins) Functions.

UNIT V**(15 HOURS)**

Introduction to PL/SQL (blocks of PL/SQL, Variables, constants) – Control Structure – Iterative Control – cursor - Procedures –Function – Packages-Exception Handlings – Triggers.

RECOMMENDED TEXTBOOKS:

1. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw-Hill Education, 2019 Reprint.
2. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts, 7th Edition, McGraw-Hill Education, 2020.

REFERENCE BOOKS:

1. Carlos Coronel and Steven Morris, Database Systems: Design, Implementation, and Management, 14th Edition, Cengage Learning, 2023.
2. Elmasri and Navathe, Fundamentals of Database Systems, 8th Edition, Pearson Education, 2021.
3. Thomas Connolly and Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation and Management, 7th Edition, Pearson Education, 2023.
4. Benjamin Rosenzweig and Elena Silvestrova, Oracle Database PL/SQL Programming, 7th Edition, McGraw-Hill Education, 2022.
5. Michael McLaughlin, Oracle Database 23c SQL, 2024 Edition, Oracle Press, 2024.

E-LEARNING RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc26_cs39/preview
2. <https://www.coursera.org/learn/sql-data-science>
3. <https://www.coursera.org/learn/introduction-to-relational-databases>
4. <https://www.geeksforgeeks.org/dbms/>
5. <https://www.jbiet.edu.in/coursefiles/cse/HO/cse2/DBMSI-III.pdf>

GUIDELINES TO THE QUESTION PAPER SETTERS
QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions(each in 300	1-12	3	30
B	Answer any 5 out of 7 questions(each in 300	13-19	6	30
C	Answer any 4 out of 6 questions(each in 1200	20-25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	1
II	3	1	2
III	2	2	1
IV	2	1	1
V	2	1	1
TOTAL	12	7	6
SECTION A – 12		SECTION B – 7	SECTION C – 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	3	2	2
CO 2	3	2	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	3
Ave.	3.0	2.8	2.8	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	2	2
CO 2	3	2	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	3	2
CO 5	3	3	3	3	2
Ave.	3.0	2.8	2.8	2.4	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Analyze the database design methodology.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K4
CO2	Interpret knowledge in fundamentals of database management system.	PO1	PSO1, PSO2	K2
CO3	Compare the difference between traditional file system and DBMS.	PO1, PO3	PSO1, PSO3	K4
CO4	Use the different database languages.	PO1, PO2	PSO1, PSO2, PSO4	K3
CO5	Create various data models for DBMS using SQL queries.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: RELATIONAL DATABASE MANAGEMENT SYSTEM

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	SQL queries & DB design	10	5
Workbook/recordbook/notebook	Notes + query practice	10	5
Class activity 1	Quiz with MCQ	10	5
Class activity 2	Seminar/Presentation	10	5
Class activity 3	Case Study Analysis	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – X
COURSE NAME: CLOUD COMPUTING	COURSE CODE: 26UBCA310
SEMESTER: IV	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE:

To introduce the basic concepts of cloud computing and to understand the emerging area of “cloud computing” and how it relates to traditional models of computing.

COURSE OUTCOMES:

1. Explain fundamental cloud concepts and types.
2. Analyze the Cloud Architecture and Virtualization
3. Interpret cloud infrastructure.
4. Describe key mechanisms and models of distributed systems.
5. Assess cloud security and risk management.

UNIT 1

(18 HOURS)

CLOUD DEFINITION AND TYPES

Cloud Computing definition – Private, Public and Hybrid Cloud – IaaS – PaaS – SaaS – Benefits and challenges of cloud computing – Public vs Private clouds – Role of virtualization in cloud computing- Current cloud resources.

UNIT II

(18 HOURS)

ARCHITECTURE & VIRTUALIZATION

Computing Architecture – Cloud Computing Technology – Cloud Architecture – Cloud Modeling and Design – Virtualization Foundation – Grid Computing – Cloud and Virtualization – Virtualization and Cloud Computing.

UNIT III

(18 HOURS)

CLOUD INFRASTRUCTURE

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture – Design Challenges – Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

UNIT IV

(18 HOURS)

PROGRAMMING MODEL

Parallel and Distributed Programming Paradigms – MapReduce, Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS- Cloud Software Environments - Eucalyptus, Open Nebula, OpenStack - AI as a Service (AIaaS) – Cloud AI Pipelines.

UNIT V

(18 HOURS)

SECURITY IN THE CLOUD

Security Overview – Cloud Security Challenges and Risks – Software- as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - AI security threats - Identity Management and Access Control– Autonomic Security.

RECOMMENDED TEXTBOOKS:

1. Rajkumar Buyya, Christian Vecchiola & S. Thamarai Selvi, Mastering Cloud Computing, McGraw-Hill Education, 1st Edition, 2013
2. Arshdeep Bahga & Vijay Madisetti, Cloud Computing: A Hands-On Approach, Universities Press, 1st Edition, 2014

REFERENCE BOOKS

1. Thomas Erl, Zaigham Mahmood & Ricardo Puttini, Cloud Computing: Concepts, Technology & Architecture, Pearson Education, 1st Edition, 2013
2. Nikos Antonopoulos & Lee Gillam, Cloud Computing: Principles, Systems and Applications, Springer, 2nd Edition, 2017
3. Toby Velte, Anthony Velte & Robert Elsenpeter, Cloud Computing: A Practical Approach, McGraw-Hill, 1st Edition, 2010
4. John W. Rittinghouse & James F. Ransome, Cloud Computing: Implementation, Management and Security, CRC Press, 1st Edition, 2016
5. Gem Stapleton, AI and Machine Learning for Coders, O'Reilly Media, 1st Edition, 2021

E-LEARNING RESOURCES

1. https://onlinecourses.nptel.ac.in/noc26_cs55/preview
2. <https://nptel.ac.in/courses/106104182>
3. <https://www.coursera.org/browse/information-technology/cloud-computing>
4. <https://skillsbuild.org/students/course-catalog/cloud-computing>
5. <https://www.investopedia.com/terms/c/cloud-computing.asp>

GUIDELINES TO THE QUESTION PAPER SETTERS
QUESTION PAPER PATTERN

Section	Question Component	Numbers	Marks	Total
A	Definition/Principle Answer any 10 out of 12 questions (each in 50 words)	1-12	3	30
B	Short Answer Answer any 5 out of 7 questions (each in 300 words)	13-19	6	30
C	Essay Answer any 4 out of 6 questions (each in 600 words)	20-25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	2
II	3	1	1
III	2	1	1
IV	2	2	1
V	2	1	1
TOTAL	12	7	6
SECTION A – 12		SECTION B – 7	SECTION C – 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	2	2
CO 2	3	3	3	2	2
CO 3	3	3	3	2	2
CO 4	3	2	3	2	2
CO 5	3	3	3	2	2
Ave.	3.0	2.6	2.8	2.0	2.0

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	1	3	2
CO 2	3	3	2	3	2
CO 3	3	3	2	3	2
CO 4	3	3	2	3	2
CO 5	3	3	3	3	2
Ave.	3.0	2.8	2.0	3.0	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Explain fundamental cloud concepts and types.	PO1	PSO1, PSO4	K2
CO2	Analyze the Cloud Architecture and Virtualization.	PO1, PO2, PO3	PSO1, PSO2, PSO4	K4
CO3	Interpret cloud infrastructure.	PO1, PO3	PSO1, PSO2, PSO4	K2
CO4	Describe key mechanisms and models of distributed systems.	PO1, PO2	PSO1, PSO2, PSO4	K2
CO5	Assess cloud security and risk management.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K5

K1= Remember, K2= Understand, K3= Apply, K4=Analyze, K5= Evaluate, K6= Create

COURSE NAME: CLOUD COMPUTING

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Case study / cloud tools analysis	10	5
Workbook/recordbook/notebook	Notes + diagrams	10	5
Class activity 1	Seminar/Presentation	10	5
Class activity 2	Group Discussion	10	5
Class activity 3	Case Study Analysis	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – XI
COURSE NAME: PROMPT ENGINEERING	COURSE CODE: 26UBCA311
SEMESTER: IV	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE:

To enable learners to design, apply, and evaluate prompts effectively for Large Language Models with ethical and responsible AI usage.

COURSE OUTCOMES:

1. Recall the concepts of Generative AI, Large Language Models, and Prompt Engineering.
2. Design effective prompts using various prompting techniques and frameworks.
3. Apply advanced prompting strategies to solve real-world tasks.
4. Develop prompt-based solutions for content generation, coding, and academic applications.
5. Evaluate prompt engineering practices for ethical and responsible AI usage.

UNIT 1

(18 HOURS)

INTRODUCTION TO GENERATIVE AI AND PROMPT ENGINEERING

Introduction to Artificial Intelligence – Overview of Generative AI – Large Language Models (LLMs): ChatGPT, Gemini, Copilot – What is Prompt Engineering – Types of Prompts – Importance and Applications of Prompt Engineering – Basic Prompting Techniques – Hallucination in AI: Causes and Awareness – Challenges and Limitations of LLMs.

UNIT II

(18 HOURS)

FUNDAMENTALS OF PROMPT DESIGN

Components of a Prompt: Context, Instructions, Constraints, and Output Format – Role-Based Prompting – Prompt Structure and Clarity – Writing Effective Prompts – Prompt Templates – Prompt Iteration and Refinement – Best Practices for Prompt Creation – Common Prompting Mistakes and How to Avoid Them.

UNIT III

(18 HOURS)

PROMPTING TECHNIQUES

Zero-Shot Prompting – One-Shot Prompting – Few-Shot Prompting – Instruction-Based Prompting – Chain-of-Thought Prompting – Self-Consistency Prompting – Prompt Chaining – Multi-Step Prompting – Prompting for Problem Solving – Prompting for Content Generation – Prompting for Coding Assistance – Prompting for Research and Summarization.

UNIT IV

(18 HOURS)

PROMPT APPLICATIONS FOR ACADEMIC AND EVERYDAY USE

Prompting for Academic Writing – Prompting for Resume and Cover Letter Creation – Prompting for Social Media Content – Prompting for Exam Preparation and Study Notes – Prompting for Data Summarization and Report Writing – Prompting for Creative Writing and Storytelling – Prompting for Translation and Language Learning – Prompt Debugging: Identifying and Fixing Poor Prompts – Output Quality Assessment and Improvement.

UNIT V

(18 HOURS)

ETHICS, SAFETY, AND FUTURE OF PROMPT ENGINEERING

AI Ethics and Responsible AI Usage – Bias and Fairness in AI Outputs – Hallucinations and Misinformation: Identification and Mitigation – Prompt Security Risks – Adversarial Prompting and Prompt Injection Awareness – Privacy and Data Protection in AI Tools – AI Governance and Regulations – Industry Applications of Prompt Engineering – Emerging Trends and Future Directions in Generative AI.

RECOMMENDED TEXTBOOKS:

1. Jules White, Osman G. Yalcin, Austin Z. Henley & Deniz Ilhan, The Art of Prompt Engineering with ChatGPT, Vanderbilt University Press, 2024.
2. Nathan Hunter, Prompt Engineering for Generative AI, O'Reilly Media, 2024.

REFERENCE BOOKS:

1. Lee Boonstra, Introduction to Prompt Engineering, Google Cloud Documentation, Latest Edition. (Free Online)
2. Hands-On Large Language Models – Jay Alammar & Maarten Grootendorst, O'Reilly Media, 2024.
3. OpenAI Prompt Engineering Guide – OpenAI, 2024.
4. Google Prompt Design Guide – Google Cloud, 2024.
5. Generative AI for Everyone – Andrew Ng, DeepLearning.AI, 2024.

E-LEARNING RESOURCES:

1. <https://www.coursera.org/learn/prompt-engineering>.
2. <https://www.coursera.org/learn/generative-ai-for-everyone>.
3. <https://nptel.ac.in/courses/106106156>.
4. <https://platform.openai.com/docs/guides/prompt-engineering>.
5. <https://cloud.google.com/discover/what-is-prompt-engineering>.

GUIDELINES TO THE QUESTION PAPER SETTERS
QUESTION PAPER PATTERN

Section	Question Component	Numbers	Marks	Total
A	Definition/Principle Answer any 10 out of 12 questions (each in 50 words)	1-12	3	30
B	Short Answer Answer any 5 out of 7 questions (each in 300 words)	13-19	6	30
C	Essay Answer any 4 out of 6 questions (each in 600 words)	20-25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	2
II	3	1	1
III	2	1	1
IV	2	2	1
V	2	1	1
TOTAL	12	7	6
SECTION A – 12		SECTION B – 7	SECTION C – 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	2	2
CO 2	3	3	3	1	2
CO 3	3	3	3	2	3
CO 4	3	3	3	2	2
CO 5	2	3	3	3	3
Ave.	2.8	2.6	2.8	2.0	2.4

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	1	3	1
CO 2	3	3	2	3	2
CO 3	3	3	3	3	2
CO 4	3	3	2	3	2
CO 5	2	2	3	3	3
Ave.	2.8	2.6	2.2	3.0	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Explain Metaverse concepts and components.	PO1	PSO1, PSO4	K2
CO2	Identify enabling technologies and architectures.	PO1, PO2	PSO1, PSO2, PSO4	K1
CO3	Analyze Metaverse platforms and applications.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K4
CO4	Describe blockchain-based digital economies.	PO1, PO2	PSO1, PSO2, PSO4	K2
CO5	Interpret ethical and future challenges.	PO3, PO4, PO5	PSO3, PSO4, PSO5	K2

K1= Remember, K2= Understand, K3= Apply, K4=Analyze, K5= Evaluate, K6= Create

COURSE NAME: PROMPT ENGINEERING

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Case study / technology analysis	10	5
Workbook/recordbook/ notebook	Notes + diagrams	10	5
Class activity 1	Quiz with MCQ	10	5
Class activity 2	Case Study Analysis	10	5
Class activity 3	Seminar/Presentation	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE –XII
COURSE NAME: PRACTICAL - IV: RELATIONAL DATABASE MANAGEMENT SYSTEM	COURSE CODE: 26UBCA312P
SEMESTER: IV	MARKS:100
CREDITS: 4	TOTAL HOURS: 60
PRACTICAL	

COURSE OBJECTIVE:

To provide a strong foundation in database concept, developing and querying a database, SQL and PL/ SQL Commands

COURSE OUTCOMES:

1. Formulate database schemas using SQL DDL.
2. Populate and query a database using SQL(DML/DCL) commands.
3. Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS
4. Describe views, indexes, TCL, PL/SQL.
5. Programming PL/SQL including stored procedures, stored functions, cursors, packages.

LAB EXERCISES

INTRODUCTION TO SQL

1. Logging onto SQL interface
2. Choosing and Describing Tables
3. Elements of the SQL Query
4. The System Dummy Table
5. Selecting Tables and Columns
6. Duplicate Information DISTINCT
7. Sorting Information

DATA DEFINITION LANGUAGE (DDL)

1. Create
2. Drop
3. Alter
4. Rename

INTEGRITY CONSTRAINTS

1. Types of Constraint
2. Referential Integrity
3. Defining Constraints

DATA MANIPULATION LANGUAGE DML

1. Select
2. Insert
3. Update
4. Delete

FILTERING DATA USING WHERE

1. Where Operators
2. Where with Keywords
3. Where and Logical Operators

SQL FUNCTIONS AND DATA TYPES

1. Date and Time Functions
2. Numeric Functions
3. String Functions
4. Conversion Functions

GROUP BY

1. Group Function Examples
2. Group Function with Having

RETRIEVING DATA FROM MULTIPLE TABLES USING JOINS

1. Natural Join
2. Inner Join
3. Outer Join

SUB-QUERIES

1. Basic Subqueries
2. Multiple Column Subqueries
3. Subqueries with Having
4. Correlated Subqueries

VIEWS

1. Create view
2. View with check option

INDEXES

1. Create Index
2. Unique Option
3. When and What to Index
4. Drop Index

DATA CONTROL LANGUAGE (DCL)

1. Grant
2. Revoke

TRANSACTION CONTROL LANGUAGE

1. Commit
2. Rollback
3. Savepoint
4. SetTransaction

PL/SQL

1. Variables and type declarations
2. Loop structure
3. Procedures and Functions

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	3	2	2
CO 2	3	3	3	2	2
CO 3	3	3	3	2	2
CO 4	3	2	3	2	2
CO 5	3	3	3	2	3
Ave.	3.0	2.8	3.0	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	2	2	2
CO 2	3	3	3	2	2
CO 3	3	3	3	2	2
CO 4	3	2	2	2	2
CO 5	3	3	3	3	2
Ave.	3.0	2.8	2.6	2.2	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Formulate database schemas using SQL DDL.	PO1, PO2	PSO1, PSO2	K6
CO2	Populate and query a database using SQL(DML/DCL) commands.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K3
CO3	Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS	PO1, PO2, PO3	PSO1, PSO2, PSO3	K3
CO4	Describe views, indexes, TCL, PL/SQL.	PO1, PO2	PSO1, PSO2	K2
CO5	Programming PL/SQL including stored procedures, stored functions, cursors, packages.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: PRACTICAL - IV: RELATIONAL DATABASE MANAGEMENT SYSTEM

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Practical examination with programming/problem-solving tasks for 90 minutes	50	10
Model Examination	Practical examination with programming/problem-solving tasks for 180 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Workbook/recordbook/notebook	Handwritten record of experiments, observations, results, and conclusions	10	5
Class activity 1	Debugging Test	10	5
Class activity 2	Problem-Solving Exercise	10	5
Class activity 3	Quiz with MCQ	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed)			
1) Quiz with MCQ			
2) Case-Study analysis			
3) Debate			
4) Seminar/ Presentation			
5) Peer/Self-Assessment			
6) Role play			
7) Scrap book			
8) Monograph			
9) Puzzle			
10) Group Discussion			
11) Group activity			
12) Surprise class tests			

PROGRAMME: B.Sc. (CS), BCA, B.Sc. (IT), B.Sc. (DA)	BATCH: 2026 – 2029
PART: III	COURSE COMPONENT: ALLIED – IV
COURSE NAME: OPERATIONS RESEARCH	COURSE CODE: 26UBCA3A4
SEMESTER: IV	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

On completion of this course student will be able to use the mathematical knowledge in optimal use of resources.

COURSE OUTCOMES:

1. Recollect the fundamental ideas of Operations Research.
2. Understand Solution of LPP, Transportation, Assignment, Sequencing and Network Problems.
3. Apply the concepts of graphical representation and different models into practice.
4. Analyze minimization and maximization concepts of different models.
5. Evaluate different models of LPP, Transportation, Assignment, Sequencing and Network problems.

UNIT I

(18 HOURS)

Linear Programming Problem: Introduction, Requirements for a Linear Programming Problem, Assumptions in Linear Programming Models, Applications of Linear Programming Method, Areas of Application of Linear Programming, Formulation of Linear Programming Problems. Graphical Method of Solutions, Some exceptional cases

Chapter 1 & 2.

UNIT II

(18 HOURS)

Transportation Problem: Definitions of the Transportation problem, Formulation and Solution of Transportation Models: Basic feasible solution by North West Corner Method, Least Cost Method, Vogel's Approximation Method. without degeneracy. Unbalanced Transportation Problem, Maximization Problem.

Chapter 7.

UNIT III

(18 HOURS)

Assignment Problem: Definition of the Assignment problem, Formulation and Solution of the Assignment models, Unbalanced Assignment Problem, Maximization Problem.

Chapter 8.

UNIT IV (18 Hours)

Sequencing Problem: n jobs through two machines, n jobs through three machines, two jobs through m machines, n jobs through m machines.

Chapter 14.

UNIT V (18 HOURS)

Network Analysis: Introduction, planning, scheduling, control, basic technologies, rules for constructing a project network, network construction, Program Evaluation Review Techniques (PERT), Critical Path Method (CPM). (no crashing).

Chapter 15

RECOMMENDED TEXTBOOKS:

Resource Management Techniques - Sundaresan, K.S.Ganapathy Subramanian, K.Ganesan, A.R.Publications.

REFERENCE BOOKS:

1. Operations Research - Kandiswarup, P.K.Gupta, ManMohan, S.Chand & Sons Education Publications, New Delhi, 12th Revised edition.
2. Operations Research Principles and Problems - S. Dharani Venkata Krishnan, Keerthi publishing house PVT Ltd
3. Operations Research - Prem Kumar Gupta & D. S. Hira, 7th Revised Edition, S. Chand & Company Ltd., 2014

E - LEARNING RESOURCES

1. <https://nptel.ac.in/courses/110106062> .
2. <https://maa.org/press/maa-reviews/operations-research-problems>
3. https://ocw.mit.edu/courses/15-053-optimization-methods-in-management-science-spring-2013/resources/mit15_053s13_lec2/

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions	1 - 12	3	30
B	Answer any 5 out of 7 questions	13 - 19	6	30
C	Answer any 4 out of 6 questions	20 - 25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS FOR THEORY AND PROBLEMS

UNITS	SECTION A		SECTION B		SECTION C	
	THEORY	PROBLEM	THEORY	PROBLEM	THEORY	PROBLEM
I	1	1	-	1	-	1
II	1	1	-	1	-	1
III	1	1	-	1	-	1
IV	1	1	-	1	-	1
V	1	1	-	1	-	1
Any Unit	-	2	1	1	-	1
TOTAL	5	7	1	6	-	6
	SECTION A - 12		SECTION B - 7		SECTION C – 6	

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	2	2
CO 2	3	3	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	3
Ave.	3.0	2.8	2.6	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	1	2	2
CO 2	3	3	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	3	2
CO 5	3	3	3	3	2
Ave.	3.0	2.8	2.4	2.4	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Recollect the fundamental ideas of Operations Research.	PO1	PSO1, PSO4	K1
CO2	Understand Solution of LPP, Transportation, Assignment, Sequencing and Network Problems.	PO1, PO2	PSO1, PSO2	K2
CO3	Apply the concepts of graphical representation and different models into practice.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K3
CO4	Analyze minimization and maximization concepts of different models	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K4
CO5	Evaluate different models of LPP, Transportation, Assignment, Sequencing and Network Problems.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K5

K1=Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: OPERATIONS RESEARCH

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Problem solving on LPP, Transportation, Assignment models	10	5
Workbook/recordbook/notebook	Step-by-step solutions of OR problems (all units)	10	5
Class activity 1	Puzzle	10	5
Class activity 2	Quiz with MCQ	10	5
Class activity 3	Case Study Analysis	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: COMMON TO BCA, B.Sc (CS), B.Sc (IT), B.Sc (DA), B.Sc CS with AI	BATCH: 2026-2029
PART: IV	COURSE COMPONENT: INDIAN KNOWLEDGE SYSTEM
COURSE NAME: INDIAN KNOWLEDGE SYSTEM WITH ARTIFICIAL INTELLIGENCE	COURSE CODE: 26UIKS409
SEMESTER: IV	MARKS:100
CREDITS: 1	TOTAL HOURS: 15
THEORY	

COURSE OBJECTIVE:

Provide a concise understanding of Indian Knowledge Systems and AI, focusing on foundations, ethics, and interdisciplinary applications.

COURSE OUTCOMES:

1. Explain Indian Knowledge Systems and their relevance to modern technology.
2. Analyze AI concepts and compare them with Indian logical frameworks.
3. Evaluate the integration of IKS and AI in real-world applications.

UNIT I Introduction to Indian Traditional Knowledge

(5 HOURS)

Concept, scope, and significance of Indian Traditional Knowledge (ITK) Concept and scope of Indian Knowledge Systems - Sources of IKS: Vedas, Upanishads, Puranas, Manuscripts, inscriptions, oral traditions - Major knowledge domains in IKS : Ayurveda, Yoga, Siddha , Mathematics, Astronomy, Architecture, Linguistics - Indian scientific and logical traditions: Nyaya, Vaisheshika, Sankhya - Relevance of IKS in the modern digital and technological era.

UNIT II Artificial Intelligence – Concepts and Indian Perspectives

(5 HOURS)

Introduction to Artificial Intelligence: Definition, history, and applications - Core AI concepts: Machine Learning, Deep Learning, Natural Language Processing (NLP) - Data, knowledge representation, and reasoning - Indian logical frameworks and cognition: Comparison of Indian logic with modern AI reasoning - Ethical AI and Indian philosophical perspectives: Dharma, ethics, and responsible AI.

UNIT III Integration of IKS and AI Applications

(5 HOURS)

Digitization of Indian Knowledge using AI: Manuscript digitization, OCR for Indian scripts, Knowledge extraction. AI applications in traditional knowledge systems: AI in Ayurveda diagnosis and drug discovery, AI in Yoga and wellness analytics, AI in agriculture and traditional farming

knowledge. Knowledge databases and digital repositories: Traditional Knowledge Digital Library (TKDL) – role and importance. Challenges and future scope of IKS with AI: Preservation, authenticity, bias, and ethics, Research and innovation opportunities.

RECOMMENDED TEXTBOOKS

1. Kapoor, Kapil, Indian Knowledge Systems, D.K. Printworld, 2017.
2. Russell, Stuart and Norvig, Peter, Artificial Intelligence: A Modern Approach, 4th Edition, Pearson Education, New Delhi, 2021.
3. Chatterjee, Satischandra and Datta, Dhirendramohan, An Introduction to Indian Philosophy, University of Calcutta Press, Kolkata, 2016.

REFERENCE BOOKS

1. Plofker, Kim, Mathematics in India, Princeton University Press, Princeton, 2009.
2. Vagbhata, Ashtanga Hridayam (Selected English Translations), Chaukhambha Publications, Varanasi, 2014.
3. Bishop, Christopher M., Pattern Recognition and Machine Learning, Springer, New York, 2006.
4. Brachman, Ronald J. and Levesque, Hector J., Knowledge Representation and Reasoning, Morgan Kaufmann Publishers, San Francisco, 2004.
5. CSIR, Government of India, Traditional Knowledge Digital Library (TKDL): Documentation and Reports, Council of Scientific and Industrial Research, New Delhi, 2018.

E-LEARNING RESOURCES

1. <https://www.tkdil.res.in>
2. <https://www.namami.gov.in>
3. <https://www.dli.gov.in>
4. <https://www.unesco.org/en/digital-heritage>
5. <https://indianculture.gov.in>

GUIDELINES TO THE QUESTION PAPER SETTERS QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	ESSAY ANSWER ANY 5 OUT OF 10 QUESTIONS (EACH IN 1200 WORDS)	1-10	20	100

BREAK UP OF QUESTIONS

Section	Units	No. of Questions	
		Theory	Problems
A	Unit – 1	2	
	Unit – 2	2	
	Unit – 3	2	
	Unit – 4	2	
	Unit – 5	2	

PROGRAMME: BCA	BATCH: 2026 – 2029
PART: IV	COURSE COMPONENT: ABILITY ENHANCEMENT SKILLS - IV
COURSE NAME: RESUME WRITING AND INTERVIEW SKILLS	COURSE CODE: 26USKL405
SEMESTER: IV	MARKS: 100
CREDITS: 2	TOTAL HOURS: 30
THEORY	

COURSE OBJECTIVE:

To equip the students to acquire the relevant skills for better employability.

COURSE OUTCOMES:

1. Prepare professional resumes, CVs, biodata and covering letters suitable for job applications.
2. Apprise the fundamental concepts, purpose and characteristics of job interviews.
3. Identify various types of interviews and their expectations in recruitment processes.
4. Apply interview techniques and strategies to effectively handle different stages of the interview process.
5. Demonstrate employability skills such as communication, personality development, time management, and presentation skills for career readiness.

UNIT I: Preparing Biodata/CV/Resume

(6 HOURS)

Essential characteristics of a job Application-Difference between Biodata- CV-Resume-covering letter-Tips to draft an application

UNIT II: Introduction to Interview Skills

(6 HOURS)

Definition- meaning- concept of interview –Purpose- Objectives of interview-Characteristic features of job interviews

UNIT III: Types of Interview

(6 HOURS)

Traditional one on one job interview- Panel interview- Behavioral interview-Group interview- Phone Interview- Preliminary Interview-Patterned Interview Depth Interview, Stress Interview, Exit Interview- Interview through tele and video conferencing

UNIT IV: Interviews: Techniques and Strategies

(6 HOURS)

Preparing for the Interview Process- Before the interview-During the interview-After the interview -Tips to ace an interview -Commonly asked questions in interview -Do's and Don'ts of interview - Reasons for rejections

UNIT V: Leveraging Employability Skills

(6 HOURS)

Personality Development-Organizational skills-Time Management–Stress Management-Effective Communication Skills -Reasoning Ability-Verbal Ability- Group Discussion-Technical skills - Presentation skills

RECOMMENDED TEXTBOOKS

1. Monipally, Matthukutty M. (2017) *Business Communication: From Principles to Practice*
2. Peter, Francis. (2012) *Soft Skills and Professional Communication*. New Delhi: Tata McGraw Hill.

REFERENCE BOOKS

1. Higgins, Jessica JD (2018) *10 Skills for Effective Business Communication: Practical Strategies from the World's Greatest Leaders*
2. Nicholas, Sonji (2023) *Interviewing: Preparation, Types, Techniques, and Questions*, Pressbooks
3. Storey, James (2016) *The Art of The Interview: The Perfect Answers to Every Interview Question*

E-LEARNING RESOURCES

1. <https://careermobilityoffice.cs.ny.gov/cmo/documents/Resume%20&%20Interviewing%20Handout.pdf>
2. <https://edu.gcfglobal.org/en/interviewingskills/interview-etiquette/1/>
3. <https://findjobhub.com/en/types-of-interviews>
4. <https://egyankosh.ac.in/bitstream/123456789/23411/1/Unit-2.pdf>
5. https://bharatskills.gov.in/pdf/E_Books/CTS/ES/English/ES_Part_1_62%20hour_English.pdf
6. https://bharatskills.gov.in/pdf/E_Books/CTS/ES/English/ES_Part2_58hour_English.pdf

GUIDELINES TO THE QUESTION PAPER SETTERS QUESTION PAPER PATTERN

Section	Question Component	Numbers	Marks	Total
A	Answer any 5 out of 7 questions (answer in 50 words)	1-7	2	10
B	Answer any 4 out of 6 questions (answer in 300 words)	8-13	5	20
C	Answer any two(Internal (Choice)	14-15	10	20
	Internal & Viva Voce		50	50

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	----
II	2	1	1
III	1	1	1
IV	1	1	1
V	1	1	1
TOTAL	7	6	4
SECTION A – 7		SECTION B – 6	SECTION C – 4

SEMESTER V

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – XIII
COURSE NAME: PROGRAMMING IN PYTHON	COURSE CODE: 26UBCA313
SEMESTER: V	MARKS:100
CREDITS: 4	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To equip students with fundamental knowledge of Python programming and enable them to develop structured, object-oriented, and application-oriented software solutions.

COURSE OUTCOMES:

1. Explain Python fundamentals.
2. Apply functions and modules to solve problems.
3. Analyze OOP principles in Python.
4. Illustrate exception handling and file processing.
5. Develop applications using SQLite, Tkinter, and Flask.

UNIT 1

(18 HOURS)

Introduction to Python – Features and Applications – Installing and Running Python – Python Program Structure – Keywords – Identifiers – Variables – Data Types – Type Conversion – Operators and Expressions – Input and Output Statements. Control Structures – Conditional Statements (if, if-else, elif) – Looping Statements (for, while) – break, continue, pass. Introduction to Data Structures – Lists: Creation, Indexing, Slicing, Operations, List Methods – Tuples: Creation and Basic Operations – Sets: Introduction and Set Operations – Dictionaries: Creation, Accessing Elements, Basic Operations.

UNIT II

(18 HOURS)

Functions – Definition and Invocation – Parameters and Arguments – Default and Keyword Arguments – Variable Scope – Recursive Functions. Built-in Functions – enumerate(), zip(), sorted(), map(), filter() – Applications. Strings – String Operations – Indexing, Slicing – String Methods and Formatting. Modules – Importing Modules – Creating User-defined Modules – Overview of Python Standard Library. Comprehensions – List Comprehension – Dictionary Comprehension – Introduction to Lambda Functions.

UNIT III

(18 HOURS)

Introduction to Object-Oriented Programming – Classes and Objects – Creating Classes – Instance Attributes and Methods – Constructors – Built-in Class Attributes. Encapsulation – Data Hiding – Private Members – Getter and Setter Methods. Inheritance – Types of Inheritance – Method Overriding. Polymorphism – Operator Overloading – Introduction to Abstract Classes. Static Variables and Static Methods.

UNIT IV

(18 HOURS)

Exception Handling – Types of Errors – try, except, else, finally – Raising Exceptions – Assertions – Built-in Exceptions. File Handling – Opening and Closing Files – File Modes – Reading and Writing Text Files – Working with File Methods. Regular Expressions – Pattern Matching – Metacharacters – Identifiers and Quantifiers – Applications using re module.

UNIT V

(18 HOURS)

Introduction to Databases – Basics of SQL – Working with SQLite in Python – Creating Tables – Insert, Update, Delete, Select Operations. Introduction to GUI Programming – Tkinter Basics – Creating Windows – Widgets (Label, Button, Entry) – Event Handling. Introduction to Web Programming – Basics of Flask – Routing – Creating Simple Web Applications.

RECOMMENDED TEXTBOOKS:

1. Gowrishankar S. and Veena A., Introduction to Python Programming, 2nd Edition, 2024, CRC Press / Taylor & Francis.
2. Eric Matthes, Python Crash Course, 3rd Edition, 2023, No Starch Press.

REFERENCE BOOKS:

1. Tony Gaddis, Starting Out with Python, 6th Edition, 2024, Pearson Education.
2. John Zelle, Python Programming: An Introduction to Computer Science, 4th Edition, 2024, Franklin, Beedle & Associates.
3. Python Cookbook – David Beazley & Brian K. Jones, 3rd Edition, O'Reilly Media, 2013.
Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 3rd Edition, 2024, O'Reilly Media.
4. Bill Lubanovic, Introducing Python: Modern Computing in Simple Packages, 3rd Edition, 2023, O' Reilly Media.
5. Dusty Phillips, Python 3 Object-Oriented Programming, 4th Edition, 2024, Packt Publishing.

E-LEARNING RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc26_cs84/preview
2. https://onlinecourses.swayam2.ac.in/e-learning/preview/cec22_cs20
3. <https://www.coursera.org/specializations/python>.
4. <https://www.edx.org/learn/python/the-georgia-institute-of-technology-computing-in-python-i-fundamentals-and-procedural-programming>
5. https://onlinecourses.swayam2.ac.in/e-learning/preview/cec22_cs20

GUIDELINES TO THE QUESTION PAPER SETTERS
QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions(each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions(each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions(each in 1200 words)	20-25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	1
II	3	1	2
III	2	2	1
IV	2	1	1
V	2	1	1
TOTAL	12	7	6
SECTION A – 12		SECTION B - 7	SECTION C – 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	2	2
CO 2	3	3	3	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	3
Ave.	3.0	2.8	2.8	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	1	2	2
CO 2	3	3	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	3	2
Ave.	3.0	2.8	2.4	2.2	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Explain Python fundamentals.	PO1	PSO1, PSO2	K2
CO2	Apply functions and modules to solve problems.	PO1, PO2	PSO1, PSO2, PSO3	K3
CO3	Analyze OOP principles in Python.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K4
CO4	Illustrate exception handling and file processing.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K3
CO5	Develop applications using SQLite, Tkinter, and Flask.	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO3, PSO4	K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: PROGRAMMING IN PYTHON

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Python programming tasks	10	5
Workbook/recordbook/notebook	Notes maintenance	10	5
Class activity 1	Quiz with MCQ	10	5
Class activity 2	Seminar/Presentation	10	5
Class activity 3	Surprise Class Test	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – XIV
COURSE NAME: SOFTWARE ENGINEERING AND TESTING	COURSE CODE: 26UBCA314
SEMESTER: V	MARKS:100
CREDITS: 4	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To introduce the five phases of software engineering and various software testing techniques.

COURSE OUTCOMES:

1. Decompose the given project in various phases of a lifecycle.
2. Choose appropriate process model depending on the user requirements.
3. Perform software life cycle activities.
4. Describe the basic concepts of software testing.
5. Formulate SQA activities and strategies.

UNIT 1

(18 HOURS)

Introduction to Software Engineering Some definition – Some size factors – Quality and productivity factors – Managerial Issues. Software Development Life Cycle Models: Phases of Software Project – Software Process Model: Traditional, Iterative and Agile Models. Planning a Software Project: Defining the problem - Developing a solution strategy – planning the development process – planning an organizational structure – other planning activities.

UNIT II

(18 HOURS)

Software Cost Estimation: Software Cost Factors – Software Cost Estimation Techniques – Staffing Level Estimation – Estimating Software Maintenance Costs. Software Requirement Definition: The Software Requirement Specification – Formal Specification Techniques.

UNIT III

(18 HOURS)

Software Design: Fundamental Design Concepts – Modules and Modularization Criteria – Design Notations – Design Techniques – Detailed Design Considerations- Real-Time and Distributed System Design - Test Plans – Milestones, Walkthroughs and Inspections – Design Guidelines. Implementation issues: Structured Coding techniques. Software Maintenance: Enhancing Maintainability during development, Managerial aspects of software maintenance.

UNIT IV**(18 HOURS)**

Software Testing: Quality, Quality Assurance, and Quality Control, Testing, Verification, and Validation, Types of Testing: White Box Testing - Black Box Testing - Integration testing: Top-Down Integration - Bottom-Up Integration - Bi-Directional Integration - System Integration.

UNIT V**(18 HOURS)**

System and Acceptance Testing: System Testing Overview - Functional testing - Non-functional Testing, Performance Testing: Methodology of Performance Testing - Regression Testing: Types of Regression Testing.

RECOMMENDED TEXTBOOKS:

1. Richard E. Fairley and Susan A. Moore, Software Engineering Concepts, 3rd Edition, McGraw-Hill Education, 2019.
2. Srinivasan Desikan and Goplalaswamy Ramesh – “Software Testing – Principles and Practices” – Pearson Education, 2010. Chapters 1 to 10.

REFERENCE BOOKS:

1. Ian Sommerville, Software Engineering, 10th Edition, Pearson Education.
2. Paul C. Jorgensen, Software Testing: A Craftsman's Approach, 5th Edition, CRC Press, 2023.
3. Ron Patton, Software Testing, 2nd Edition, Pearson Education.
4. Paul Ammann and Jeff Offutt, Introduction to Software Testing, 2nd Edition, Cambridge University Press.
5. Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 3rd Edition, No Starch Press, 2023.

E-LEARNING RESOURCES:

1. http://onlinecourses.nptel.ac.in/noc20_cs68/preview
2. https://onlinecourses.nptel.ac.in/noc26_cs59/preview
3. www.testing-whiz.com
4. https://acecollege.in/CITS_Upload/Downloads/Books/1035_File.pdf
5. <https://gacbe.ac.in/pdf/ematerial/18BIT41C-U1.pdf>

GUIDELINES TO THE QUESTION PAPER SETTERS
QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20-25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	1
II	3	1	2
III	2	2	1
IV	2	1	1
V	2	1	1
TOTAL	12	7	6
SECTION A – 12		SECTION B - 7	SECTION C – 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	2	3	2	2	2
CO 2	2	3	3	2	2
CO 3	3	3	2	2	2
CO 4	2	3	3	2	2
CO 5	3	3	3	2	3
Ave.	2.4	3.0	2.6	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	3	2	2	2
CO 2	2	3	2	2	2
CO 3	3	3	2	2	2
CO 4	2	3	3	2	2
CO 5	3	3	3	2	3
Ave.	2.4	3.0	2.4	2.0	2.2

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Decompose the given project in various phases of a lifecycle.	PO1, PO2	PSO1, PSO2	K4
CO2	Choose appropriate process model depending on the user requirements.	PO1, PO2, PO3	PSO1, PSO2, PSO5	K5
CO3	Perform software life cycle activities.	PO1, PO2, PO4	PSO1, PSO2	K3
CO4	Describe the basic concepts of software testing.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K2
CO5	Formulate SQA activities and strategies.	PO1, PO2, PO3, PO4	PSO1, PSO2, PSO3, PSO5	K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: SOFTWARE ENGINEERING AND TESTING

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Case study / SDLC tasks	10	5
Workbook/recordbook/notebook	Notes maintenance	10	5
Class activity 1	Case Study Analysis	10	5
Class activity 2	Group Discussion	10	5
Class activity 3	Seminar/Presentation	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – XV
COURSE NAME: PRACTICAL - V: PROGRAMMING IN PYTHON	COURSE CODE: 26UBCA315P
SEMESTER: V	MARKS:100
CREDITS: 4	TOTAL HOURS:75
PRACTICAL	

COURSE OBJECTIVE:

To provide students with a strong foundation in Python programming by developing problem-solving skills, implementing object-oriented concepts, handling files and exceptions, and building basic database, GUI, and web-based applications.

COURSE OUTCOMES:

1. Apply Python concepts: data types, control structures, and built-in data structures.
2. Design modular programs using functions and recursion.
3. Develop OOP programs in Python.
4. Implement file handling and exception handling.
5. Create applications using SQLite, Tkinter, and Flask.

LAB EXERCISES

1. Write a program to find the largest of three numbers and check whether a given number is prime.
2. Write a program to generate Fibonacci series and find factorial of a number using loops.
3. Write a program to perform list operations (append, insert, remove, sort) and demonstrate list comprehension.
4. Write a program to create and manipulate a dictionary (add, delete, update) and perform set operations (union, intersection, difference).
5. Write a program to demonstrate default arguments, keyword arguments, and variable-length arguments.
6. Write a recursive function to compute factorial and Fibonacci series.
7. Write a program using lambda functions with map() and filter().
8. Create a user-defined module for arithmetic operations and import it into another program.
9. Create a class “Student” with attributes and methods to display student details.
10. Write a program to demonstrate single inheritance and method overriding.
11. Write a program to demonstrate private variables with getter/setter methods and overload an operator.
12. Write a program to read a text file and count the number of lines, words, and characters. Handle file-related exceptions properly.
13. Create a SQLite database for student records and perform Insert, Update, Delete, and Display operations.
14. Develop a simple calculator or student registration form using Tkinter.
15. Develop a simple Flask web application with routing and basic form handling.

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	2	2	2
CO 2	3	3	3	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	3
Ave.	3.0	3.0	2.8	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	2	2	2
CO 2	3	3	2	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	3	2
Ave.	3.0	3.0	2.6	2.2	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Apply Python concepts: data types, control structures, and built-in data structures.	PO1, PO2	PSO1, PSO2	K3
CO2	Design modular programs using functions and recursion.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K6
CO3	Develop OOP programs in Python.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K6
CO4	Implement file handling and exception handling.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K3
CO5	Create applications using SQLite, Tkinter, and Flask.	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO3, PSO4	K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: PRACTICAL - V: PROGRAMMING IN PYTHON

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Practical examination with programming/problem-solving tasks for 90 minutes	50	10
Model Examination	Practical examination with programming/problem-solving tasks for 180 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Workbook/recordbook/notebook	Handwritten record of experiments, observations, results, and conclusions	10	5
Class activity 1	Debugging Test	10	5
Class activity 2	Problem-Solving Exercise	10	5
Class activity 3	Quiz with MCQ	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: ELECTIVE - I IDE (INTER DISCIPLINARY ELECTIVE)
COURSE NAME: PRACTICAL: DIGITAL IMAGE PROCESSING (GIMP)	COURSE CODE: 26UBCA3E1P
SEMESTER: V	MARKS:100
CREDITS: 4	TOTAL HOURS:75
PRACTICAL	

COURSE OBJECTIVE:

To introduce students to basic digital image processing concepts and enable them to perform image enhancement, filtering, and basic image design using the GIMP tool.

COURSE OUTCOMES:

1. Explain basic digital image processing concepts and image formats.
2. Apply fundamental image editing and enhancement techniques using GIMP.
3. Use filters and adjustment tools to improve image quality.
4. Manipulate images effectively using layers, selections, and transformations.
5. Formulate simple graphics such as logos, posters, and banners using GIMP.

LAB EXERCISES

1. Introduction to GIMP interface and tools
2. Opening, saving, and exporting images in different formats
3. Image selection using selection tools
4. Cropping and resizing images
5. Converting color images to grayscale and indexed mode
6. Adjusting brightness and contrast
7. Color enhancement using hue, saturation, and color balance
8. Applying blur and sharpening filters
9. Adding and removing noise from images
10. Working with layers (create, merge, reorder)
11. Image composition using multiple layers
12. Adding and formatting text in images
13. Applying basic transformations (rotate, scale, flip)
14. Designing a simple logo or poster using GIMP
15. Preparing and optimizing images for web and print using GIMP

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	2	2	3	2	2
CO 2	2	3	3	2	2
CO 3	2	3	3	2	2
CO 4	2	3	3	2	2
CO 5	2	3	3	2	3
Ave.	2.0	2.8	3.0	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	3	2	2	2
CO 2	2	3	2	2	2
CO 3	2	3	2	2	2
CO 4	2	3	2	2	2
CO 5	3	3	2	2	2
Ave.	2.2	3.0	2.0	2.0	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Explain basic digital image processing concepts and image formats.	PO1	PSO1, PSO2	K2
CO2	Apply fundamental image editing and enhancement techniques using GIMP.	PO1, PO2	PSO1, PSO2	K3
CO3	Use filters and adjustment tools to improve image quality.	PO1, PO2, PO3	PSO1, PSO2	K3
CO4	Manipulate images effectively using layers, selections, and transformations.	PO1, PO2, PO3	PSO1, PSO2, PSO5	K3
CO5	Formulate simple graphics such as logos, posters, and banners using GIMP.	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO5	K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: PRACTICAL: DIGITAL IMAGE PROCESSING (GIMP)

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Practical examination with programming/problem-solving tasks for 90 minutes	50	10
Model Examination	Practical examination with programming/problem-solving tasks for 180 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Workbook/recordbook/notebook	Handwritten record of experiments, observations, results, and conclusions	10	5
Class activity 1	Debugging Test	10	5
Class activity 2	Problem-Solving Exercise	10	5
Class activity 3	Quiz with MCQ	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: ELECTIVE - I IDE (INTER DISCIPLINARY ELECTIVE)
COURSE NAME: DATA MANIPULATION USING SQL LAB	COURSE CODE: 26UBCA3E4P
SEMESTER: V	MARKS:100
CREDITS: 4	TOTAL HOURS:75
PRACTICAL	

COURSE OBJECTIVE:

To enhance the knowledge in the process of Database Development and Administration using SQL.

COURSE OUTCOMES:

1. Explain how databases store data using tables.
2. Apply SQL syntax for queries.
3. Write complex SQL queries.
4. Create and modify database objects using SQL DDL.
5. Manage data in relational databases using SQL.

LAB EXERCISES

1. Table creation and simple Queries
2. SQL Data Type Specification
3. SQL Constraint specification (Primary key, Foreign key, Unique, check, Not Null)
4. Queries using ALTER, DROP, TRUNCATE
5. Queries using COMMIT, ROLLBACK
6. Insertion, Selection, Deletion, Updation of records
7. Selection with Where clause
8. Duplicate removal with Distinct clause
9. SQL Queries with Operators (Arithmetic Operators, Comparison Operators, Logical Operators)
10. SQL Queries with Operators (Like, In, Between)
11. SQL Queries with Grouping Function (Group By)
12. SQL Queries using Aggregate Function (Max, Min, Count, Sum, Avg)
13. SQL Queries using Sort Function (Order By)
14. SQL Queries using Join Operation
15. Nested SQL with sub Queries

16. SQL Union and Intersection Operation

17. SQL with Group By function

18. SQL Queries using Views

19. SQL Queries using Alias

20. Create Database using SQL

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	2	2
CO 2	3	3	3	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	3
Ave.	3.0	2.8	2.8	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	2	1	2
CO 2	3	3	3	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	3	2
Ave.	3.0	2.8	2.8	2.0	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Explain how databases store data using tables.	PO1	PSO1, PSO2	K2
CO2	Apply SQL syntax for queries.	PO1, PO2	PSO1, PSO2, PSO3	K3
CO3	Write complex SQL queries	PO1, PO2, PO3	PSO1, PSO2, PSO3	K3
CO4	Create and modify database objects using SQL DDL.	PO1, PO2	PSO1, PSO2, PSO3	K6
CO5	Manage data in relational databases using SQL.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K3

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: DATA MANIPULATION USING SQL LAB

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Practical examination with programming/problem-solving tasks for 90 minutes	50	10
Model Examination	Practical examination with programming/problem-solving tasks for 180 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Workbook/recordbook/notebook	Handwritten record of experiments, observations, results, and conclusions	10	5
Class activity 1	Debugging Test	10	5
Class activity 2	Problem-Solving Exercise	10	5
Class activity 3	Quiz with MCQ	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: For other Programmes except BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: ELECTIVE - I IDE (INTER DISCIPLINARY ELECTIVE)
COURSE NAME: BUSINESS INTELLIGENCE	COURSE CODE: 26UBCA3E5
SEMESTER: V	MARKS:100
CREDITS: 4	TOTAL HOURS:75
THEORY	

COURSE OBJECTIVE:

To familiarize with business analytics, and learn to do data visualization that helps to take data driven decisions in an organization.

COURSE OUTCOMES:

1. Explain Business Intelligence (BI) methodology and concepts.
2. Discuss data warehouse operation and security issues.
3. Examine the different types of analytics
4. Analyze the importance of streaming data analytics.
5. Describe emerging technologies in Business Intelligence.

UNIT I

(15 HOURS)

An overview of Business Intelligence, Analytics and Decision support

Framework for Business Intelligence (BI) – Definition of BI – A Brief History of BI – The Architecture of BI – The origin and Drivers of BI – Intelligence Creation, Use and BI Governance – Transaction Processing versus Analytic Processing – Successful BI Implementation – Analytics Overview – Descriptive, Predictive and Perspective Analytics – Analytics applied to different domain

UNIT II

(15 HOURS)

Data Warehousing

Data Warehousing definitions and concepts – What is a data warehouse? (DW) – A Historical perspective to data warehousing – Characteristics of data warehousing – Data Marts – Operational Data stores – Enterprise data warehouses – Metadata – Data warehousing process overview – Data warehousing Architecture Data Integration and the Extraction, Transformation and Load (ETL) processes – Data Warehouse Development - OLAP versus OLTP.

UNIT III**(15 HOURS)****Business Reporting**

Definitions and Concepts-Components of BRS - Visual Analytics - Data and Information Visualization – A brief history of data visualization – Different types of charts and graphs – The emergence of data visualization and visual analytics – Performance dashboards – Dashboard design

UNIT IV**(15 HOURS)****Text and Web Analytics**

Text and Web Analytics - Text Analytics and Text mining overview – Natural Language processing – Text mining applications –Text mining process – Sentiment Analysis – Sentiment analysis applications – Web mining overview – Web content and web structure mining – Search Engines – Web Analytics – Social Analytics – Social media analytics.

UNIT V**(15 HOURS)**

Business Analytics: Emerging trends and Future Impacts Location Based Analytics for organization – Geospatial Analytics – Real time location Intelligence – Analytics applications for consumers – Recommendation Engines – Web 2.0 revolution and online social networking – Cloud Computing and BI – Impacts of Analytics in Organization – Issues of legality, Privacy and Ethics – An overview of the Analytics Ecosystem.

RECOMMENDED TEXTBOOKS:

1. Ramesh Sharda, DursunDelen, Efraim Turban (2018), Business Intelligence, Pearson Education Services Pvt Ltd.
2. https://ebooks.lpude.in/computer_application/mca/term_6/DCAP606_BUSINESS_INTELLIGENCE.pdf

REFERENCE BOOKS:

1. Larissa T. Moss, S. Atre(2003), Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making, Addison Wesley.
2. Carlo Vercellis(2009), Business Intelligence: Data Mining and Optimization for Decision Making, Wiley Publications..
3. David Loshin Morgan, Kaufman(2012), Business Intelligence: The Savvy Manager's Guide, Second Edition,
4. Cindi Howson(2007), Successful Business Intelligence: Secrets to Making BI a Killer
5. App, Tata McGraw-Hill Publication.
6. Ralph Kimball ,Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker(2007), The data Warehouse Lifecycle Toolkit, Wiley Publication Inc.

E-LEARNING RESOURCES:

1. <https://www.talend.com/resources/business-intelligence-dat> <https://tdan.com/the-four-components-of-bi-governance/4681>
2. <https://www.stitchdata.com/resources/oltp-vs-olap/>
3. <https://www.logility.com/blog/descriptive-predictive-and-prescriptive-analyticsexplained/>
4. <https://www.talend.com/resources/what-is-data->
5. <https://www.geeksforgeeks.org/data-warehouse-architecture>

GUIDELINES TO THE QUESTION PAPER SETTERS
QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
C	<i>Answer any 4 out of 6 questions (each in 600 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	1
II	3	1	2
III	2	2	1
IV	2	1	1
V	2	1	1
TOTAL	12	7	6
SECTION A – 12		SECTION B – 7	SECTION C - 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	2	2	3	2	2
CO 2	2	2	3	2	2
CO 3	2	3	3	2	2
CO 4	2	3	3	2	2
CO 5	2	2	3	2	3
Ave.	2.0	2.4	3.0	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	2	2
CO 2	2	2	3	2	2
CO 3	2	3	3	2	2
CO 4	2	3	3	3	2
CO 5	2	3	3	3	2
Ave.	2.0	2.6	3.0	2.4	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Explain Business Intelligence (BI) methodology and concepts.	PO1	PSO2, PSO3	K2
CO2	Discuss data warehouse operation and security issues.	PO1, PO2	PSO2, PSO3	K2
CO3	Examine the different types of analytics.	PO1, PO3	PSO2, PSO3	K4
CO4	Analyze the importance of streaming data analytics.	PO1, PO2, PO3	PSO2, PSO3, PSO4	K4
CO5	Describe emerging technologies in Business Intelligence.	PO1, PO5	PSO2, PSO3, PSO4	K2

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: BUSINESS INTELLIGENCE

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Problem solving / coding tasks	10	5
Workbook/recordbook/notebook	Notes maintenance	10	5
Class activity 1	Quiz (MCQ)	10	5
Class activity 2	Programming task / Case study	10	5
Class activity 3	Seminar / Presentation	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: B.C.A, BSc (CS),BSc(IT),BSc (DA)	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: ELECTIVE - II
COURSE NAME: PRACTICAL - VI: PLATFORM ENGINEERING	COURSE CODE: 26UBCA3E2P
SEMESTER: V	MARKS: 100
CREDITS: 4	TOTAL HOURS: 90
PRACTICAL	

COURSE OBJECTIVE:

Exclusive Training for the industry-related programs.

COURSE OUTCOMES:

1. Explain networking, server infrastructure, storage systems, and operating system fundamentals for enterprise environments.
2. Apply Windows Server administration techniques for system configuration, storage management, and performance monitoring.
3. Analyze Active Directory services and security mechanisms for efficient domain management.
4. Apply Linux administration and virtualization techniques for managing systems and virtual environments.
5. Analyze cloud services, backup strategies, and infrastructure monitoring tools for effective IT management.

LIST OF PROGRAMS:

1. IT- Infrastructure
2. Windows Administration
3. Windows AD Administration
4. Unix Administration

(30 HOURS)

5. Virtualization Concepts
6. Cloud Deployment
7. RDBMS - Database Administration
8. Backup, Restoration & Monitoring

(30 HOURS)

9. Middleware Components
10. ITIL Process
11. Perform End to End Case Study

(30 HOURS)

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	2	2	3	2	2
CO 2	2	3	3	2	2
CO 3	2	3	3	2	2
CO 4	2	3	3	2	2
CO 5	2	3	3	2	3
Ave.	2.0	2.8	3.0	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	2	3	2
CO 2	2	3	2	3	2
CO 3	2	3	3	3	2
CO 4	2	3	2	3	2
CO 5	2	3	3	3	2
Ave.	2.0	2.8	2.4	3.0	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Explain networking, server infrastructure, storage systems, and operating system fundamentals for enterprise environments.	PO1	PSO2, PSO4	K2
CO2	Apply Windows Server administration techniques for system configuration, storage management, and performance monitoring.	PO1, PO2	PSO2, PSO4	K3
CO3	Analyze Active Directory services and security mechanisms for efficient domain management.	PO1, PO2, PO3	PSO2, PSO3, PSO4	K4
CO4	Apply Linux administration and virtualization techniques for managing systems and virtual environments.	PO1, PO2, PO3	PSO2, PSO4	K3
CO5	Analyze cloud services, backup strategies, and infrastructure monitoring tools for effective IT management.	PO1, PO2, PO3, PO5	PSO2, PSO3, PSO4	K4

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: PRACTICAL - VI: PLATFORM ENGINEERING

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Practical examination with programming/problem-solving tasks for 90 minutes	50	10
Model Examination	Practical examination with programming/problem-solving tasks for 180 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Workbook/recordbook/notebook	Handwritten record of experiments, observations, results, and conclusions	10	5
Class activity 1	Debugging Test	10	5
Class activity 2	Problem-Solving Exercise	10	5
Class activity 3	Quiz with MCQ	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: ELECTIVE - II
COURSE NAME: INFORMATION SECURITY	COURSE CODE: 26UBCA3E6
SEMESTER: V	MARKS:100
CREDITS: 4	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To understand the basic principles and techniques of Information Security.

COURSE OUTCOMES:

1. Describe information security, viruses, and malicious code.
2. Analyze the access control and protection.
3. Apply the database security and integrity.
4. Illustrate the network security and cryptography.
5. Identify and protect from ethical issues in computer security.

UNIT 1

(18 HOURS)

Introduction: Security – Attacks - Computer Criminals - Method of Defense Program Security: Secure Programs - Non-Malicious Program Errors- Viruses and other Malicious Code - Targeted Malicious Code - Controls against Program Threats.

UNIT II

(18 HOURS)

Protection in OS: Memory and Address Protection, Access control, File Protection and User Authentication

UNIT III

(18 HOURS)

Database Security: Security Requirements- Reliability and Integrity- Sensitive Data Interface - Multilevel Database- Proposals for Multilevel Security

UNIT IV

(18 HOURS)

Security in Networks: Threats in Networks - Network Security Control- Firewalls Intrusion Detection Systems - Secure E-Mail - Networks and Cryptography - Example Protocols: PEMSSL-IPsec

UNIT V

(18 HOURS)

Adminstrating Security: Security Planning - Risk Analysis - Organizational Security Policies - Physical Security – Legal – Privacy - Ethical Issues in Computer Security - Protecting Programs

and Data - Information and Law- Rights of Employees and Employers Software Failures- Computer Crime- Privacy-Ethical Issues in Computer Society -Case Studies of Ethics.

RECOMMENDED TEXTBOOKS:

1. C.P.Pfleeger, and S.L.Pfleeger, Security in Computing, Pearson Education, 4th Edition, 2003.
2. Matt Bishop, Computer Security: Art and Science, Pearson Education, 2003.

REFERENCE BOOKS:

1. Stallings, Cryptography & N/w Security: Principles and practice, 4th Edition, 2006.
2. Kaufman, Perlman, Spincer, Network Security, Prentice Hall, 2nd Edition, 2003.
3. Eric Maiwald, Network Security : A Beginners Guide, TMH, 1999.
4. Macro Pistoia, Java Network Security, Pearson Education, 2nd Edition, 1999.
5. Whitman, Mattord, Principles of Information Security, Thomson, 2nd Edition, 2005.

E-LEARNING RESOURCES:

1. <https://nptel.ac.in/courses/106106141>
2. <https://nptel.ac.in/courses/106106178>
3. https://www.udemy.com/course/information_security_expert/
4. <http://www.kavery.org.in/engg/cse-ecourse/IT2042-IS.pdf>
5. <https://study.com/academy/lesson/what-is-information-security-definition-best-practices.html>

GUIDELINES TO THE QUESTION PAPER SETTERS QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20-25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	1
II	3	1	2
III	2	2	1
IV	2	1	1
V	2	1	1
TOTAL	12	7	6
SECTION A – 12		SECTION B – 7	SECTION C - 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	2	2	3	2	2
CO 2	2	3	3	2	2
CO 3	2	3	3	2	2
CO 4	2	3	3	2	2
CO 5	2	3	3	2	3
Ave.	2.0	2.4	3.0	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	2	3	1
CO 2	2	3	2	3	2
CO 3	2	3	3	3	2
CO 4	2	3	2	3	2
CO 5	2	2	2	3	3
Ave.	2.0	2.6	2.2	3.0	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Describe information security, viruses, and malicious code.	PO1	PSO2, PSO4	K2
CO2	Analyze the access control and protection.	PO1, PO2, PO3	PSO2, PSO4, PSO5	K4
CO3	Apply the database security and integrity	PO1, PO2, PO3	PSO2, PSO3, PSO4	K3
CO4	Illustrate the network security and cryptography.	PO1, PO2, PO3	PSO2, PSO4	K3
CO5	Identify and protect from ethical issues in computer security	PO3, PO4, PO5	PSO1, PSO5	K2

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: INFORMATION SECURITY

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Case study / security analysis	10	5
Workbook/recordbook/notebook	Notes maintenance	10	5
Class activity 1	Case Study Analysis	10	5
Class activity 2	Quiz with MCQ	10	5
Class activity 3	Seminar/Presentation	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: ELECTIVE - II
COURSE NAME: DATA MINING	COURSE CODE: 26UBCA3E7
SEMESTER: V	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE:

To understand the theoretical foundations and practical techniques in Data Mining.

COURSE OUTCOMES:

1. Explain data mining and data warehousing components.
2. Analyze data mining techniques and architecture.
3. Describe data mining and warehousing methodologies.
4. Compare classification and prediction approaches.
5. Interpret data mining methods.

UNIT 1

(18 HOURS)

Introduction: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Preprocessing: Preprocessing the Data – Data cleaning – Data Integration and Transformation – Data Reduction

UNIT II

(18 HOURS)

Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives– Data Mining Query Language -Architectures of Data mining Systems. Concept Description, Characterization and Comparison: Concept Description- Data Generalization and Summarization- Analytical Characterization- Mining Class Comparison – Statistical Measures.

UNIT III

(18 HOURS)

Mining Association Rules: Basics Concepts – Single Dimensional Boolean Association Rules from Transaction Databases-Multilevel Association Rules from transaction databases – Multi dimension Association Rules from Relational Database- Data Warehouses.

UNIT IV

(18 HOURS)

Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation. Classification based on Concepts from Association Rule Mining – Other Methods - Prediction – Introduction– Classifier Accuracy

UNIT V**(18 HOURS)**

Cluster Analysis: Introduction – Types of Data in Cluster Analysis-Petitioning Methods - Hierarchical Methods-Density Based Methods – GRID Based Method – Model based Clustering Method

RECOMMENDED TEXTBOOKS:

1. J. Han and M. Kamber, 2001, Data Mining Concepts and Techniques, Harcourt India Pvt. Ltd – New Delhi.
2. Jiawei Han, Micheline Kamber and Jian Pei “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2011.

REFERENCE BOOKS:

1. K.P. Soman ,Shyam Diwakar, V.Ajay ,2006, Insight into Data Mining Theory and Practice, Prentice Hall of India Pvt. Ltd - New Delhi.
2. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.
3. K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
4. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

E-LEARNING RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_cs06/preview
2. https://onlinecourses.nptel.ac.in/noc26_cs14/preview
3. <https://www.coursera.org/specializations/data-mining?>
4. https://www.vssut.ac.in/lecture_notes/lecture1422914558.pdf
5. https://www-users.cse.umn.edu/~kumar001/dmbook/dmslides/chap1_intro.pdf

GUIDELINES TO THE QUESTION PAPER SETTERS
QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20-25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	1
II	3	1	2
III	2	2	1
IV	2	1	1
V	2	1	1
TOTAL	12	7	6
SECTION A – 12		SECTION B – 7	SECTION C – 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	2	2	3	2	2
CO 2	2	3	3	2	2
CO 3	2	2	3	2	2
CO 4	2	3	3	2	2
CO 5	2	3	3	2	2
Ave.	2.0	3.0	3.0	2.0	2.0

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	3	2
CO 2	2	3	3	3	2
CO 3	2	2	3	3	2
CO 4	2	3	3	3	2
CO 5	2	3	3	3	2
Ave.	2.0	2.6	3.0	3.0	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Explain data mining and data warehousing components.	PO1	PSO2, PSO3	K2
CO2	Analyze data mining techniques and architecture.	PO1, PO2, PO3	PSO2, PSO3, PSO4	K4
CO3	Describe data mining and warehousing methodologies.	PO1, PO2	PSO2, PSO3	K2
CO4	Compare classification and prediction approaches.	PO1, PO2, PO3	PSO2, PSO3, PSO4	K4
CO5	Interpret data mining methods.	PO1, PO2, PO3	PSO2, PSO3, PSO4	K3

K1= Remember, K2= Understand, K3= Apply, K4=Analyze, K5= Evaluate, K6= Create

COURSE NAME: DATA MINING

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Problem solving / case study	10	5
Workbook/recordbook/notebook	Notes maintenance	10	5
Class activity 1	Case Study Analysis	10	5
Class activity 2	Quiz with MCQ	10	5
Class activity 3	Seminar/Presentation	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: ALL UG	BATCH: 2026 – 2029
PART: IV	COURSE COMPONENT: LIFE SKILLS - II
COURSE NAME: ENVIRONMENTAL STUDIES	COURSE CODE: 26UEVS401
SEMESTER: V	MARKS:100
CREDITS: 2	TOTAL HOURS: 30
THEORY	

COURSE OBJECTIVE:

To make students realize the importance of Environmental Studies.

COURSE OUTCOMES:

1. Define the scope and importance of environmental studies and its relevance to sustainable development.
2. Identify different types of natural resources and classify them as renewable, non-renewable, and potentially renewable.
3. Describe the concept of biodiversity and list major conservation strategies.
4. Identify the causes and types of environmental pollution and recall common prevention measures.
5. List basic disaster management plans for common environmental hazards and recall preparedness measures at community level.

UNIT I

(6 HOURS)

The Multidisciplinary nature of environmental studies Definition; Scope and importance, Need for public awareness.

UNIT II

(6 HOURS)

Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems.

- a) Forest resources: Use and Over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water dams benefits and problems.
- c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. - Role of an individual in conservation of natural resources. - Equitable use of resources for sustainable lifestyles.

UNIT III

(6 HOURS)

Ecosystems - Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem.

- Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem: -

a. Forest ecosystem

b. Grassland ecosystem

c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT IV

(6 HOURS)

Biodiversity and its Conservation

- Introduction-Definition: genetic, species and ecosystem diversity.
- Biogeographical classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT V

(6 HOURS)

Environmental Pollution: Definition - Causes, effects and control measures of: -

- a. Air pollution
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.

QUESTION PAPER PATTERN: MCQ

PROGRAMME: BCA	BATCH: 2026 -2029
PART: IV	COURSE COMPONENT: INTERNSHIP
COURSE NAME: INTERNSHIP	COURSE CODE: 26UINT401
SEMESTER: V	MARKS: -
CREDITS: 2	TOTAL HOURS: -
INTERNSHIP	

COURSE OBJECTIVE:

To Facilitate internship for students at software companies or tech startups, offering invaluable real-world experience to apply theoretical knowledge.

COURSE OUTCOMES:

1. Apply academic knowledge to real-world IT problems.
2. Develop domain knowledge, multidisciplinary, and professional skills.
3. Gain industry exposure through practical experience.
4. Practice ethical and sustainable computing approaches.
5. Enhance employability skills.

GUIDELINES:

The internship period is specifically designated to span a minimum of 4 weeks and is scheduled to occur during the extended summer break between the fourth and fifth semesters of their academic journey. During this training students are expected to immerse themselves in practical, hands-on learning opportunities, gaining exposure to real-world scenarios, industry practices, and the application of theoretical concepts learned throughout their coursework.

Upon the successful completion of the training program, each student is required to obtain an official internship completion certificate from the organization or company where they undertook their training.

SEMESTER VI

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – XVI
COURSE NAME: DEVOPS FUNDAMENTALS AND AUTOMATION	COURSE CODE: 26UBCA316
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS:75
THEORY	

COURSE OBJECTIVE:

To introduce DevOps practices and tools including version control, build automation, continuous integration, and CI/CD pipelines using free and open source software.

COURSE OUTCOMES:

1. Explain DevOps concepts, lifecycle, and version control using Git and GitHub.
2. Apply build automation tools Maven and Gradle to compile, test, and package applications.
3. Implement Continuous Integration by creating and configuring Jenkins jobs integrated with Git.
4. Configure basic server automation using Ansible playbooks and inventory files.
5. Develop a simple CI/CD pipeline using GitHub Actions for automated build and deployment.

UNIT 1

(15 HOURS)

DevOps Introduction – DevOps Lifecycle – Agile and DevOps Relationship – Continuous Integration and Continuous Delivery: Basic Concepts – Version Control Systems – Introduction to Git – Basic Git Commands (init, add, commit, push, pull, clone, branch, merge) – Introduction to GitHub – Creating and Managing Repositories – GitHub Workflow Basics.

UNIT II

(15 HOURS)

Introduction to Build Automation – Maven: Installation, POM File Structure, Build Lifecycle, Build Phases (Compile, Test, Package, Deploy), Maven Repositories (Local, Central) – Creating and Building Simple Java Projects using Maven – Introduction to Gradle – Gradle Build System Basics – Simple Build Process using Gradle – Comparison of Maven and Gradle.

UNIT III

(15 HOURS)

Introduction to Continuous Integration – Jenkins: Installation and Setup – Jenkins Dashboard Overview – Creating and Configuring Simple Jenkins Jobs – Jenkins Workspace – Integrating Jenkins with Git – Integrating Jenkins with Maven – Running First Automated Build – Viewing Build Results and Logs.

UNIT IV**(15 HOURS)**

Introduction to Configuration Management – Ansible: Overview and Architecture – Installation of Ansible – YAML Basics – Ansible Inventory Files – Ansible Modules – Adhoc Commands – Writing Simple Ansible Playbooks – Automating Basic Server Tasks using Playbooks.

UNIT V**(15 HOURS)**

Introduction to CI/CD Pipelines – Overview of GitHub Actions – GitHub Actions Workflow: Events, Jobs, and Steps – Writing a Simple GitHub Actions Workflow (.yml file) – Automating Build and Test using GitHub Actions – Introduction to Pipeline Stages (Build, Test, Deploy) – Deploying a Simple Application using GitHub Pages – Basic Automation Workflow using GitHub Actions.

RECOMMENDED TEXTBOOKS:

1. Joakim Verona, Jenkins: The Definitive Guide – Starter, O'Reilly Media, 2012.
2. Jeff Geerling, Ansible for DevOps: Server and Configuration Management for Humans, First Edition, 2015.

REFERENCE BOOKS:

1. Roberto Vormittag, A Practical Guide to Git and GitHub for Windows Users, Second Edition, Kindle, 2016.
2. Mariot Tsitoara, Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork, Second Edition, 2019.
3. David Johnson, Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps, Second Edition, 2016.
4. Jenkins User Handbook – Official Documentation.
5. Apache Maven Getting Started Guide – Official Documentation.

E-LEARNING RESOURCES:

1. <https://www.coursera.org/learn/devops-culture-and-mindset>.
2. <https://www.edx.org/learn/devops/the-linux-foundation-introduction-to-devops-transforming-and-improving-operations>.
3. <https://docs.github.com/en/actions>.
4. <https://www.programiz.com> <https://www.jenkins.io/user-handbook.pdf>.
5. https://docs.ansible.com/ansible/latest/getting_started/index.html.

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions(each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions(each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions(each in 1200 words)	20-25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	2
II	2	1	1
III	3	1	1
IV	2	2	1
V	2	1	1
TOTAL	12	7	6
SECTION A – 12		SECTION B - 7	SECTION C - 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	2	2	3	2	2
CO 2	2	2	3	2	2
CO 3	3	3	3	2	2
CO 4	2	3	3	2	2
CO 5	3	3	3	2	2
Ave.	2.4	2.6	3.0	2.0	2.0

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	2	3	2
CO 2	2	2	2	3	2
CO 3	3	3	3	3	2
CO 4	2	3	3	3	2
CO 5	3	3	3	3	2
Ave.	2.4	2.6	2.6	3.0	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Explain DevOps concepts, lifecycle, and version control using Git and GitHub.	PO1	PSO1, PSO2	K2
CO2	Apply build automation tools Maven and Gradle to compile, test, and package applications.	PO1, PO2	PSO1, PSO2	K2
CO3	Implement Continuous Integration by creating and configuring Jenkins jobs integrated with Git.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K2
CO4	Configure basic server automation using Ansible playbooks and inventory files.	PO1, PO2, PO3	PSO2, PSO3, PSO4	K4
CO5	Develop a simple CI/CD pipeline using GitHub Actions for automated build and deployment.	PO1, PO2, PO3	PSO2, PSO3, PSO4	K3

K1= Remember, K2= Understand, K3= Apply, K4=Analyze, K5= Evaluate, K6= Create

COURSE NAME: DEVOPS FUNDAMENTALS AND AUTOMATION

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Data analysis / R programs	10	5
Workbook/ recordbook / notebook	Notes maintenance	10	5
Class activity 1	Group Activity	10	5
Class activity 2	Seminar/Presentation	10	5
Class activity 3	Case Study Analysis	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – XVII
COURSE NAME: DATA COMMUNICATION AND NETWORKING	COURSE CODE: 26UBCA317
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To introduce the basic concepts of Data Communication and Networking devices

COURSE OUTCOMES:

1. Explain networking concepts and protocols across layers.
2. Analyze bandwidth sharing techniques and DLL concepts.
3. Illustrate the process of data transfer between computers over a network
4. Apply synchronization and thread concepts in distributed systems.
5. Examine distributed file systems.

UNIT I (18 HOURS)

Introduction to Data Communication, Network, Protocols and Standards - Line Configuration - Topology - Transmission mode - Classification of Network - OSI Model - Layers of OSI Model.

UNIT II (18 HOURS)

Parallel and Serial Transmission - DTE/DCE/such as EIA-449, EIA-530, EIA-202 and x.21 interface - Interface standards - Modems - Guided Media - Unguided Media - Performance - Types of Error - Error Detection - Error Corrections.

UNIT III (18 HOURS)

Multiplexing - Types of Multiplexing - Multiplexing Application - Telephone system - Project 802 - Ethernet - Token Bus - Token Ring - FDDI - IEEE 802.6 - SMDS - Circuit Switching - Packet Switching - Message switching - Connection Oriented and Connectionless services.

UNIT IV (18 HOURS)

Repeaters - Bridges - Routers - Gateway - Routing algorithms: Distance Vector, link State, path vector Routing, Multicast Routing - TCP/IP Network, Transport Layer of TCP/IP: TCP, TCP Services, TCP Features - Application Layers of TCP/IP: Namespace, DNS, Distribution of Namespace, DNS in the Internet, Resolution, DNS messages, Types of Records, Registers, Dynamics DNS, Encapsulation- World Wide Web: Architecture, Client, Server, URL, Cookies. Web document: Static Document, Dynamic Document, active Document.

UNIT V**(18 HOURS)**

Computer Security Concepts-Security Attacks: Active Attacks, Passive Attacks - Message authentication Codes: message Authentication Requirements, Message Authentication Functions Requirements for message Authentication codes-Electronic mail Security: s/MIME, Domain Keys Identified Mail- IP Security: IP Security Overview, IP Security Policy, Encapsulating Security payload, Combining Security Associations, Internet key Exchange, Cryptographic suits- Firewalls: The Need for Firewalls, Firewall Characteristics, Types of Firewalls, Firewalls Basing, Firewall Location and Configuration.

RECOMMENDED TEXTBOOKS:

1. Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, McGraw- Hill Education, 2017.
2. William Stallings, Cryptography and Network Security: Principles and Practice, 9th Edition, Pearson, 2024.

REFERENCE BOOKS:

1. Achyut S. Godbole and Atul Kahate, Data Communications and Networking, 3rd Edition, McGraw-Hill Education, 2017.
2. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, 6th Edition, Pearson, 2021.
3. James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach, 8th Edition, Pearson, 2021.
4. William Stallings, Network Security Essentials: Applications and Standards, 7th Edition, Pearson, 2023.
5. William Stallings, Data and Computer Communications, 11th Edition, Pearson, 2022.

E-LEARNING RESOURCES:

1. <https://nptel.ac.in/courses/106105082>
2. https://onlinecourses.nptel.ac.in/noc22_ee61/preview
3. <https://www.udemy.com/course/masterclass-data-communication-and-computer-networking/>
4. <https://www.coursera.org/learn/data-communication-networks?>
5. https://mrcet.com/downloads/digital_notes/ECE/III%20Year/DATA%20COMMUNICATIO NS.pdf

GUIDELINES TO THE QUESTION PAPER SETTERS
QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20-25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	1
II	3	1	2
III	2	2	1
IV	2	1	1
V	2	1	1
TOTAL	12	7	6
SECTION A – 12		SECTION B - 7	SECTION C – 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	3	2	2
CO 2	3	3	3	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	2
Ave.	3.0	2.8	3.0	2.0	2.0

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	2	3	2
CO 2	3	3	2	3	2
CO 3	3	3	2	3	2
CO 4	3	3	2	3	2
CO 5	3	3	3	3	2
Ave.	3.0	2.8	2.2	3.0	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Explain networking concepts and protocols across layers.	PO1, PO2, PO3	PSO1, PSO2, PSO4	K2
CO2	Analyze bandwidth sharing techniques and DLL concepts.	PO1, PO2, PO3	PSO1, PSO2, PSO4	K4
CO3	Illustrate the process of data transfer between computers over a network	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO4	K3
CO4	Apply synchronization and thread concepts in distributed systems.	PO1, PO2, PO3	PSO1, PSO2, PSO4	K3
CO5	Examine distributed file systems.	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO3, PSO4	K4

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: DATA COMMUNICATION AND NETWORKING

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Network concepts / case study	10	5
Workbook/recordbook/notebook	Notes maintenance	10	5
Class activity 1	Group Discussion	10	5
Class activity 2	Quiz with MCQ	10	5
Class activity 3	Case Study Analysis	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – XVIII
COURSE NAME: DATA SCIENCE FOR INTERNET OF THINGS	COURSE CODE: 26UBCA318
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS:75
THEORY	

COURSE OBJECTIVE:

To introduce students to the fundamentals of data science, machine learning, Python-based analytics, and IoT concepts for analyzing and interpreting real-world data.

COURSE OUTCOMES:

1. Outline data science concepts: data collection, preprocessing, and analysis.
2. Formulate machine learning models using SVM, decision trees, and dimensionality reduction.
3. Develop web-based data visualizations using D3.js.
4. Implement Python libraries for data analysis and machine learning.
5. Assess real-time IoT data processing using Raspberry Pi and Python.

UNIT 1

(15 HOURS)

Introduction to Data Science – Data Science Lifecycle – Types of Data – Data Collection Methods – Data Acquisition in IoT (Overview) – Sensors and Actuators. Data Preprocessing – Data Cleaning – Handling Missing Values – Basic Exploratory Data Analysis (EDA) – Descriptive Statistics – Basic Data Visualization Concepts.

UNIT II

(15 HOURS)

Introduction to Machine Learning – Types of ML (Supervised, Unsupervised) – ML Workflow – Training and Testing – Model Evaluation Concepts. Basic Algorithms: Linear Regression, k-Nearest Neighbors (kNN), Decision Trees - Dimensionality Reduction (PCA).

UNIT III

(15 HOURS)

Principles of Data Visualization – Types of Charts – Designing Effective Visualizations. Python-Based Visualization: Matplotlib (Line, Bar, Scatter, Histogram), Seaborn (Statistical Plots – Basic) - Introduction to Interactive Visualization- Overview of Web-based Visualization Tools.

UNIT IV

(15 HOURS)

NumPy – Arrays – Basic Operations. Pandas – Series and DataFrames – Data Cleaning – Data Manipulation – Reading CSV/JSON files. Introduction to Scikit-learn – Simple Model Implementation. Overview of NLP in Python.

UNIT V**(15 HOURS)**

Introduction to IoT – IoT Architecture – IoT Devices (Conceptual overview). Data Collection from IoT Devices – Basics of Sensor Data. Programming Basics for Raspberry Pi. Introduction to Real-Time Data Processing – Basic Concepts of Stream Analytics. Case Studies on IoT Data Analytics Applications.

RECOMMENDED TEXTBOOKS:

1. P. G. Madhavan, Ph.D., “Data Science for IoT Engineers A Systems Analytics Approach”, MERCURY LEARNING AND INFORMATION 2016.
2. Géron, A., Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 3rd Edition, O’Reilly Media, 2022.

REFERENCE BOOKS:

1. Bahga, A., & Madiseti, V., Internet of Things: A Hands-On Approach, 2nd Edition, Universities Press, 2024.
2. Murray, S., Interactive Data Visualization for the Web, 3rd Edition, O’ Reilly Media, 2023.
3. Raschka, S., Liu, Y., & Mirjalili, V., Machine Learning with PyTorch and Scikit-Learn, Packt, 2022.
4. McKinney, W., Python for Data Analysis, 3rd Edition, O’Reilly Media, 2022.
5. Kleppmann, M., Designing Data-Intensive Applications, O’ Reilly Media, 2017.

E-LEARNING RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc19_cs65/preview
2. <https://nptel.ac.in/courses/106106179>
3. <https://www.udemy.com/course/internet-of-things-esp-esp32-nodemcu-node-esp8266-iot/>
4. <https://www.careers360.com/courses/internet-of-things-course>
5. <https://www.youtube.com/watch?v=7ZudXhP7wFY>

GUIDELINES TO THE QUESTION PAPER SETTERS
QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
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B	Answer any 5 out of 7 questions(each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions(each in 1200 words)	20-25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	3	1	1
III	2	2	1
IV	2	2	1
V	2	1	2
TOTAL	12	7	6
SECTION A – 12		SECTION B - 7	SECTION C - 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	3	2	2
CO 2	3	3	3	2	3
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	3
Ave.	3.0	2.8	3.0	2.0	2.4

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	3	3	2
CO 2	3	3	3	3	2
CO 3	3	3	3	3	2
CO 4	3	3	3	3	2
CO 5	3	3	3	3	2
Ave.	3.0	2.8	3.0	3.0	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Outline data science concepts: data collection, preprocessing, and analysis.	PO1, PO2, PO3	PSO1, PSO3, PSO4	K2
CO2	Formulate machine learning models using SVM, decision trees, and dimensionality reduction.	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO4	K6
CO3	Develop web-based data visualizations using D3.js.	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO3	K6
CO4	Implement Python libraries for data analysis and machine learning.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K3
CO5	Assess real-time IoT data processing using Raspberry Pi and Python.	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO4	K5

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: DATA SCIENCE FOR INTERNET OF THINGS

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Data analysis / case study	10	5
Workbook/recordbook/ notebook	Notes maintenance	10	5
Class activity 1	Case Study Analysis	10	5
Class activity 2	Seminar/Presentation	10	5
Class activity 3	Group Activity	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – XIX
COURSE NAME: PRACTICAL - VII: DEVOPS FUNDAMENTALS AND AUTOMATION	COURSE CODE: 26UBCA319P
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS:60
PRACTICAL	

COURSE OBJECTIVE:

To provide hands-on experience in DevOps tools and practices using free and open source software.

COURSE OUTCOMES:

1. Perform Git operations including repository creation, branching, merging, and conflict resolution using Git and GitHub.
2. Execute Maven and Gradle build lifecycle phases to compile, test, and package Java applications.
3. Configure Jenkins jobs integrated with Git and Maven to automate the build process.
4. Implement basic Ansible playbooks to automate server configuration tasks.
5. Develop a complete CI/CD pipeline using GitHub Actions to automate build and deployment.

LAB EXERCISES

1. Install Git and configure username and email; initialize a local repository and verify status using git init, git config, and git status commands.
2. Create a GitHub repository; perform add, commit, and push operations to sync local repository with remote GitHub repository.
3. Create a new branch, make changes to files, and merge the branch back to main using git branch, git checkout, and git merge commands.
4. Simulate a merge conflict between two branches and resolve it manually; verify the final merged output
5. Install Apache Maven and create a simple Java project using Maven archetype; compile and package the project using mvn compile and mvn package commands.
6. Write a basic POM.xml file with project details and dependencies; execute Maven build lifecycle phases: compile, test, and package.
7. Create a simple Gradle project; write a build.gradle file and execute basic build tasks using gradle build and gradle tasks commands.
8. Install Jenkins on localhost; access the Jenkins dashboard and explore the interface, system configuration, and basic settings.
9. Create a Freestyle Jenkins job that pulls source code from a GitHub repository and triggers a build automatically on code push.
10. Integrate Jenkins with Maven; configure a Jenkins job to compile and package a Maven project and view build console output and results.
11. Install Ansible on Ubuntu (VirtualBox); verify installation using ansible --version and run a basic adhoc ping command on localhost.

12. Write an Ansible inventory file with host details; execute adhoc commands to check uptime, disk space, and system information on target host
13. Write and execute a simple Ansible playbook to install and start Apache web server on a target Ubuntu machine.
14. Create a GitHub Actions workflow file (.yml) to automatically run a build when code is pushed to the repository; verify the workflow run in the Actions tab.
15. Build a complete CI/CD mini pipeline using GitHub Actions: push code → trigger automated build → deploy a simple HTML page to GitHub Pages.

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	2	2	3	2	2
CO 2	3	3	3	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	3	3	3	2	3
Ave.	2.8	2.8	3.0	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	2	3	2
CO 2	3	3	3	3	2
CO 3	3	3	3	3	2
CO 4	3	3	3	3	2
CO 5	3	3	3	3	2
Ave.	2.8	2.8	2.8	3.0	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Perform Git operations including repository creation, branching, merging, and conflict resolution using Git and GitHub.	PO1, PO2, PO3, PO4	PSO1, PSO2	K3
CO2	Execute Maven and Gradle build lifecycle phases to compile, test, and package Java applications.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K3
CO3	Configure Jenkins jobs integrated with Git and Maven to automate the build process.	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO3	K3, K4
CO4	Implement basic Ansible playbooks to automate server configuration tasks.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K4
CO5	Develop a complete CI/CD pipeline using GitHub Actions to automate build and deployment.	PO1, PO2, PO3, PO4, PO5	PSO1, PSO2, PSO3, PSO4	K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: PRACTICAL - VII: DEVOPS FUNDAMENTALS AND AUTOMATION

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Practical examination with programming/problem-solving tasks for 90 minutes	50	10
Model Examination	Practical examination with programming/problem-solving tasks for 180 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Workbook/recordbook/notebook	Handwritten record of experiments, observations, results, and conclusions	10	5
Class activity 1	Debugging Test	10	5
Class activity 2	Problem-Solving Exercise	10	5
Class activity 3	Quiz with MCQ	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: CORE – XX
COURSE NAME: PROJECT	COURSE CODE: 26UBCA320
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS:60
PRACTICAL	

The project work holds significant importance within the BCA program, requiring students to approach it diligently and with earnest effort. This mini project aims to cultivate students' capacity to utilize theoretical and practical methodologies to address real-world challenges encountered in industry, academic settings, and research laboratories.

COURSE OBJECTIVE:

To apply theoretical knowledge of programming languages, database management, and software engineering principles in a practical project.

COURSE OUTCOMES:

1. Apply domain specific theories, principles, and methodologies to design and execute meaningful projects.
2. Identify complex problems and develop innovative, practical, and multidisciplinary solutions.
3. Demonstrate the ability to conduct research, analyse data, and interpret findings to support informed decision making.
4. Integrate ethical practices, sustainability, and social responsibility into project work, contributing positively to society.
5. Present and document project outcomes, while cultivating adaptability and continuous learning.

GUIDELINES:

- A student is required to allocate approximately three months towards the comprehensive phases of project development, encompassing planning, analysis, design, and implementation. The project's commencement is marked by the submission of a project proposal, which serves as an initial assignment.
- Active participation from each student is obligatory for internal evaluation and eligibility to present in the final viva examination.

EVALUATION:

- Internal evaluation will rely on the submission of the initial project proposal, along with two subsequent reviews and a detailed final project report.
- External evaluation will be conducted through a presentation of the project work and an oral examination (Viva Voce).

COURSE NAME: PROJECT

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Practical examination with programming/problem-solving tasks for 90 minutes	50	10
Model Examination	Practical examination with programming/problem-solving tasks for 180 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Workbook/recordbook/notebook	Handwritten record of experiments, observations, results, and conclusions	10	5
Class activity 1	Debugging Test	10	5
Class activity 2	Problem-Solving Exercise	10	5
Class activity 3	Quiz with MCQ	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: ELECTIVE - III
COURSE NAME: ARTIFICIAL INTELLIGENCE	COURSE CODE: 26UBCA3E3
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To introduce about Artificial Intelligence using Machine learning algorithm.

COURSE OUTCOMES:

1. Explain informed and uninformed search strategies.
2. Formulate real-world problems using state space representation.
3. Apply machine learning techniques in the design of computer systems
4. Differentiate between various categories of ML algorithms
5. Develop and make modifications to existing machine learning algorithms.

UNIT I

(18 HOURS)

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

UNIT II

(18 HOURS)

Advanced Search: Constructing Search Trees, Stochastic Search, AO* Search Implementation, Minimax Search, Alpha-Beta Pruning Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

UNIT III

(18 HOURS)

Machine-Learning: Introduction. Machine Learning Systems, Forms of Learning: Supervised and Unsupervised Learning, reinforcement – theory of learning – feasibility of learning – Data Preparation– training versus testing and split.

UNIT IV

(18 HOURS)

Supervised Learning: Regression: Linear Regression, multi linear regression, Polynomial Regression, logistic regression, Non-linear Regression, Model evaluation methods. Classification: – support vector machines (SVM), Naïve Bayes classification

UNIT V

(18 HOURS)

Unsupervised learning Nearest neighbor models – K-means – clustering around medoids – silhouettes – hierarchical clustering – k-d trees, Clustering trees – learning ordered rule lists – learning unordered rule. Reinforcement learning- Example: Getting Lost -State and Action Spaces

RECOMMENDED TEXTBOOKS:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice Hall, 2010.
2. MACHINE LEARNING: An Algorithmic Perspective 2nd Edition, Stephen Marsland, 2015, by Taylor & Francis Group, LLC.

REFERENCE BOOKS:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
2. George F. Luger,
2. Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.
3. Introduction to Machine Learning, Second Edition, Ethem Alpaydın, the MIT Press, Cambridge, Massachusetts, London, England.
4. Machine Learning, Tom M. Mitchell, McGraw-Hill Science, ISBN: 0070428077
5. Understanding Machine Learning: From Theory to Algorithms, c 2014 by Shai Shalev-Shwartz and Shai Ben-David, Published 2014 by Cambridge University Press.

E-LEARNING RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_cs56/preview
2. https://onlinecourses.nptel.ac.in/noc25_cs159/preview
3. <https://www.udemy.com/course/artificial-intelligence-online-course/>
4. <https://www.cin.ufpe.br/~cavmj/Machine%20-%20Learning%20-%20Tom%20Mitchell.pdf>
5. <https://www.cs.huji.ac.il/~shais/UnderstandingMachineLearning/understanding-machine-learning-theory-algorithms.pdf>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions(each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions(each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions(each in 1200 words)	20-25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	1
II	3	1	2
III	2	2	1
IV	2	1	1
V	2	1	1
TOTAL	12	7	6
SECTION A – 12		SECTION B - 7	SECTION C – 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	2	2
CO 2	3	3	2	2	2
CO 3	3	3	3	2	3
CO 4	2	2	3	2	2
CO 5	3	3	3	2	3
Ave.	2.8	2.6	2.6	2.0	2.4

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	2	3	2
CO 2	3	3	2	3	2
CO 3	3	3	3	3	3
CO 4	2	2	3	3	2
CO 5	3	3	3	3	3
Ave.	2.8	2.6	2.6	3.0	2.4

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Explain informed and uninformed search strategies.	PO1, PO2, PO3	PSO1, PSO2	K2
CO2	Formulate real-world problems using state space representation.	PO1, PO2, PO3	PSO1, PSO2	K6
CO3	Apply machine learning techniques in the design of computer systems.	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO3, PSO4	K3
CO4	Differentiate between various categories of ML algorithms.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K4
CO5	Develop and make modifications to existing machine learning algorithms.	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO3, PSO4, PSO5	K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

COURSE NAME: ARTIFICIAL INTELLIGENCE

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	AI problems / ML case study	10	5
Workbook/recordbook/notebook	Notes maintenance	10	5
Class activity 1	Case Study Analysis	10	5
Class activity 2	Seminar/Presentation	10	5
Class activity 3	Quiz with MCQ	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: ELECTIVE - III
COURSE NAME: BIG DATA ANALYTICS	COURSE CODE: 26UBCA3E8
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To provide overview of Big Data, i.e. storage, retrieval and processing and analytics on different data sets.

COURSE OUTCOMES:

1. Identify Big Data types and handling techniques.
2. Describe the essence of big data analytics and significance of business intelligence.
3. Interpret big data technologies and databases.
4. Utilize key aspects and components of Hadoop Architecture.
5. Outline the concepts of Big data analytical tools.

UNIT 1

(18 HOURS)

Introduction to Big Data: Data, Characteristics of data -Types of digital data: Unstructured, Semi- structured and Structured -Sources of data - Working with unstructured data - Evolution and Definition of big data - Characteristics and Need of big data - Challenges of big data - Data environment versus big data environment.

UNIT II

(18 HOURS)

Big data Analytics: Overview of business intelligence - Data science and Analytics - Meaning and Characteristics of big data analytics - Need of big data analytics - Classification of analytics - Challenges to big data analytics - Importance of big data analytics - Basic terminologies in big data environment.

UNIT III

(18 HOURS)

Big Data Technologies and Databases: Introduction to NoSQL - Uses, Features and Types of NoSQL- Need, Advantages and Disadvantages of NoSQL- Application of NoSQL- Overview of NewSQL- Comparing SQL, NoSQL and NewSQL- Introduction to MongoDB and its needs - Characteristics of MongoDB - Introduction of Apache Cassandra and its needs - Characteristics of Cassandra.

UNIT IV

(18 HOURS)

Hadoop Foundation for Analytics: History, Needs, Features- Key advantage and Versions of Hadoop- Essential of Hadoop ecosystems- RDBMS versus Hadoop- Key aspects and Components of Hadoop- Hadoop architectures.

UNIT V

(18 HOURS)

Hadoop MapReduce and YARN Framework: Introduction to MapReduce- Processing data with Hadoop using MapReduce- Introduction to YARN- Components, Need and Challenges of YARN- Dissecting YARN- MapReduce application.

RECOMMENDED TEXTBOOKS:

1. Seema Acharya and Subhashini Chellappan, “Big Data and Analytics”, Wiley India Pvt. Ltd., 2016.
2. “Big Data” by Judith Hurwitz, Alan Nugent, Dr. Fern Halper and Marcia Kaufman, Wiley Publications, 2014.

REFERENCE BOOKS:

1. “Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics” by Soumendra Mohanty, Madhu Jagadeesh and Harsha Srivatsa, Apress Media, Springer Science + Business Media New York, 2013
2. “Mining of Massive Datasets”, Anand Rajaraman, Jure Leskovec, Jeffery D. Ullman, Springer, July 2013.
3. Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
4. ArvindSathi, “BigDataAnalytics: Disruptive Technologies for Changing the Game”, MC Press, 2012
5. Paul Zikopoulos ,Dirk DeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corigan , "Harness the Power of Big Data The IBM Big Data Platform ", Tata McGraw Hill Publications, 2012

E-LEARNING RESOURCES:

1. <https://nptel.ac.in/courses/106104189>
2. https://onlinecourses.nptel.ac.in/noc26_cs09/preview
3. <https://www.coursera.org/courses?query=big%20data%20analytics&index>
4. <https://www.mygreatlearning.com/academy/learn-for-free/courses/mastering-big-data-analytics>
5. <https://www.matellio.com/blog/big-data-in-elearning/>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions(each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions(each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions(each in 1200 words)	20-25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	3	1	1
III	2	2	1
IV	2	2	1
V	2	1	2
TOTAL	12	7	6
SECTION A – 12		SECTION B - 7	SECTION C – 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	3	2	2
CO 2	2	2	3	2	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	2
CO 5	2	2	3	2	2
Ave.	2.6	2.4	3.0	2.0	2.0

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	3	3	2
CO 2	2	2	3	3	2
CO 3	3	3	3	3	2
CO 4	3	3	3	3	2
CO 5	2	2	3	3	2
Ave.	2.6	2.4	3.0	3.0	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Identify Big Data types and handling techniques.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K1, K2
CO2	Describe the essence of big data analytics and significance of business intelligence.	PO1, PO2, PO3	PSO2, PSO3, PSO4	K2
CO3	Interpret big data technologies and databases.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K3, K4
CO4	Utilize key aspects and components of Hadoop Architecture.	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO3, PSO4	K3
CO5	Outline the concepts of Big data analytical tools.	PO1, PO2, PO3	PSO2, PSO3, PSO4	K2

K1= Remember, K2= Understand, K3= Apply, K4=Analyze, K5= Evaluate, K6= Create

COURSE NAME: BIG DATA ANALYTICS

Continuous Internal Assessment – Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Case study / technology study	10	5
Workbook/recordbook/notebook	Notes maintenance	10	5
Class activity 1	Case Study Analysis	10	5
Class activity 2	Seminar/Presentation	10	5
Class activity 3	Quiz with MCQ	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50
The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed) 1) Quiz with MCQ 2) Case-Study analysis 3) Debate 4) Seminar/ Presentation 5) Peer/Self-Assessment 6) Role play 7) Scrap book 8) Monograph 9) Puzzle 10) Group Discussion 11) Group activity 12) Surprise class tests			

PROGRAMME: BCA	BATCH: 2026 -2029
PART: III	COURSE COMPONENT: ELECTIVE - III
COURSE NAME: GRAPHICS AND MULTIMEDIA	COURSE CODE: 26UBCA3E9
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To introduce about the design and development of two-dimensional graphics and transformations along with multimedia concepts.

COURSE OUTCOMES:

1. Recall factual information about multimedia systems, text, audio, and video tools.
2. Implement algorithms for line-drawing, circle-generating, and ellipse-generating.
3. Utilize computer graphics techniques for entertainment, design, and engineering.
4. Interpret multimedia tools and their impact on communication and society.
5. Creates Animation with special effects using algorithms.

UNIT 1

(18 HOURS)

Output Primitives: Points and Lines – Line-Drawing algorithms – Loading frame Buffer – Line function – Circle-Generating algorithms – Ellipse-generating algorithms. Attributes of Output Primitives: Line Attributes – Curve attributes – Color and Grayscale Levels – Area-fill attributes – Character Attributes.

UNIT II

(18 HOURS)

2D Geometric Transformations: Basic Transformations – Matrix Representations – Composite Transformations – Other Transformations. 2D Viewing: The Viewing Pipeline – Viewing Co-ordinate Reference Frame – Window-to-Viewport Co-ordinate Transformation – 2D Viewing Functions – Clipping Operations.

UNIT III

(18 HOURS)

Text: Types of Text – Unicode Standard – Font – Insertion of Text – Text compression – File formats. Image: Image Types – Seeing Color – Color Models – Basic Steps for Image Processing – Scanner – Digital Camera – Interface Standards – Specification of Digital Images – CMS – Device Independent Color Models – Image Processing software – File Formats – Image Output on Monitor and Printer.

UNIT IV**(18 HOURS)**

Audio: Introduction – Acoustics – Nature of Sound Waves – Fundamental Characteristics of Sound– Microphone – Amplifier – Loudspeaker – Audio Mixer – Digital Audio – Synthesizers – MIDI – Basics of Staff Notation – Sound Card – Audio Transmission – Audio File formats and CODECs – Audio Recording Systems – Audio and Multimedia – Voice Recognition and Response – Audio Processing Software.

UNIT V**(18 HOURS)**

Video: Analog Video Camera – Transmission of Video Signals – Video Signal Formats – Television Broadcasting Standards – PC Video – Video File Formats and CODECs – Video Editing – Video Editing Software. Animation: Types of Animation – Computer Assisted Animation – Creating Movement – Principles of Animation – Some Techniques of Animation – Animation on the Web – Special Effects – Rendering Algorithms. Compression: MPEG-1 Audio – MPEG-1 Video – MPEG-2Audio – MPEG-2 Video

RECOMMENDED TEXTBOOKS:

1. Donald Hearn & M. Pauline Baker, Computer Graphics with OpenGL, Pearson Education, 4th Edition, 2011.
2. Tay Vaughan, Multimedia: Making It Work, McGraw-Hill, 9th Edition, 2014.

REFERENCE BOOKS:

1. James D. Foley, Andries Van Dam, Steven K. Feiner & John F. Hughes, Computer Graphics: Principles and Practice, Pearson Education, 3rd Edition, 2013.
2. F.S. Hill Jr. & Stephen M. Kelley, Computer Graphics Using OpenGL, Pearson Education, 3rd Edition, 2006.
3. Ze-Nian Li & Mark S. Drew, Fundamentals of Multimedia, Pearson Education, 2nd Edition, 2014.
4. Ralf Steinmetz & Klara Nahrstedt, Multimedia: Computing, Communications and Applications, Pearson Education, 1st Edition, 2012.
5. David Salomon, Data Compression: The Complete Reference, Springer, 4th Edition, 2007.

E-LEARNING RESOURCES:

1. <https://www.geeksforgeeks.org/what-is-multimedia/>
2. https://www.tutorialspoint.com/multimedia/multimedia_introduction.htm
3. <https://bcastudyguide.com/computer-graphics-and-multimedia-application/>
4. <https://sctevtservices.nic.in/docs/website/pdf/140301.pdf>
5. https://users.dimi.uniud.it/~antonio.dangelo/MMS/materials/Fundamentals_of_Multimedia.pdf

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions(each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions(each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions(each in 1200 words)	20-25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	1
II	3	1	2
III	2	2	1
IV	2	1	1
V	2	1	1
TOTAL	12	7	6
SECTION A - 12		SECTION B – 7	SECTION C - 6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	1	2	2	1
CO 2	3	3	3	2	2
CO 3	3	3	3	2	2
CO 4	2	2	3	2	3
CO 5	3	3	3	2	3
Ave.	2.8	2.4	2.8	2.0	2.2

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	2	3	1
CO 2	3	3	2	2	1
CO 3	3	3	2	3	2
CO 4	2	2	2	3	3
CO 5	3	3	2	3	3
Ave.	2.6	2.6	2.0	2.8	2.0

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Recall factual information about multimedia systems, text, audio, and video tools.	PO1, PO3	PSO1, PSO3	K1
CO2	Implement algorithms for line-drawing, circle-generating, and ellipse-generating.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K3
CO3	Utilize computer graphics techniques for entertainment, design, and engineering.	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO4	K3
CO4	Interpret multimedia tools and their impact on communication and society.	PO1, PO3, PO5	PSO2, PSO3, PSO4, PSO5	K4
CO5	Creates Animation with special effects using algorithms.	PO1, PO2, PO3, PO4	PSO1, PSO2, PSO4, PSO5	K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyze, K5= Evaluate, K6= Create

COURSE NAME: GRAPHICS AND MULTIMEDIA**Continuous Internal Assessment – Components**

Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Pen and Paper test for 90 minutes	50	10
Model Examination	Written examination for 180 minutes	100	10
Assignment	Graphics algorithm	10	5
Workbook/recordbook/notebook	Notes maintenance	10	5
Class activity 1	Case Study Analysis	10	5
Class activity 2	Seminar/Presentation	10	5
Class activity 3	Quiz with MCQ	10	5
Attendance	Marks will be given based on the attendance percentage of respective course	5	5
Total			50

The Mode of Evaluation for class activity can be based on the following parameters (these are suggestions, the faculty can add more if needed)

- 1) Quiz with MCQ
- 2) Case-Study analysis
- 3) Debate
- 4) Seminar/ Presentation
- 5) Peer/Self-Assessment
- 6) Role play
- 7) Scrap book
- 8) Monograph
- 9) Puzzle
- 10) Group Discussion
- 11) Group activity
- 12) Surprise class tests