

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

B.Sc INFORMATION TECHNOLOGY

(SEMESTER PATTERN WITH CHOICE BASED CREDIT SYSTEM)

Syllabus

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

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LEARNING OUTCOME BASED CURRICULUM FRAMEWORK

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

PREAMBLE

1. ABOUT THE PROGRAMME

B.Sc. (Information Technology) is a well-structured three-year undergraduate programme spread over six semesters, designed to prepare students for a successful and rewarding career in the IT industry. The programme offers a good balance of theory and practical training, giving students the technical knowledge, professional skills, and problem-solving abilities needed to meet the demands of today's software industry.

In a world where technology is changing rapidly, the B.Sc. (IT) curriculum is regularly updated to keep pace with new developments and emerging trends. The programme covers core Information Technology domains supported by a solid foundation in Mathematics and Statistics, ensuring that students develop both technical depth and analytical thinking. Students are taken through the various dimensions of the IT field its concepts, its scope, its career pathways, and its real-world applications. so that they are well-prepared to face the challenges of the modern workplace.

Throughout the programme, students are encouraged to think independently, work on practical projects, and engage with the latest tools and technologies used in the industry. This hands-on approach ensures that students do not just learn concepts in the classroom but are also able to apply them effectively in real-world situations. This programme serves as an ideal starting point for students who wish to enter the IT workforce directly after graduation, as well as for those who aspire to pursue higher studies in Information Technology and related disciplines.

2. VISION

To be a centre of excellence in Information Technology education, inspiring students to go beyond limits, lead with purpose, and build successful careers in industry, academia, and government - driven by knowledge, innovation, and a commitment to the betterment of society.

3. MISSION

- a. Equip students with the latest IT skills and knowledge, encouraging innovation, logical thinking, and problem-solving abilities that prepare them to succeed in a fast-changing technological world. The IT course will nurture creativity, lateral thinking and Problem-solving skills.
- b. Strengthen the connection between academia and industry by exposing students to real-world challenges.
- c. Develop well-rounded IT professionals who have technical strength, good values, and a genuine commitment to learning and contributing to society.

4. PROGRAMME EDUCATIONAL OBJECTIVES(PEOs)

PEO 1: Values of Life, Ethics & Social Concern

The graduates exhibit truth, loyalty, and love as integral moral principles, thereby contributing to a society characterized by enhanced well-being and fundamental goodness in behavior.

PEO 2: Employability & Entrepreneurship

The graduates apply analytical, logical, and critical problem-solving skills in professional contexts, elevating employability and cultivating entrepreneurial capabilities through upskilling.

PEO 3: Regional/National/Global Relevance & Competency

The graduates foster advanced analytical skills and a heightened appreciation for current Regional/National/Global perspectives, enabling informed and sustainable decision-making in a dynamic environment.

PEO 4: Skill Enhancement, Self-Directed & Lifelong Learning

The graduates independently engage in skill-based learning, utilizing infrastructure and opportunities for continuous upskilling, enabling self-evaluation and lifelong excellence attainment.

PEO 5: Research Skills & Innovation

The graduates proficiently apply scientific reasoning, fostering creativity, strategic thinking, and effective problem-solving skills. They demonstrate a core competency in generating innovative ideas for advancements and inventions.

5. PROGRAMME OUTCOMES(POs)

PO 1: Knowledge: Gain fundamental knowledge in the field of Information Technology and its core concepts.

PO 2: Problem Solving: Identify and solve IT-related problems using appropriate tools, techniques, and logical approaches.

PO 3: Critical Thinking: Analyze computing problems and develop effective IT solutions using critical and analytical thinking skills.

PO 4: Individual and Team Work: Exhibit creativity and ethics while working individually and in a team in the IT environment.

PO 5: Communication and Lifelong Learning: Communicate effectively and pursue lifelong learning to enhance professional skills in cutting-edge technologies.

6. PROGRAMME SPECIFIC OUTCOMES(PSOs)

PSO 1: Specialized or Uniqueness: Apply specialized knowledge in emerging areas of Information Technology.

PSO 2: Experiential or Modern Tools Used: Utilize contemporary tools and technologies in IT industry practices.

PSO 3: Investigation or Research: Investigate, analyze and design suitable system architectures for organizational and business requirements using research methods.

PSO 4: Employability: Develop technical and professional skills to support career or higher education opportunities.

PSO 5: Inter-disciplinary or Multi-disciplinary: Integrate interdisciplinary and multidisciplinary knowledge to develop innovative computing solutions for diverse real-world applications.

7. PEO – PO MAPPING

	PEO 1	PEO2	PEO3	PEO4	PEO5
PO 1	3	3	3	3	3
PO 2	3	3	3	3	3
PO3	2	3	3	3	3
PO 4	2	3	3	3	3
PO 5	2	3	3	3	3

8. PEO – PSO MAPPING

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

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 subject paper 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 **B.Sc Information Technology** should have passed the higher Secondary Examinations (Academic or Vocational Stream) conducted by the Government of Tamil Nadu or an examination accepted as equivalent thereof by the Syn-dicate 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 for 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) Main subject (b) Allied Subjects (c) Elective subjects related to the main subject of study and project work.

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 and taken a non -Tamil language under Part – I, shall opt for Advanced 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.

Ability Enhancement 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 **B.Sc Information Technology** 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 Skills 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 as a compulsory component carries 2 credits and Project is a compulsory Core course with 4 credit for all the UG & PG programmes. Extension Activity is a compulsory component with one 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
	Self-study (Compulsory) Course	1	2
	EVS	1	2
	Value Education	1	2
	Internship	1	2
	Indian Knowledge System	1	1
Part V	Extension activity	1	1
Total		43	142

CREDIT DISTRIBUTION FOR EACH SEMESTER

Sem	Part	Course Component	Subject Name	Credits	HOUR	Internal	External	Total
I	I	Language	Language – I	3	6	50	50	100
	II	English	English- I	3	4	50	50	100
	III	Core I	Problem Solving Using C	4	5	50	50	100
		Core II	Practical I: Problem Solving Using C Lab	4	4	50	50	100
		Allied I	Allied Mathematics	4	5	50	50	100
	IV	Non-Major Elective I	Basic Tamil I/ Advanced Tamil I/ Web flow Lab	2	2	50	50	100
		Life Skills I	Value Education	2	2	50	50	100
		Ability Enhance- ment skills I	Communication and Personality Development Skills	2	2	50	50	100
	Total			24	30			
II	I	Language	Language – II	3	6	50	50	100
	II	English	English- II	3	4	50	50	100
	III	Core III	Programming in Java	4	6	50	50	100
		Core IV	Practical II: Programming in Java Lab	4	4	50	50	100
		Allied II	Statistics	4	6	50	50	100
	IV	Non-Major Elective II	Basic Tamil II/ Advanced Tamil II /Google Apps and Fundamentals Lab	2	2	50	50	100
		Ability Enhance- ment skills II	Foundations of quantitative aptitude	2	2	50	50	100
			Total			22	30	
III	III	Core V	Data Structures and Algorithmic Techniques	4	6	50	50	100
		Core VI	Foundations of Relational Database Management Systems	4	6	50	50	100
		Core VII	Python Programming	4	6	50	50	100
		Core VIII	Practical III: Data Structures and Algorithm Using Python Lab	4	4	50	50	100
		Allied III	Discrete Mathematics	4	6	50	50	100
	IV	Ability Enhance- ment skills III	Practical III: NO SQL Database	2	2		100	100
		Self-Study (Compulsory) Course	Indian Heritage and Knowledge System / Contemporary World and Sustainable Development	2	--	--	100	100
	Total			24	30			

Sem	Part	Course Component	Title	Credits	HOUR	Internal	External	Total
IV	III	Core IX	Big Data Analytics	4	5	50	50	100
		Core X	Operating System	4	6	50	50	100
		Core XI	Full Stack Development	4	6	50	50	100
		Core XII	Practical IV: Full Stack Development Lab	4	4	50	50	100
		Allied IV	Operations Research	4	6	50	50	100
	IV	Indian Knowledge Systems	Indian Knowledge System with Artificial Intelligence	1	1		100	100
		Ability Enhancement skills IV	Resume Writing and Interview Skills	2	2		100	100
Total				23	30			
V	III	Core XIII	Software Engineering Practices and Testing	4	6	50	50	100
		Core XIV	Foundations of Artificial Intelligence	4	6	50	50	100
		Core XV	Practical V: Artificial Intelligence using PROLOG Lab	4	5	50	50	100
		Elective I Inter- Disciplinary Elective	Data Visualization using Advanced Excel	4	5	50	50	100
		Elective II	Practical VI: Platform Engineering / Machine Learning/ Cyber Security	4	6	50	50	100
	IV	Life Skill II	Environment Studies	2	2		100	100
		Internship	Internship	2	--	--	--	--
Total				24	30			
VI	III	Core XVI	IoT Systems Design and Communication Technologies	4	5	50	50	100
		Core XVII	Natural Language Processing	4	6	50	50	100
		Core XVIII	R Programming for Data Science	4	5	50	50	100
		Core XIX	Practical VII: R Programming for Data Science Lab	4	4	50	50	100
		Core XX	Project	4	4	50	50	100
		Elective III	Cloud Computing / Mobile Computing / Parallel Computing	4	6	50	50	100
	V	Extension Activity		1		-	-	-
Total				25	30			

OVERALL CREDIT TOTAL = 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 / record book / 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 faculty concerned.

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

% 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 Practical's 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)	1. The lowest level of questions requires students to recall information from the course content 2. Knowledge questions usually require students to identify information in the textbook. 3. 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)	1. Understanding off acts and ideas by comprehending organizing, comparing, translating, interpolating and interpreting in their own words. 2. The questions go beyond simple recall and require students to combined at altogether 3. Suggested Keywords: Classify, Compare, Contrast, Demonstrate, Explain, Extend, Illustrate, In-fer, Interpret, Outline, Relate, Rephrase, Show, Summarize, Translate

Application (K3)	1. Students have to solve problems by using / applying a concept learned in the classroom. 2. Students must use their knowledge to determine a exact response. 3. Suggested Keywords: Apply, Build, Choose, Construct, Develop, Experiment with, Identify, Interview, make use of, Model, Organize, Plan, Select, Solve, Utilize
Analyze (K4)	1. Analyzing the question is one that asks the students to breakdown something into its component parts. 2. Analyzing requires students to identify reasons causes or motives and reach conclusions or generalizations. 3. 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)	1. Evaluation requires an individual to make judgment on something. 2. Questions to be asked to judge the value of an idea, a character, a work of art, or a solution to a problem. 3. Students are engaged in decision-making and problem-solving. 4. Evaluation questions do not have single right answers. 5. 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)	1. The questions of this category challenge students to get engaged in creative and original thinking. 2. Developing original ideas and problem-solving skills 3. 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: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-2029
PART: III	COURSE COMPONENT: CORE-I
COURSE NAME: PROBLEM SOLVING USING C	COURSE CODE: 26UBIT301
SEMESTER: I	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE:

To develop the ability to analyze a problem and develop an algorithm to solve it using C Programming.

COURSE OUTCOMES:

CO 1: Explain the concepts of programming techniques and C fundamentals.

CO 2: Apply data input/output functions and control structures in problem-solving.

CO 3: Apply functions and storage classes in program development.

CO 4: Implement arrays, strings, structures, and unions in C programming.

CO 5: Apply pointers and file handling techniques for efficient data management.

UNIT I

(18 HOURS)

Planning the Computer Program: Problem definition- Program design-Debugging-Types of Errors in programming, Techniques of Problem Solving: Algorithms- Flowcharting, C Fundamentals: Over View of C- History and Features of C- Structure of a C Program with Examples- Character Set- C tokens – Identifiers and Keywords – Data types -Constants - Variables- - Declaration & initialization of variables- symbolic constant.

UNIT II

(18 HOURS)

C Fundamentals: Expressions -Operators: Arithmetic, Unary, Relational and Logical, Assignment and Conditional- Library Functions. Data input output operations - Simple C programs - Control Structures: Decision making Statements - Simple if, if else statement, Nested if else, else if ladder, Multiple branching statements: Switch-case, go to-break - continue statements; Looping Statements - while, do-while, for loops, Nested Loops-Comma operator.

UNIT III

(18 HOURS)

Functions: Definition –Accessing Function-Function Prototypes-Passing arguments to functions-Calling a function- Category of Functions – Nesting of Functions - Recursion- Storage Classes: Automatic, External, Static, Register Variable.

UNIT IV

(18 HOURS)

Arrays: Defining and Processing - Passing arrays to functions — multi-dimension arrays – Arrays and Strings User defined data types: Structures: Structure definition – Structure Initialization – Array of structure – Array within structure –Structure within Structure, Unions: Union definition-; difference between Structures and Unions.

UNIT V

(18 HOURS)

Pointers: Declaring and Initializing pointers - Passing pointers to Functions - Operation in

Pointers - Pointer and Arrays- Pointer Expressions - Pointers and Character strings, File Management: Defining and Opening File –Closing a File – File Operation and File Functions – Command Line Arguments.

PRESCRIBED BOOKS:

1. E. Balaguruswamy, “Programming in ANSI C”- 8th edition, TMH publishing Company LTD
2. Byron Gottfried. (2018). Programming with C, 4th Edition, Tata McGraw Hill.
3. Programming in C, Dr.S. Ramaswamy and P.Radhaganesan, Scitech Publications (India) Pvt. Ltd.

REFERENCE BOOKS:

1. Yashavant Kanetkar, (2020). Let Us C, 16th Edition, BPB Publications, New Delhi.
2. N. Kanthane, 2008, Programming with ANSI and Turbo C, Pearson Education\
3. Pradeep K. Sinha and Priti Sinha: Computer Fundamentals (Sixth Edition), BPB Publication

E-LEARNING RESOURCES:

1. <https://www.geeksforgeeks.org/c-language-introduction/>
2. <https://www.learn-c.org/>
3. <https://www.cprogramming.com/>
4. <https://www.tutorialspoint.com/cprogramming/index.htm>

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 4 out of 6 questions (each in 1200 words)</i>	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

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	2	3	2	3	3
CO 2	3	3	3	2	2
CO 3	3	3	3	2	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	2.8	3	2.8	2.6	2.8

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	2
CO 2	3	3	3	2	3
CO 3	3	2	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	3	2.8	2.8

PO-PSO - CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Explain the concepts of programming techniques and C fundamentals.	PO1, PO2	PSO 1, PSO 4	K2
CO 2	Apply data input/output functions and control structures in problem-solving.	PO1, PO2, PO3	PSO 1, PSO 3, PSO 4	K3
CO 3	Apply functions and storage classes in program development.	PO2, PO3, PO4	PSO 1, PSO 2, PSO 4, PSO 5	K3
CO 4	Implement arrays, strings, structures, and unions in C programming.	PO3, PO4, PO5	PSO 1, PSO 2, PSO 3, PSO 4	K5
CO 5	Apply pointers and file handling techniques for efficient data management.	PO3, PO4, PO5	PSO 1, PSO 4, PSO 3	K3

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Problem Solving / Coding Tasks	10	5
Class activity 2	Seminar / Presentation	10	5
Class activity 3	Surprise Class Test / Quiz	10	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			

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-2029
PART: III	COURSE COMPONENT: CORE - II
COURSE NAME: PRACTICAL –I: PROBLEM SOLVING USING C LAB	COURSE CODE: 26UBIT302P
SEMESTER: I	MARKS:100
CREDITS: 4	TOTAL HOURS:60
PRACTICAL	

COURSE OBJECTIVE

To Read, understand, develop and trace the execution of programs written in C language.

COURSE OUTCOMES

CO 1: Apply input/output and conditional statements in C programs.

CO 2: Develop programs Using Conditional Structures in C.

CO 3: Develop programs using functions and recursion in C.

CO 4: Handle data using arrays, strings, and matrices.

CO 5: Implement structures, pointers, and file handling in C.

PROGRAMS

1. Write a program to find the largest of three numbers.
2. Write a program to print current date and time.
3. Create a program to check whether a number is Prime or not.
4. Write a program to check for Armstrong number.
5. Write a program to check whether a string is a palindrome or not.
6. Write a program to print Fibonacci series using function.
7. Write a program for counting the number of vowels, consonants, words, white spaces in a line of text.
8. Create a program to calculate factorial of a number using recursive function.
9. Create a program to perform the addition and subtraction of two matrices.
10. Create a program to perform the multiplication and division of two matrices.
11. Write a program to arrange a set of numbers in ascending and descending order using arrays.
12. Write a program to arrange a set of names in ascending and descending order using arrays.
13. Create a Program to Store Student Information Using Structure.
14. Create a program to explain and implement call by value and call by reference using pointers.
15. Write a program to read the names and marks of n students and store the details in a file. If the file already exists, append the new student records to the existing file.

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	2	3	2	2	2
CO 2	3	3	2	2	3
CO 3	3	3	3	3	2
CO 4	3	3	3	2	3
CO 5	3	3	3	3	3
AVG	2.8	3	2.6	2.6	2.6

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	2	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	3	2.8	3	3

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 toK6)
CO 1	Implement the concepts of sequential programming Conditional Structures in C.	PO 1, PO 2	PSO 1, PSO 3, PSO 5	K3
CO 2	Develop programs Using Conditional Structures in C.	PO 1, PO 2	PSO 1, PSO 4, PSO 5	K3
CO 3	Develop programs using functions and recursion in C.	PO 2, PO 3	PSO 1, PSO 4, PSO 5	K3
CO 4	Handle data using arrays, strings, and matrices.	PO 4, PO 5	PSO 1, PSO 3, PSO 4, PSO 5	K4
CO 5	Implement structures, pointers, and file handling in C.	PO 4, PO 5	PSO 1, PSO 3, PSO 4, PSO 5	K3

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

CIA COMPONENT

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 90 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Practical Record Book	Handwritten record of experiments, observations, results and conclusions	10	5
Class activity 1	Debugging Test	5	5
Class activity 2	Problem-solving Exercise	5	5
Class activity 3	Quiz with (MCQ)	5	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			

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026 - 29
PART: III	COURSE COMPONENT: ALLIED - I
COURSE NAME: Allied Mathematics	COURSE CODE: 26UBIT3A1
SEMESTER: I	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To improve basics in mathematical and analytical skills.

COURSE OUTCOMES:

CO 1: Implement the basic concepts of matrices and its applications.

CO 2: Demonstrate the concept finite difference and newtons raphson methods.

CO 3: Apply operations of matrix to find eigen value, interpolation formula, expansion of sine series.

CO 4: Analyze the verification of Cayley -Hamilton, interpolation for equal intervals, hyperbolic functions, particular solutions.

CO 5: Evaluate inverse of Matrix, interpolation for unequal intervals, maxima and minima of a function, general solution for differential equations.

UNIT I

(18 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

(18 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

(18 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

(18 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

(18 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 . Chapter 5, Section 5.2,5.2.1

PRESCRIBED BOOK:

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

BREAK UP OF QUESTIONS FOR THEORY

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
	2	10	-	7	-	6
TOTAL		12		7		6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	2	3	2	2	2
CO 2	2	3	2	3	2
CO 3	3	3	3	3	2
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	2.6	3	2.6	2.8	2.4

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	3	2	3
CO 2	3	3	2	2	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	2
AVG	2.8	3	2.8	2.6	2.8

PO-PSO-CO-QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Implement the basic concepts of matrices and its applications.	PO1, PO2	PSO1, PSO2, PSO5	K3
CO 2	Demonstrate the concept finite difference and newtons raphson methods.	PO1, PO4	PSO1, PSO2, PSO3, PSO5	K2
CO 3	Apply operations of matrix to find eigen value, interpolation formula, expansion of sine series.	PO3, PO4	PSO1, PSO2, PSO3, PSO4	K3
CO 4	Analyze the verification of Cayley - Hamilton, interpolation for equal intervals, hyperbolic functions, particular solutions.	PO3, PO4	PSO2, PSO3, PSO4, PSO5	K4
CO 5	Evaluate inverse of Matrix, interpolation for unequal intervals, maxima and minima of a function, general solution for differential equations.	PO3, PO4, PO5	PO 5, PSO1, PSO2, PSO3, PSO5	K5

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Workbook / Notebook Maintenance for Classwork	10	5
Class activity 1	Problem Solving Tasks	10	5
Class activity 2	Seminar / Presentation	10	5
Class activity 3	Surprise Class Test / Quiz	10	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			

PROGRAMME: For other programs Except B.Sc. IT	BATCH: 2026-29
PART- IV	COURSE COMPONENT: Non-Major Elective - I
COURSE NAME: PRACTICAL: WEB FLOW LAB	COURSE CODE: 26UNME4A100
SEMESTER: I	MARKS:100
CREDITS: 2	TOTAL HOURS: 30
PRACTICAL	

COURSE OBJECTIVE:

To learn and explore the in-browser design tool Web flow, that gives students the power to design, build, and launch responsive websites visually from scratch.

COURSE OUTCOMES:

- CO 1: Create and manage a website account in Web flow.
- CO 2: Implement the selection and customization of templates to meet specific design requirements.
- CO 3: Design website structure and navigation.
- CO 4: Edit content, images, and visual styles for better website appearance.
- CO 5: Implement the editing of text, buttons, colors, and hover states to achieve desired website design and functionality.

PROGRAMS:

1. Create a free web flow account and log in to access the dashboard.
2. Select and apply a suitable website template in web flow.
3. Create a homepage with header, banner, content, and footer sections.
4. Add new images and replace existing images in the website layout.
5. Edit website text content, headings, buttons, fonts, and colour schemes.
6. Apply and customize hover effects for buttons, images, and menu items.
7. Create a new webpage and configure its page settings in web flow.
8. Design and manage the website navigation menu with links to webpages.
9. Add animations and interaction effects using web flow interaction tools.
10. Check and optimize website responsiveness for desktops, tablet, and mobile devices.
11. Integrate required third-party applications or plugins into the website
12. Create and customize a footer section with social media icons and copyright details.
13. Add and style an image gallery using grid layout or slider components in web flow.
14. Create a call-to-action section with styled buttons, background images, and effects.
15. Embed a Google Map into the contact page using web flow embed components.

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	2.8	2.8	3

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	2	3	3
CO 4	3	3	2	3	3
CO 5	3	3	3	2	3
AVG	2.8	2.8	2.6	2.8	3

PSO-CO-QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Create and manage a website account in Web flow.	PO1, PO2	PSO 1, PSO 4, PSO 5	K6
CO 2	Implement the selection and customization of templates to meet specific design requirements	PO2, PO3	PSO 2, PSO 4	K3
CO 3	Design website structure and navigation.	PO1, PO2, PO 3	PSO 1, PSO 4, PSO 5	K2
CO 4	Edit content, images, and visual styles for better website appearance.	PO3, PO4	PO 5, PSO 1, PSO 4, PSO 5	K4
CO 5	Implement the editing of text, buttons, colors, and hover states to achieve desired website design and functionality.	PO1, PO, PO5	PSO 1, PSO 4, PSO 5	K3

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

CIA COMPONENT:

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 90 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Practical Record Book	Handwritten record of experiments, observations, results and conclusions	10	5
Class activity 1	Debugging Test	5	5
Class activity 2	Problem-solving Exercise	5	5
Class activity 3	Quiz with (MCQ)	5	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			

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
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:

CO1: Recall core value systems and their relevance to real-life situations and ethical decision-making in personal and social contexts.

CO2: Describe the role of culture and civilization in shaping individual and collective identities.

CO3: List salient values for life such as forgiveness, sacrifice, self-esteem, teamwork, and creative thinking.

CO4: Describe the relationship between human rights, social values, and contemporary social issues.

CO5: Recall the teachings of Guru Nanak Dev Ji and describe their connection to values and sustainable living.

UNIT 1: 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 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 2: 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, maturity, family members, neighbors, strangers, etc.

UNIT 3: 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 4: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 5: GURU NANAK DEVJI'S TEACHINGS**(6 HOURS)**

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

REFERENCE BOOKS:

1. Dr. Abdul Kalam. 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>

QUESTION PAPER PATTERN: MCQ

SOFT SKILLS: COMMON TO ALL	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:

- CO1: 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.
- CO2: Articulate thoughts, ideas, and information clearly and concisely, using appropriate language and structure to convey messages effectively in both written and verbal communication
- CO3: 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.
- CO4: 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.
- CO5: 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

(6 HOURS)

Types of Communication

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

(6 HOURS)

Etiquette & Ethical Practices in Communication

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**(6 HOURS)****Self-Actualization**

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

UNIT IV**(6 HOURS)****Leadership and Teamwork**

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

UNIT V**(6 HOURS)****Stress and Time Management**

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.

PRESCRIBED BOOKS

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	<i>Answer any 5 out of 7 questions (answer in 50 words)</i>	1-7	2	10
B	<i>Answer any 4 out of 6 questions (answer in 300 words)</i>	8-13	5	20
C	<i>Answer any two (Internal (Choice))</i>	14-15	10	20
	<i>Internal & Viva Voce</i>		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

SEMESTER - II

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: CORE - III
COURSE NAME: PROGRAMMING IN JAVA	COURSE CODE: 26UBIT303
SEMESTER: II	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE:

To gain knowledge of the structure and model of the Java programming language.

COURSE OUTCOMES:

- CO 1: Apply basic Java concepts and control structures to write programs.
- CO 2: Analyze Java OOP concepts and data handling techniques to develop programs.
- CO 3: Create interfaces, packages, and multithreading concepts in Java.
- CO 4: Describe various exceptions and understand the concepts of graphics.
- CO 5: Explain the concepts of Java Swing.

UNIT I (18 HOURS)

Introduction to Java - Features of Java - Basic Concepts of Object-Oriented Programming – Java Tokens - Java Statements – Constants – Variables - Data Types - Type Casting – Operators – Expressions - Control Statements: Branching and Looping Statements.

UNIT II (18 HOURS)

Classes, Objects and Methods - Constructors - Methods Overloading – Inheritance -Overriding Methods - Finalizer and Abstract Methods - Visibility Control –Arrays - Strings and Vectors - String Buffer Class.

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 - Syntax of Exception Handling Code - Using Finally Statement - Throwing Our Own Exceptions - Applet Programming - Applet Life Cycle-Graphics Programming.

UNIT V (18 HOURS)

Introduction to Java Swing-Swing Components-Creating Windows and Dialogs-Event Handling in Swing-Layout Management in Swing-Working with Text and Graphics in Swing-Using Swing Controls and Menus

PRESCRIBED BOOKS:

1. Y. Daniel Liang, 2018, An Introduction to JAVA Programming, Prentice – Hall of India Pvt. Ltd.
2. Cay S. Horstmann and Gary Cornell, 2013, Core Java™2 Volume I, Fundamental9th Edition, Pearson Education.

REFERENCE BOOKS:

1. E. Balagurusamy 2004, Programming with JAVA – 7th Edition, Tata McGraw-Hill Publishing Co. Ltd, New Delhi.
2. Herbert Schildt, The Complete Reference Java TM 2-5th Edition, Tata McGraw-Hill Publishing Co. Ltd, New Delhi

E-LEARNING RESOURCES:

1. https://www.w3schools.com/java/java_intro.asp

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 4 out of 6 questions (each in 1200 words)</i>	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

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	2	2	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	2	3	3	2
CO 5	3	3	3	3	3
AVG	3	2.8	2.8	2.8	2.8

PSO – CO Mapping

	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	2	3
CO 2	3	3	3	3	2
CO 3	3	3	2	3	3
CO 4	3	3	3	2	2
CO 5	3	3	3	3	3
AVG	3	3	2.8	2.6	2.6

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Apply basic Java concepts and control structures to write programs.	PO2, PO3	PSO1, PSO3	K3
CO 2	Analyze Java OOP concepts and data handling techniques to develop programs.	PO2, PO3	PSO1, PSO2	K4
CO 3	Create interfaces, packages, and multithreading concepts in Java	PO1, PO2	PSO1, PSO2, PSO3	K6
CO 4	Describe various exceptions and understand the concepts of graphics.	PO2, PO3, PO4	PSO1, PSO2, PSO4, PSO5	K4
CO 5	Explain the concepts of Java Swing.	PO2, PO3, PO4	PSO1, PSO2, PSO5	K2, K5

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

CIA COMPONENT:

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Problem Solving Tasks	10	5
Class activity 2	Seminar / Presentation	10	5
Class activity 3	Surprise Class Test / Quiz	10	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

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: CORE - IV
COURSE NAME: PRACTICAL II: PROGRAMMING IN JAVA LAB	COURSE CODE: 26UBIT304P
SEMESTER: II	MARKS:100
CREDITS: 4	TOTAL HOURS: 60
PRACTICAL	

COURSE OBJECTIVE:

To Implement Object Oriented programming concept and to build Java Applications.

COURSE OUTCOMES:

CO 1: Create control structures, strings, and functions to develop java programs.

CO 2: Apply OOPS such as classes, objects, and their relationships to solve specific problems.

CO 3: Achieve code reusability and faster application development using inheritance, interfaces, and packages.

CO 4: Create Java applications with threads and generics classes.

CO 5: Apply exception handling and multithreading for robust and efficient Java application development.

PROGRAMS:

1. Write a Simple Java Program to Demonstrate Class and Object On OOPS
2. Write a Java Program to Demonstrate the Constructor in a Class
3. Write a Java Program to Implement Method Overloading in a Class
4. Write a Java Program to Implement Single Inheritance.
5. Write a Java Program to Demonstrate Method Overriding in Inheritance
6. Write a Java Program to Implement Package with Various Access Modifiers
7. Write a Java Program to implement Interface in a class
8. Write a Java Program to demonstrate the use of Super and This Keyword
9. Write a Java Program for demonstrate Exception Handling
10. Write a Java Program to achieve Multi-Threading Using Thread Class
11. Write a Java Program to Displaying Image in an Applet
12. Write a Java Program to create Buttons using Applet?
13. Write a Java program to create Frames using Applet
14. Write a Java Program to create different Shapes and apply fill colors to fill the shape using Applet?
15. Write a java program to develop GUI application using Swing components

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	2	2	2
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	3	2.8	3	2.8

PSO – CO MAPPING

	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3
CO 2	3	2	3	3	3
CO 3	3	3	2	3	3
CO 4	3	3	3	3	2
CO 5	3	3	2	3	3
AVG	3	2.8	2.6	3	2.8

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Create control structures, strings, and functions to develop java programs.	PO1, PO2	PSO1, PSO4	K3
CO 2	Apply OOPS such as classes, objects, and their relationships to solve specific problems.	PO2, PO3	PSO1, PSO3	K3
CO 3	Achieve code reusability and faster application development using inheritance, interfaces, and packages.	PO2, PO3	PSO1, PSO4,	K5
CO 4	Create Java applications with threads and generics classes.	PO3, PO4	PSO1, PSO2	K6
CO 5	Apply exception handling and multithreading for robust and efficient Java application development.	PO4, PO5	PSO1, PSO5	K5

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

CIA COMPONENT

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 90 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Practical Record Book	Handwritten record of experiments, observations, results and conclusions	10	5
Class activity 1	Debugging Test	5	5
Class activity 2	Problem-solving Exercise	5	5
Class activity 3	Quiz with (MCQ)	5	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			

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026 – 29
PART: III	COURSE COMPONENT: ALLIED - II
COURSE NAME: STATISTICS	COURSE CODE: 26UBIT3A2
SEMESTER: II	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

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

COURSE OUTCOMES:

CO 1: Apply the basics of statistical data, meaning of correlation and regression and probability.

CO 2: Demonstrate the concept measures of central tendency and dispersion.

CO 3: Apply the concepts of data in various types of averages and deviations and probability models.

CO 4: Analyze graphical representation, measures of central tendency, dispersion correlation and regression.

CO 5: Evaluate different types of measures of central tendency, dispersion conditional probability and Baye's Theorem

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

PRESCRIBED BOOK:

1. 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 - 3/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-andmathematics-ebooks

GUIDELINES TO THE QUESTION PAPER SETTERS**QUESTION PAPER PATTERN**

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

BREAK UP OF QUESTIONS FOR THEORY

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
	5	7	-	7	-	6
TOTAL	12		7		6	

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	3	2	3
CO 2	3	3	3	3	2
CO 3	3	2	3	3	3
CO 4	3	3	3	2	3
CO 5	2	3	3	3	3
AVG	2.8	3	3	2.6	2.8

PSO-CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	3	3	3
CO 2	3	2	3	3	2
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	2.8	2.8	3	3	2.8

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Apply the basics of statistical data, meaning of correlation and regression and probability.	PO 1, PO 2	PSO 1, PSO 2, PSO 5	K1
CO 2	Demonstrate the concept measures of central tendency and dispersion.	PO 1, PO 2	PSO 1, PSO 3, PSO 5	K1, K2
CO 3	Apply the concepts of data in various types of averages and deviations and probability models.	PO 3, PO 4	PSO 1, PSO 2, PSO 3, PSO 4	K3
CO 4	Analyze graphical representation, measures of central tendency, dispersion correlation and regression.	PO 2, PO 3	PO 4, PSO 1, PSO 2, PSO 3, PSO 5	K3, K4
CO 5	Evaluate different types of measures of central tendency, dispersion conditional probability and Baye's Theorem.	PO 3, PO 5	PSO 1, PSO 3, PSO 4, PSO 5	K4, K5

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Workbook / Notebook Maintenance for Classwork	10	5
Class activity 1	Problem Solving Tasks	10	5
Class activity 2	Seminar / Presentation	10	5
Class activity 3	Surprise Class Test / Quiz	10	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			

PROGRAMME: For other programs Except B.Sc. IT	BATCH: 2026-29
PART: IV	COURSE COMPONENT: NON-MAJOR ELECTIVE – II
COURSE NAME: PRACTICAL: GOOGLE APPS AND FUNDAMENTALS LAB	COURSE CODE: 26UNME4B100
SEMESTER: II	MARKS:100
CREDITS: 2	TOTAL HOURS: 30
PRACTICAL	

COURSE OBJECTIVE:

To master Google Suite for productivity, collaboration, and communication in diverse contexts.

COURSE OUTCOMES:

CO 1: Create and format documents using Google Docs.

CO 2: Implement effective data analysis and visualization with Google Sheets.

CO 3: Design presentations to incorporate multimedia elements using Google Slides.

CO 4: Create surveys and manage files using Forms and Drive.

CO 5: Implement streamlined surveys, feedback collection, and task management using Google Forms, Drive and calendar.

PROGRAMS:

1. **Google Docs:** Create a CV incorporating various features of google docs.
2. **Google Sheets:** Create a student mark spreadsheet containing marks of various subjects. Perform mathematical operation and find the total, average, maximum and minimum marks.
3. **Google Slides:** Design a presentation about your favourite personality using google slides incorporating images, charts and transitions.
4. **Google Forms:** Develop a survey to gather feedback on a recent event or product, including various question types.
5. **Google Drive:** Organize and share a folder containing documents, spreadsheets, and presentations related to a specific project.
6. **Google Calendar:** Schedule a series of exam schedules for a student using google calendar and set reminders.
7. **Google Keep:** Make a checklist for assignments, class activities including class tests and exam preparations.
8. **Google Photos:** Create an album capturing the highlights of a recent trip or event and share it with friends.
9. **Google Sites:** Create and publish a simple website.
10. **Google Classroom:** Create a digital classroom where teachers and students can share work, feedback, and assignments.

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	2	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	2.8	2.8	3

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	2
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	3	2	3
CO 5	3	2	3	3	3
AVG	3	2.8	3	2.6	2.8

PO-PSO-CO-QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Create and format documents using Google Docs.	PO 1, PO 2	PSO 1, PSO 4, PSO 5	K3
CO 2	Implement effective data analysis and visualization with Google Sheets.	PO 1, PO 2	PSO 1, PSO 4, PSO 5	K3
CO 3	Design presentations to incorporate multimedia elements using Google Slides.	PO 3, PO 4	PSO 1, PSO 4, PSO 5	K3
CO 4	Create surveys and manage files using Forms and Drive.	PO 3, PO 4	PSO 1, PSO 4, PSO 5	K3
CO 5	Use Google tools for scheduling, organization, and collaboration	PO 4, PO 5	PSO 1, PSO 4, PSO 5	K3

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

CIA COMPONENT

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 90 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Practical Record Book	Handwritten record of experiments, observations, results and conclusions	10	5
Class activity 1	Debugging Test	5	5
Class activity 2	Problem-solving Exercise	5	5
Class activity 3	Quiz with (MCQ)	5	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			

PROGRAMME: ALL UG	BATCH: 2026-29
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:

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

COURSE OUTCOME:

- CO1: Apply the concepts of number systems, divisibility rules, and number series to solve numerical problems.
- CO2: Compute HCF and LCM of numbers using prime factorization method.
- CO3: Apply percentage concepts to solve problems involving profit, loss, cost price, and selling price.
- CO4: Compare simple interest and compound interest to solve financial problems.
- CO5: Interpret data from tables and graphs to draw meaningful conclusions.

UNIT I

(6 HOURS)

Number system and Number series

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

(6 HOURS)

HCF and LCM of Numbers

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

UNIT III

(6 HOURS)

Percentage, Profit and Loss

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

(6 HOURS)

Simple Interest and Compound Interest

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

(6 HOURS)

Data interpretation

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

PRESCRIBED BOOK:

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/numeral-system/#:~:text=crore%20is%207.-,International%20Numeral%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

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: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: CORE - V
COURSE NAME: DATA STRUCTURES AND ALGORITHMIC TECHNIQUES	COURSE CODE: 26UBIT305
SEMESTER: III	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE:

To learn and analyze the different data structures and algorithms for problem solving.

COURSE OUTCOMES:

CO 1: Analyse data structures, algorithms and their performance

CO 2: Implement and apply stacks and queues in data manipulation.

CO 3: Develop and manipulate linked lists, trees, and graphs.

CO 4: Apply divide-and-conquer and greedy methods to solve computational problems.

CO 5: Solve optimization problems using dynamic programming techniques

UNIT I

(15 HOURS)

INTRODUCTION TO ALGORITHMS AND DATA STRUCTURES

Algorithms: Definition, Properties, Performance Analysis-Space Complexity, Time Complexity, Asymptotic Notations. Data structures: Introduction, Data Structure types, DS Operations.

UNIT II

(15 HOURS)

STACKS AND QUEUES

Stacks: Introduction, Stack Operations, Applications: Infix to Postfix Conversion, Evaluation of Postfix Expression. Queues: Introduction, Operations on queues, Circular queues.

UNIT III

(15 HOURS)

LINKED LISTS AND APPLICATIONS

Linked lists: Introduction, singly linked lists, Circular linked lists, doubly linked lists, Applications: Polynomial Representation. Trees and graphs: Introduction, Definition and basic terminologies, graph definition, representation.

UNIT IV

(15 HOURS)

DIVIDE AND CONQUER

Divide and Conquer: General method, finding maximum and minimum, Merge sort, Quick sort, Greedy Method: General Method, Knapsack problem, Job sequencing with deadlines.

UNIT V

(15 HOURS)

DYNAMIC PROGRAMMING

Dynamic programming: General Method, Multistage graphs, All pairs shortest paths, String editing, 0/1 Knap sack problem.

PRESCRIBED BOOKS:

1. G.A.V PAI, Data Structures and Algorithms, Concepts, Techniques and Applications, Volume1, 1stEdition, Tata McGraw-Hill, 2017.
2. Horowitz and Sahani, Fundamentals of Computer Algorithms, 2ND Edition, 2012.

REFERENCE BOOKS:

1. Langsam, M. J. Augenstein, A. M. Tanenbaum, Data structures using C and C++, 2nd Edition, PHI Education, 2015
2. Sartaj Sahni, Ellis Horowitz, Fundamentals of at Structures in C, 2nd Edition, Orientblackswan, 2010.

E-LEARNING RESOURCES:

- 1.<https://www.geeksforgeeks.org/data-structures/>
- 2.<https://www.programiz.com/dsa>
- 3.<https://www.w3schools.in/data-structures-tutorial/intro/>

GUIDELINES TO THE QUESTION PAPER SETTERS**QUESTION PAPER PATTERN**

Section	Question Component	Numbers	Marks	Total
A	Definition / Principles Answer any 10 out of 12 questions	1 – 12	3	30
B	Short Answer Answer any 5 out of 7 questions	13–19	6	30
C	Essay 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
I	3	2	2
II	3	1	1
III	2	1	1
IV	2	2	1
V	2	1	1
TOTAL	12	7	6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	3	2	3
CO 2	2	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	2
CO 5	3	3	3	3	3
AVG	2.8	3	3	2.8	2.8

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	2	3	2	2
CO 3	3	3	3	3	3
CO 4	3	3	3	2	3
CO 5	3	3	3	3	3
AVG	3	2.8	3	2.6	2.8

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Analyse data structures, algorithms and their performance.	PO1, PO2	PSO2, PSO3 PSO4	K4
CO 2	Implement and apply stacks and queues in data manipulation.	PO3, PO4	PSO2, PSO5	K3
CO 3	Develop and manipulate linked lists, trees, and graphs.	PO3, PO5	PSO 2, PSO 4, PSO 5	K6
CO 4	Apply divide-and-conquer and greedy methods to solve computational problems.	PO1, PO3, PO4	PSO1, PSO 2, PSO 5	K3
CO 5	Solve optimization problems using dynamic programming techniques.	PO4, PO5	PSO 2, PSO 4, PSO 5	K6

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Seminar / Presentation	10	5
Class activity 2	Quiz (MCQ)	10	5
Class activity 3	Surprise Class Test	10	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			

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: CORE - VI
COURSE NAME: FOUNDATIONS OF RELATIONAL DATABASE MANAGEMENT SYSTEMS	COURSE CODE: 26UBIT306
SEMESTER: III	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE

Analyze the existing design of a database schema and Create database for real-life applications, with constraints and keys, using SQL and PL/SQL.

COURSE OUTCOMES

CO 1: Describe the conceptual models of a database using ER modelling.

CO 2: Apply relational algebra operations for querying and data manipulation.

CO 3: Create database design tools for efficient schema creation.

CO 4: Develop and apply SQL skills to manage and manipulate databases effectively.

CO 5: Apply PL/SQL programming skills for advanced database operations.

UNIT I

(18 HOURS)

Introduction to DBMS– Data and Information- Database – Database Management System – Objectives - Advantages – Components - Architecture. ER Model: Building blocks of ER Diagram – Relationship Degree – Classification – ER diagram to Tables – ISA relationship – Constraints – Aggregation and Composition – Advantages.

UNIT II

(18 HOURS)

Relational Model: CODD's Rule- Relational Data Model - Key - Integrity – Relational Algebra Operations – Advantages and limitations – Relational Calculus – Domain Relational Calculus - QBE.

UNIT III

(18 HOURS)

Structure of Relational Database. Introduction to Relational Database Design - Objectives – Tools – Redundancy and Data Anomaly – Functional Dependency - Normalization – 1NF – 2NF – 3NF – BCNF. Transaction Processing – Database Security.

UNIT IV

(18 HOURS)

SQL: Commands – Data types – DDL - Selection, Projection, Join and Set Operations – Aggregate Functions – DML – Modification - Truncation - Constraints – Subquery.

UNIT V

(18 HOURS)

PL/SQL: Structure - Elements – Operators Precedence – Control Structure – Iterative Control - Cursors - Procedure - Function - Packages – Exceptional Handling - Triggers.

PRESCRIBED BOOKS:

1. Abraham Silberchatz, Henry F. Korth, S. Sudarshan, “Database System Concepts”, 7th edition, McGrawHill, 2021.
2. Fundamentals of Relational Database Management System, Dr. J. Vanathi and Mr. T. Ravishankar, 2022, Island Publishers Tamilnadu, India.

REFERENCE BOOKS:

1. Alexis Leon & Mathews Leon, “Fundamentals of DBMS”, 2nd Edition, Vijay Nicole Publications, 2014.
2. S. Sumathi, S. Esakkirajan, “Fundamentals of Relational Database Management Systems”, Springer International Edition, 2007.

E-LEARNING RESOURCES:

1. NPTEL & MOOC courses titled Relational Database Management Systems
2. <https://nptel.ac.in/courses/106106093/>
3. <https://nptel.ac.in/courses/106106095/>
4. <https://www.javatpoint.com/what-is-rdbms>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

Section	Question Component	Numbers	Marks	Total
A	Definition / Principles Answer any 10 out of 12 questions	1 – 12	3	30
B	Short Answer Answer any 5 out of 7 questions	13–19	6	30
C	Essay 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
I	3	2	2
II	3	1	1
III	2	1	1
IV	2	2	1
V	2	1	1
TOTAL	12	7	6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	3	3	3
CO 2	3	3	3	2	2
CO 3	2	3	3	3	3
CO 4	3	3	3	3	2
CO 5	3	3	3	3	3
AVG	2.8	2.8	3	2.8	2.6

PSO – CO MAPPING

	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	2	3
AVG	3	3	3	2.8	3

PO – PSO – CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Describe the conceptual models of a database using ER modelling.	PO1, PO2	PSO1, PSO2, PSO4	K2
CO 2	Apply relational algebra operations for querying and data manipulation.	PO1, PO2, PO3	PSO1, PSO2, PSO5	K3
CO 3	Create database design tools for efficient schema creation.	PO3, PO4	PSO2, PSO4, PSO 5	K6
CO 4	Develop and apply SQL skills to manage and manipulate databases effectively.	PO3, PO4	PSO1, PSO2, PSO4	K6
CO 5	Apply PL/SQL programming skills for advanced database operations.	PO4, PO5	PSO1, PSO4, PSO5	K3

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Seminar / Presentation	10	5
Class activity 2	Quiz (MCQ)	10	5
Class activity 3	Surprise Class Test	10	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			

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: CORE - VII
COURSE NAME: PYTHON PROGRAMMING	COURSE CODE: 26UBIT307
SEMESTER: III	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE:

To explore the mechanism of python programming using modules and package.

COURSE OUTCOMES:

CO 1: Describe the basic concepts of Python Syntax and Semantics.

CO 2: Implement the control structures in Python programs.

CO 3: Apply the functional concepts and strings in Python.

CO 4: Analyze various data structures in Python.

CO 5: Explain the object-oriented programming concepts in Python.

UNIT I

(18 HOURS)

Introduction: Introduction to Python, Expressions, Statements: Variables, Keywords, Operators & Operands, Order of Operations, String Operations, Comments, Keyboard Input. Functions: Type Conversion function, Math functions, Composition of Functions, defining own function, Parameters, Arguments, Importing Functions.

UNIT II

(18 HOURS)

Conditions & Iterations: Conditions, Modulus Operators, If Statement. Iteration while, for, break, continue, Nested loop. Recursion: Python recursion, Recursion error. Strings: Accessing values in String, Updating String, Slicing String.

UNIT III

(18 HOURS)

String Methods – upper (), find (), lower (), capitalize (), count (), join (), len (), isalnum (), isalpha (), isdigit (), islower (), isnumeric (), isspace (), isupper () max (), min (), replace (), split (). Structures & Functions: List: Introduction, Traversal, Operations, Slice, Methods, Delete element, Difference between Lists and Strings. Dictionaries: Introduction, Brief idea of Dictionaries & Lists

UNIT IV

(18HOURS)

Tuples: Introduction, Brief idea of Lists & Tuples, Brief idea of Dictionaries & Tuples. Date & Time, Modules, Defining Functions, Exit function, Default arguments. Classes & Objects: Creating class, Instance objects, accessing attributes, built in class attributes, destroying objects, Inheritance, Method overriding, Overloading methods, Overloading operators, Data

UNIT V**(18 HOURS)**

Anonymous Functions: lambda - Functional Programming Tools - Timing Iteration Alternatives - Modules and Packages - Python Program Architecture - Module Coding Basics: Module Creation, Usage, Namespaces -Reloading Modules – Module design Concepts. Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions.

PRESCRIBED BOOKS:

1. Allen Downey, Jeffrey Elkner, Chris Meyers, How to Think Like a Computer Scientist - Learning with Python, Green Tea Press, 2015, 2nd edition.
2. Python programming made easy, 2020, Dr. J. Vanathi, G. SriPradha, T. Ravishankar, Pranesh Publication, No. 16, Chinnappa st, Triplicane, Chennai.

REFERENCE BOOKS:

1. MarkLutz, Learning Python: Powerful Object-Oriented Programming, Fifth Edition, O'Reilly, Shroff Publishers and Distributors, 2014.

E-LEARNING RESOURCES:

1. <https://docs.python.org/3/tutorial/index.html>
2. <https://www.w3schools.com/python/>
3. <https://www.programiz.com/python-programming>

GUIDELINES TO THE QUESTION PAPER SETTERS**QUESTION PAPER PATTERN**

Section	Question Component	Numbers	Marks	Total
A	Definition / Principles <i>Answer any 10 out of 12 questions</i>	1 – 12	3	30
B	Short Answer <i>Answer any 5 out of 7 questions</i>	13–19	6	30
C	Essay <i>Answer any 4 out of 6 questions</i>	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

PO - CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	2
CO 3	3	2	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	2	3
AVG	3	2.8	3	2.8	2.8

PSO – CO MAPPING

	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	3	3	3	3

PO-PSO-CO-QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POS ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Describe the basic concepts of Python Syntax and Semantics	PO1, PO2	PSO1, PSO2	K1
CO 2	Understand the control structures in Python programs	PO1	PSO1, PSO3	K2
CO 3	Apply the functional concepts and strings in Python.	PO2, PO3	PSO1, PSO4	K3
CO 4	Analyze the data structure concepts in Python	PO2, PO3	PSO1, PSO3	K4
CO 5	Explain the concepts of OOPS in Python.	PO3, PO4, PO 5,	PSO1, PSO5	K5

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Problem Solving / Coding Tasks	10	5
Class activity 2	Seminar / Presentation	10	5
Class activity 3	Surprise Class Test / Quiz	10	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			

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: CORE - VIII
COURSE NAME: PRACTICAL III: DATA STRUCTURES USING PYTHON LAB	COURSE CODE: 26UBIT308P
SEMESTER: III	MARKS:100
CREDITS: 4	TOTAL HOURS: 60
PRACTICAL	

COURSE OBJECTIVE:

To enable students to understand and implement basic data structures using Python and apply them to solve programming problems effectively.

COURSE OUTCOMES:

CO 1: Describe and implement fundamental data structures.

CO 2: Implement advanced data structures lists, tuples, dictionaries, and arrays.

CO 3: Apply object-oriented programming concepts in data structures.

CO 4: Analyze and implement fundamental data structures including stack, queue, linked list, trees, and graphs using Python.

CO 5: Develop and implement algorithmic solutions such as sorting and shortest path algorithms.

PROGRAMS:

1. Design a student performance evaluator program using various Python Operators.
2. Write a Python program, Voting Eligibility Checker to demonstrate use of conditional statements
3. Develop a Python program ATM Cash Withdrawal Simulator to demonstrate use of control loop.
4. Develop a program that demonstrates various list operations, including creation, insertion, deletion, sorting, slicing, and iteration.
5. Write a Python program to illustrate tuple properties and operations such as accessing elements, concatenation, repetition, and conversion between lists and tuples.
6. Create a Python program to perform CRUD (Create, Read, Update, Delete) operations on a dictionary. Implement real-world data, such as a student database.
7. Write program in Python to demonstrate following operations:
 - a) Method overloading b) Method overriding
8. Write a program in Python for handling array to demonstrate following operations:
 - a) Array declaration b) Insertion c) Deletion d) Append e) Index f) Reverse
9. Write a program in Python for linked list to demonstrate following operations:
 - a) Insertion b) Deletion c) Updating d) Merging to list
10. Write a program to perform Push and Pop operations in a stack.
11. Write a program in Python to demonstrate queue data structure operations:
 - a) Enqueue b) Dequeue c) Display

12. Develop a Python program to create a binary tree from a given list and perform traversal operations (inorder, preorder, and postorder) using the binary tree module.
13. Write a Python program to represent a graph using an adjacency list or adjacency matrix. Implement graph traversal techniques:
 - a) Breadth-First Search (BFS) b) Depth-First Search (DFS)
14. Develop a Python program to implement Merge Sort Algorithm (Divide and Conquer)
15. Write a Python program to implement Dijkstra's Algorithm Using a Graph.

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	3	3
CO 4	3	2	3	3	3
CO 5	3	3	2	3	3
AVG	3	2.8	2.8	2.6	2.6

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	2	2	3	3
CO 3	3	3	3	3	2
CO 4	3	3	3	3	3
CO 5	2	3	2	3	3
AVG	2.8	2.8	2.6	3	2.8

PO-PSO-CO QUESTION PAPER MAPPING

CO	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Describe and implement fundamental data structures.	PO 1	PSO 1, PSO 4, PSO 5	K2
CO 2	Implement advanced data structures lists, tuples, dictionaries, and arrays.	PO 2, PO 3	PSO 1, PSO 4, PSO 5	K3
CO 3	Apply object-oriented programming concepts in data structures.	PO 2, PO 3	PSO 2, PSO 4, PSO 5	K3
CO 4	Analyze and implement fundamental data structures including stack, queue, linked list, trees, and graphs using Python.	PO 3, PO 4	PSO 1, PSO 4, PSO 5	K4
CO 5	Develop and implement algorithmic solutions such as sorting and shortest path algorithms.	PO 3, PO 4	PO 5, PSO 4, PSO 5	K6

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

CIA COMPONENT

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 90 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Practical Record Book	Handwritten record of experiments, observations, results and conclusions	10	5
Class activity 1	Debugging Test	5	5
Class activity 2	Problem-solving Exercise	5	5
Class activity 3	Quiz with (MCQ)	5	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			

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026 - 29
PART: III	COURSE COMPONENT: ALLIED -III
COURSE NAME: DISCRETE MATHEMATICS	COURSE CODE: 26UBIT3A3
SEMESTER: III	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To introduce the concepts of discrete mathematics and enhance math computing skills.

COURSE OUTCOMES:

CO 1: Characterize the fundamental ideas of logic, combinatorics, graphs, set structures, and lattices.

CO 2: Apply concepts related to logic, combinatorics, graphs, sets and lattices.

CO 3: To apply the concepts of logic, graph introductions, combinatorics set structures and lattices into practice.

CO 4: Analyze lattices, graph introductions, logic, combinatorics, and set structures.

CO 5: Evaluate the concepts of logic, combinatorics, graph introductions, set structures, and lattices.

UNIT I (18 HOURS)

Logic and Proofs: Propositional Logic, Propositional equivalences, Predicates and quantifiers
Chapter - 1(Page No.: 1 to 26 and 29 to 42 (Textbook 1)

UNIT II (18 HOURS)

Combinatorics: Mathematical induction, Strong induction and well ordering, The basics of counting, The Pigeonhole Principle, Permutation and combinations. Chapter – 6 (Page No.: 314 to 342) (Textbook 1)

UNIT III (18 HOURS)

Graph Theory: Graphs and graph models, Graph terminology and special types of graphs, presenting graphs and graph isomorphism, connectivity, Euler and Hamilton paths. Chapter - 7(Page No. :366 to 393) (Textbook 1)

UNIT IV (18 HOURS)

Structured Sets: Algebraic structures, Groups, Semigroups, monoid, co-sets, Lagrange's Theorem, homomorphism. Chapter – 5 (Page No.: 232 to 266) (Volume 1)

UNIT V (18 HOURS)

Lattices and Boolean Algebra: Partial ordering, Posets – Lattices and Posets, Properties of lattices, Lattices as algebraic systems, Sub lattices, Direct product and homomorphism, Boolean algebra. Chapter - 4: Section 4.1, 4.2, 4.5, 4.7, 4.10, 4.11, 4.12 (Textbook 2)

PRESCRIBED BOOKS:

1. T. Veerarajan, "Discrete Mathematics" Tata McGraw Hill Pub. Co. Ltd., New Delhi,

2. J.P. Singh, "Discrete Mathematics for undergraduates" Ane Book Pvt. Ltd.

REFERENCE BOOKS:

1. Grimaldi. R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2013.
2. Koshy. T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.
3. Lipchitz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

E-LEARNING RESOURCES:

1. <https://mu.ac.in/wp-content/uploads/2021/05/Decision-Making-and-Mathematical-Modeling-Final-1-converted.pdf>
2. <https://www.geeksforgeeks.org/mathematics-combinatorics-basics>
3. <https://nptel.ac.in/courses/111106050>
4. <https://www.geeksforgeeks.org/groups-discrete-mathematics>
5. <https://calcworkshop.com/relations/lattices/>

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 FOR THEORY

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	2	-	1	-	1	-
V	1	1	-	1	-	1
Any Unit	-	2	1	1	-	1
	6	6	3	4	2	4
TOTAL	12		7		6	

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	3	2	2
CO 2	3	3	3	3	3
CO 3	3	3	3	2	3
CO 4	3	2	3	3	2
CO 5	3	3	2	3	3
AVG	3	2.8	2.8	2.6	2.6

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	2
CO 2	2	2	3	2	3
CO 3	3	3	2	3	2
CO 4	3	3	3	3	3
CO 5	3	2	3	2	3
AVG	2.8	2.6	2.8	2.6	2.6

PO-PSO-CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	PSOs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Characterize the fundamental ideas of logic, combinatorics, graphs, set structures, and lattices.	PO 1, PO 2	PSO1, PSO2, PSO5	K1
CO 2	Apply concepts related to logic, combinatorics, graphs, sets and lattices.	PO 2, PO 3	PSO2, PSO3, PSO5	K2
CO 3	Create the concepts of logic, graph introductions, combinatorics set structures and lattices into practice.	PO 2, PO 3	PSO2, PSO3, PSO4, PSO5	K3
CO 4	Analyze lattices, graph introductions, logic, combinatorics, and set structures.	PO 4, PO 5	PSO1, PSO3, PSO4, PSO5	K4, K5
CO 5	Evaluate the concepts of logic, combinatorics, graph introductions, set structures, and lattices	PO 4, PO 5	PSO2, PSO3, PSO4, PSO5	K5, K6

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

CIA COMPONENT

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	Any topic related to the course	10	5
Workbook / record book / notebook	Workbook / Notebook Maintenance for Classwork	10	5
Class activity 1	Problem Solving Tasks	10	5
Class activity 2	Seminar / Presentation	10	5
Class activity 3	Surprise Class Test / Quiz	10	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			

PROGRAMME: COMMON TO ALL IT STUDENTS	BATCH: 2026-29
PART: IV	COURSE COMPONENT: ABILITY ENHANCEMENT SKILLS III
COURSE NAME: Practical: NoSQL Database	COURSE CODE: 26USKL408
SEMESTER: III	MARKS: - 100
CREDITS: 2	TOTAL HOURS: 30
PRACTICAL	

COURSE OBJECTIVE:

To impart foundations and the key skills of NoSQL Databases.

COURSE OUTCOMES:

- CO 1: Install and configure NoSQL databases such as Redis, MongoDB, Cassandra, and Neo4j on Windows and Linux environments.
- CO 2: Perform basic database operations on different NoSQL databases.
- CO 3: Apply query operations in MongoDB such as filtering, sorting, and limiting records.
- CO 4: Implement advanced database features including indexing, advanced indexing, aggregation, and MapReduce techniques.
- CO 5: Analyze and manipulate real-world datasets by executing queries to extract meaningful information.

PROGRAMS:

1. Installation of NoSQL Databases: MongoDB
2. NoSQL Commands to perform Create, Read operations on the MongoDB
3. NoSQL Commands to perform Update, and Delete operations on the MongoDB
4. Usage of Where Clause equivalent in MongoDB
5. Usage of operations in MongoDB – AND in MongoDB, OR in MongoDB
6. NoSQL Command to Limit Records and Sort Records.
7. Usage of operations in MongoDB – Indexing, Advanced Indexing, Aggregation and Map Reduce.
8. Write a program to demonstrate Unwind command, Skip command and Limit command.
9. Write a NoSQL Command Write a program to implement MongoDB Text Search.
10. Practice with ' MacDonald's ' collection data for document-oriented database. Import restaurants collection and apply some queries to get specified output.

CIA COMPONENT

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 90 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Practical Record Book	Handwritten record of experiments, observations, results and conclusions	10	5
Class activity 1	Debugging Test	5	5
Class activity 2	Problem-solving Exercise	5	5
Class activity 3	Quiz with (MCQ)	5	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			

PROGRAMME: COMMON TO ALL	BATCH: 2026-29
PART: III	COURSE COMPONENT: SELF STUDY
COURSE NAME: INDIAN HERITAGE AND KNOWLEDGE SYSTEM	COURSE CODE: 26USSP401
SEMESTER: III	MARKS: - 100
CREDITS: 2	TOTAL HOURS: Self Study
QUESTION PATTERN: MCQ	
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 OBJECTIVE:

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:

CO1: Recall the key features of Indian heritage and its role in shaping cultural identity.

CO2: Identify the artistic, architectural, and literary achievements of South India and other regions.

CO3: List traditional practices preserved through folklore across India.

CO4: Recall the principles of ancient Indian sciences related to physical, mental, and spiritual well-being.

CO5: Describe the connections between spiritual, medicinal, and artistic elements in Indian heritage.

UNIT I

Introduction to Indian Heritage

- **Concept of Heritage:** Definition, the importance of studying heritage, and its diverse forms.
- **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 II

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 III

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 IV

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 V

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: 2026-29
PART: III	COURSE COMPONENT: SELF STUDY
COURSE NAME: CONTEMPORARY WORLD AND SUSTAINABLE DEVELOPMENT	COURSE CODE: 26USSP402
SEMESTER: III	MARKS: - 100
CREDITS: 2	TOTAL HOURS: Self Study
QUESTION PATTERN: MCQ	
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

CO1: Identify the key actors and institutions that shape the contemporary world order.

CO2: Describe the political, economic, and security challenges in major Asian regions.

CO3: Recall the causes and human impact of recent wars and conflicts.

CO4: Describe the principles of sustainable development and their relevance at local, national, and global levels.

CO5: Identify India's contributions to the SDGs through Tamil Nadu's programs.

UNIT I

Global Governance and Institutions

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

Key Actors: International states, Intergovernmental organizations (IGOs), non-governmental 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 II

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 III

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 IV

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 V

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)
 - Kalaigal 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 Naamey 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: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: CORE - IX
COURSE NAME: BIG DATA ANALYTICS	COURSE CODE: 26UBIT309
SEMESTER: IV	MARKS:100
CREDITS: 4	TOTAL HOURS: 75
THEORY	

COURSE OBJECTIVE

To Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.

COURSE OUTCOMES

CO 1: Explain the basic concepts and applications of Big Data.

CO 2: Describe Big Data analytics and Hadoop architecture.

CO 3: Illustrate Big Data storage systems and NoSQL types.

CO 4: Apply Apache Spark for data processing tasks.

CO 5: Utilize Spark SQL and RDD for data analysis.

UNIT I

(15 HOURS)

Big Data

Big Data: Overview - Definition - Big Data Vs Small Data - The Five V's- Mining Big Data: Clustering - Classification - Decision Tree for Transactions - Data Visualization. Application of Big Data: Healthcare - Advertising: Pay per click advertising - Targeted advertising - Recommender Systems - Big Data in Society: Smart Vehicle - Smart Homes - Smart Cities.

UNIT II

(15 HOURS)

Big Data Analytics

Big Data Analytics: Introduction - Tools for Data Analytics - Hadoop: Features - Hadoop Architecture - Hadoop Distributed File System - MapReduce - Map Function - Shuffle and Reduce Functions - Advantages & disadvantages.

UNIT III

(15 HOURS)

Big Data Storage

Introduction: Moore's Law- ACID Properties- Storing structured and unstructured data: Relational Database Management Systems - NoSQL databases - Types of No-SQL Databases: Document Oriented - Columnar - Graph - Key-Value Pair.

UNIT IV

(15 HOURS)

Spark

Overview of Spark: Spark Architecture - Spark Toolset - Structured API- Structured Spark types- API Execution -Basic structured operations: Schemas- Columns and expressions- Records - Data frame transformations. Working with Different types of Data- Aggregations - Grouping- Joins.

UNIT V**(15 HOURS)****Spark SQL**

Spark SQL: Running Spark SQL Queries - Tables - Views - Databases - Complex Types - Functions - subqueries – Dataset: Actions - Transformations- Joins - Grouping and Aggregation - Resilient Distributed Datasets (RDD) - Types - Creation - Transformations - Actions.

PRESCRIBED BOOKS:

- 1 Dawn E. Holmes, 2017, “Big Data: A Very Short Introduction”, 1st Edition, Oxford (Unit I - III)
- 2 Bill Chambers and Matei Zaharia, (2018), “Spark: The Definitive Guide”, O’Reilly Media (Unit IV, V)

REFERENCE BOOKS:

- 1 Jules.S., Brooke Wenig, Tathagata Das& Denny Lee, (2020),” Learning Spark”, O’Reilly Media.
- 2 Holden Karau & Rachel Warren, (2017),” High Performance Spark”, O’Reilly Media.

E – LEARNING RESOURCES:

1. <https://cloud.google.com/learn/what-is-big-data>
2. <https://spark.apache.org/>

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 4 out of 6 questions (each in 1200 words)</i>	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

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	2.8	2.8	3

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	2
CO 2	3	3	3	2	3
CO 3	3	2	3	3	3
CO 4	3	3	3	2	3
CO 5	3	3	3	3	3
AVG.	3	2.8	3	2.6	2.8

PO – PSO - CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Explain the basic concepts and applications of Big Data.	PO1, PO2, PO3	PSO3, PSO1	K2, K5
CO 2	Describe Big Data analytics and Hadoop architecture.	PO3, PO4	PSO1, PSO2, PSO3, PSO4	K2
CO 3	Illustrate Big Data storage systems and NoSQL types.	PO3, PO4	PSO1, PSO3, PSO4	K2
CO 4	Apply Apache Spark for data processing tasks.	PO3, PO4, PO5	PSO2, PSO1, PSO3, PSO5	K3
CO 5	Utilize Spark SQL and RDD for data analysis.	PO3, PO4, PO5	PSO1, PSO2, PSO3, PSO4	K3

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Seminar / Presentation	10	5
Class activity 2	Quiz (MCQ)	10	5
Class activity 3	Surprise Class Test	10	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			

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: IV	COURSE COMPONENT: CORE - X
COURSE NAME: OPERATING SYSTEMS	COURSE CODE: 26UBIT310
SEMESTER: IV	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE

To Understand and Evaluate the requirement for process synchronization and coordination handled by operating system.

COURSE OUTCOMES

CO 1: Describe the basic concepts, types, and structure of operating systems.

CO2: Explain process management including process states, creation, scheduling, and communication.

CO 3: Apply process synchronization methods and identify deadlock conditions and solutions.

CO 4: Explain memory management techniques and file management in operating systems.

CO 5: Describe real-time systems and mobile operating systems.

UNIT I

(18 HOURS)

Introduction to Operating Systems: Introduction- History & evolution of OS- Types of Operating Systems- Simple Batch Systems, Multiprogramming and Time-Sharing systems. Personal Computer Systems, Parallel Systems, Distributed Systems and Real time Systems. Operating System Structures: Operating System Services, System components, system calls.

UNIT II

(18 HOURS)

Process Management: Process states, Process creation, process termination, Process Scheduling Algorithms-Non-Preemptive and Preemptive Scheduling Algorithms- Concurrent and Dependent Processes- Inter-process Communication

UNIT III

(18 HOURS)

Process Synchronization: Critical Section problem- Semaphores - Deadlock: Deadlock Characterization, Necessary and Sufficient Conditions for Deadlock, Deadlock Handling Approaches: Deadlock Prevention, Deadlock Avoidance and Deadlock Detection and Recovery.

UNIT IV

(18 HOURS)

Memory Management: Physical and Virtual Address Space; Memory Allocation Strategies—Fixed and -Variable Partitions, Paging, Segmentation, Virtual Memory. File Management: Directory Structure, File Operations, File Allocation Methods.

UNIT V

(18 HOURS)

Advanced OS: Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems—Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems.

PRESCRIBED BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012

REFERENCE BOOKS:

1. H.M. Deitel, An Introduction to Operating system, - Second Edition, Addison Wesley.
 2. Andrew S. Tanenbaum, Modern Operating Systems, Pearson Education, 2nd edition.

E-LEARNING RESOURCES:

1. <https://www.geeksforgeeks.org/what-is-an-operating-system/>

GUIDELINES TO THE QUESTION PAPER SETTERS**QUESTION PAPER PATTERN**

Section	Question Component	Numbers	Marks	Total
A	Definition / Principles Answer any 10 out of 12 questions	1 – 12	3	30
B	Short Answer 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
I	3	2	2
II	3	1	1
III	2	1	1
IV	2	2	1
V	2	1	1
TOTAL	12	7	6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	2	2	3
CO 2	3	3	3	3	2
CO 3	3	3	3	3	3
CO 4	3	2	3	3	3
CO 5	3	2	3	3	3
AVG	3	2.6	2.8	2.8	2.8

PSO – CO MAPPING

	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	2	3
CO 2	3	3	3	3	2
CO 3	3	2	3	3	3
CO 4	3	3	3	2	3
CO 5	3	3	3	3	2
AVG	3	2.8	3	2.6	2.6

PO- PSO-CO-QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Describe the basic concepts, types, and structure of operating systems.	PO1, PO2	PO1, PO2, PSO1, PSO2, PSO3	K1
CO 2	Explain process management including process states, creation, scheduling, and communication.	PO2, PO3	PSO1, PSO2, PSO4	K2
CO 3	Apply process synchronization methods and identify deadlock conditions and solutions.	PO2, PO3, PO4	PSO1, PSO2, PSO3, PSO4	K3
CO 4	Explain memory management techniques and file management in operating systems.	PO3, PO4, PO5	PSO1, PSO2, PSO3, PSO4	K4
CO 5	Describe real-time systems and mobile operating systems.	PO3, PO4, PO5,	PSO1, PSO2, PSO4, PSO5	K5

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Seminar / Presentation	10	5
Class activity 2	Quiz (MCQ)	10	5
Class activity 3	Surprise Class Test	10	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			

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: IV	COURSE COMPONENT: CORE - XI
COURSE NAME: FULL STACK DEVELOPMENT	COURSE CODE: 26UBIT311
SEMESTER: IV	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE

To equip students with the knowledge and skills to design and develop full-stack web applications using HTML5, CSS3, JavaScript, Node.js, Express, MySQL, and MongoDB.

COURSE OUTCOMES

CO 1: Design web pages using HTML5 and CSS3.

CO 2: Implement dynamic and interactive functionalities using JavaScript.

CO 3: Develop server-side applications using Node.js with MySQL integration.

CO 4: Create web applications using the Express framework.

CO 5: Create full-stack web applications using Express.js with routing, form handling, and user authentication.

UNIT I

(18 HOURS)

Introduction to HTML5: Headings – Linking – Images – Lists – Tables – Forms – Meta Elements – Form Input Types – Datalist Elements and Autocomplete attribute – Page-Structure Elements. Introduction to Cascading Style Sheets (CSS3): Inline Styles – Embedded Style Sheets – Linking External Style Sheets – Positioning Elements – Backgrounds – Box Model and Text Flow – Drop-Down Menus – Rounded Corners – Color – Box Shadows – Animation – Transitions and Transformations.

UNIT II

(18 HOURS)

JavaScript: Introduction to Scripting – Data Types – Variables – Operators – Control and Looping Structures – Functions – Arrays – Objects – Math Object – String Object – Date Object – Boolean and Number Object – Document Object – Document Object Model – Event Handling in JavaScript.

UNIT III

(18 HOURS)

Node.js: Introduction – Set up the Node.js Environment – Modules – File System – Node Packet Manager (NPM) – Event Handling in Node.js – Node.js with MySQL: Relational Database Management System – MySQL with Node.js – Create Database and Tables – Insert Data – View Data – Pass Values during Query Execution – Ordered Result Set – Apply Limit and Offset to SELECT Records – Join Query – Update Records – Delete Records Drop Table.

UNIT IV**(18 HOURS)**

Express and Node.js: Introduction to Express Framework – Express Server Request - Response – Routes –Route Parameters – Multiple Route Callback/Handler Functions – Methods of Response Object – Chaining Route Handlers – Send Static Files – Accept User Input – File Upload with Express – Manage Cookies – Send file as a Response.

UNIT V**(18 HOURS)**

MongoDB: Overview – Features and Advantages of Mongo DB –Data Modeling – Environment – CRUD Operations – Projection –Limiting and Sorting – Indexing –Aggregation – Replication – Sharding.

PRESCRIBED BOOKS:

1. Internet & World Wide Web –How to Program, Paul Deitel, Harvey Deitel, Abbey Deitel, Fifth Edition, Pearson Education 2012. (Unit I & II)
2. Node JS Guidebook, Dhruti Shah, BPB Publications 2018. (Unit III & IV)
3. MongoDB: The Definitive Guide, Kristina Chodorow, Second Edition, O'Reilly 2013. (Unit-V)

REFERENCE BOOKS:

1. HTML & CSS: The Complete Reference, Thomas A. Powell, Fifth Edition, The McGraw-Hill Companies, Inc 2010.
2. Web Technologies, A Computer Science Perspective, Jeffrey C. Jackson, Pearson Education 2011.
3. Learning Node, Shelly Powers, First Edition, O'Reilly 2012.
4. Beginning Node.js, Basarat Ali Syed, Apress 2014.
5. MongoDB in Action, Kyle Banker, Peter Bakkum, Shaun Verch, Douglas Garrett, Tim Hawkins, Second Edition, Manning Publications Co 2016.

E-LEARNING RESOURCES:

1. W3Schools – <https://www.w3schools.com>
2. MDN Web Docs (by Mozilla) – <https://developer.mozilla.org>
3. freeCodeCamp – <https://www.freecodecamp.org>

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 4 out of 6 questions (each in 1200 words)</i>	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

PO - CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	3	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	2.8	3	3

PSO CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	2
CO 2	3	3	3	3	3
CO 3	3	2	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	3	3	2.8

PO-PSO-CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Design web pages using HTML5 and CSS3.	PO 1, PO 2	PSO 1, PSO 4, PSO 5	K6
CO 2	Implement dynamic and interactive functionalities using JavaScript.	PO 2, PO 3	PSO 1, PSO 4, PSO 5	K3
CO 3	Develop server-side applications using Node.js with MySQL integration.	PO 3, PSO 1	PSO 4, PSO 5	K3
CO 4	Create web applications using the Express framework.	PO 3, PO4	PSO 1, PSO 4, PSO 5	K6
CO 5	Create full-stack web applications using Express.js with routing, form handling, and user authentication	PO 4, PO 5	PSO 2, PSO4, PSO 5	K6

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Problem Solving / Coding Tasks	10	5
Class activity 2	Seminar / Presentation	10	5
Class activity 3	Surprise Class Test / Quiz	10	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			

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: IV	COURSE COMPONENT: CORE - XII
COURSE NAME: PRACTICAL-IV: FULL STACK DEVELOPMENT LAB	COURSE CODE: 26UBIT312P
SEMESTER: IV	MARKS:100
CREDITS: 4	TOTAL HOURS: 60
PRACTICAL	

COURSE OBJECTIVE:

To enable students to develop interactive and full-stack web applications using HTML5, CSS3, JavaScript, Node.js, Express.js, and databases.

COURSE OUTCOMES:

CO 1: Create well-structured web pages using HTML5 and CSS3.

CO 2: Apply JavaScript to create dynamic functionalities like form validation, timers, and task management.

CO 3: Develop backend applications using Node.js with file system access and server creation.

CO 4: Integrate MySQL with Node.js to perform database operations for web applications.

CO 5: Create full-stack web applications using Express.js with routing, form handling, and user authentication.

PROGRAMS:

1. Design a table to display student data using HTML5 tags.
2. Design a student registration and login form using HTML5.
3. Create a web page showcasing various CSS3 styles and techniques.
4. Design a webpage using CSS3 animations, transitions, and transformations.
5. Write a JavaScript program to validate an email address and provide visual feedback for valid and invalid entries.
6. Write a JavaScript program to create a simple stopwatch with Start, Stop, and Reset functions.
7. Write a JavaScript program to create a simple To-Do List where users can add tasks, mark them as completed, and delete them.
8. Write a Node.js program to create a basic 'Hello, World!' server.
9. Write a Node.js program to illustrate file system operations.
10. Write a Node.js program to perform basic MySQL DML operations on a student database.
11. Write an Express.js server with routes and form handling.
12. Write a program to implement authentication using Express.js and cookies.

13. Write a Node.js program to perform CRUD operations using MongoDB.

14. Write a MongoDB program for sorting, limiting, and projection.

15. Write a MongoDB program to perform data aggregation.

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	2	2	2
CO 2	3	3	3	3	2
CO 3	3	3	3	3	3
CO 4	3	2	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	2.8	2.8	2.6

PO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	2	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	2	3
CO 5	2	3	3	3	3
AVG	2.8	2.8	3	2.8	3

PSO-CO-QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Create well-structured web pages using HTML5 and CSS3.	PO1,PO2,PO3	PSO1, PSO 3, PSO 5	K1
CO 2	Apply JavaScript to create dynamic functionalities like form validation, timers, and task management.	PO 3, PO 4,	PSO 1, PSO 2, PSO 5	K2
CO 3	Develop backend applications using Node.js with file system access and server creation.	PO 3, PO 4, PO 5,	PO 2, PO 3, PSO 1, PSO 4, PSO 5	K3
CO 4	Integrate MySQL with Node.js to perform database operations for web applications.	PO 3, PO 4, PO 5,	PSO 1, PSO 4, PSO 5	K6
CO 5	Create full-stack web applications using Express.js with routing, form handling, and user authentication.	PO 3, PO 4, PO 5,	PSO 2, PSO 4, PSO 5	K6

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

CIA COMPONENT

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 90 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Practical Record Book	Handwritten record of experiments, observations, results and conclusions	10	5
Class activity 1	Debugging Test	5	5
Class activity 2	Problem-solving Exercise	5	5
Class activity 3	Quiz with (MCQ)	5	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			

PROGRAMME: B.Sc. (CS), BCA, B.Sc. (IT), B.Sc. (DA)	BATCH: 2026 – 29
PART: III	COURSE COMPONENT: ALLIED -IV
COURSE NAME: OPERATIONS RESEARCH	COURSE CODE: 26UBIT3A4
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 mathematical knowledge in optimal use of resources.

COURSE OUTCOMES:

CO 1: Implement the fundamental ideas of Operations Research.

CO 2: Apply the concept of LPP, Transportation and problems.

CO 3: Analyzes of graphical representation and different models into practice and Assignment problems.

CO 4; Create minimization and maximization concepts of different models.

CO 5: Evaluate different models of LPP, 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 Northwest 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

PRESCRIBED BOOKS

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

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
	5	7	1	6	-	6
TOTAL	12		7		6	

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	3	2	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	2
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	3	3	2.8	2.8

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	3	3	3
CO 2	3	3	2	3	2
CO 3	3	2	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	2.8	3	2.8

PO-PSO-CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Recollect the fundamental ideas of Operations Research.	PO1, PO2	PSO1, PSO2, PSO5	K1
CO 2	Apply the concept of LPP, Transportation and problems.	PO2, PO3	PSO2, PSO3, PSO4, PSO5	K3
CO 3	Analyzes of graphical representation and different models into practice and Assignment problems.	PO2, PO3, PO4	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO 4	Create minimization and maximization concepts of different models.	PO1, PO2, PO3	PSO2, PSO3, PSO5	K3, K6
CO 5	Evaluate different models of LPP, Sequencing and Network problems.	PO2, PO3, PO5	PSO1, PSO2, PSO3, PSO4	K4, K5

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Workbook / Notebook Maintenance for Classwork	10	5
Class activity 1	Problem Solving Tasks	10	5
Class activity 2	Seminar / Presentation	10	5
Class activity 3	Surprise Class Test / Quiz	10	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			

PROGRAMME: BCA, B.Sc (CS), B.Sc (IT), B.Sc (DA), B.Sc CS with AI	BATCH: 2026-29
PART: IV	COURSE COMPONENT: INDIAN KNOWLEDGE SYSTEMS
COURSE NAME: INDIAN KNOWLEDGE SYSTEMS WITH ARTIFICIAL INTELLIGENCE	COURSE CODE: 26UIKS409
SEMESTER: IV	MARKS:100
CREDITS: 1	TOTAL HOURS: 15
THEORY	

COURSE OBJECTIVE:

To provide learners with a comprehensive understanding of Indian Knowledge Systems (IKS) and Artificial Intelligence (AI), and to explore their conceptual foundations, ethical perspectives, and interdisciplinary integration for modern technological applications and innovation.

COURSE OUTCOMES:

CO 1: Explain Indian Knowledge Systems and their relevance to modern technology.

CO 2: Analyze AI concepts and compare them with Indian logical frameworks.

CO 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. Print world, 2017.
2. Russell, Stuart and Norvig, Peter, Artificial Intelligence: A Modern Approach, 4th Edition, Pearson Education, New Delhi, 2021.
3. Chatterjee, Satischandra and Datta, Dharendra Mohan, 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://iks.aicte-india.org/>
2. https://www.youtube.com/@IKS_Media_MoE
3. <https://www.classcentral.com/course/swayam-indian-knowledge-system-292677>
4. <https://www.ignca.gov.in/>
5. <https://artsandculture.google.com/partner?hl=en>

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	

SOFT SKILLS: COMMON TO ALL	BATCH: 2026-29
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

COURSE OBJECTIVE:

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

COURSE OUTCOMES:

- CO1. Prepare professional resumes, CVs, biodata and covering letters suitable for job applications.
- CO2. Apprise the fundamental concepts, purpose and characteristics of job interviews.
- CO3. Identify various types of interviews and their expectations in recruitment processes.
- CO4. Apply interview techniques and strategies to effectively handle different stages of the interview process.
- CO5. 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-to-one job interview – Panel interview – Behavioural 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 interview questions – Do's and Don'ts – Reasons for rejection.

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

PRESCRIBED BOOKS

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

2. Higgins, Jessica JD (2018) 10 Skills for Effective Business Communication: Practical Strategies from the Greatest Leaders.
3. Nicholas, Sonji (2023) Interviewing: Preparation, Types, Techniques, and Questions, Pressbooks.
4. 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.gcglobal.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

SEMESTER - V

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: CORE - XIII
COURSE NAME: SOFTWARE ENGINEERING PRACTICES AND TESTING	COURSE CODE: 26UBIT313
SEMESTER: V	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE

To understand and analyze software engineering principles and methodologies.

COURSE OUTCOMES

- CO 1: Explain basic software process models used in development.
- CO 2: Apply software engineering techniques to collect and analyze software requirements.
- CO 3: Design software using design principles and UML diagrams.
- CO 4: Perform various software testing and identify bugs.
- CO 5: Analyze and manage software maintenance and project activities

UNIT I (18 HOURS)

The Software Product and Software Process: Software Product and Process Characteristics, Software Process Models: Linear Sequential Model, Prototyping Model, RAD Model, Evolutionary Process Models like Incremental Model, Spiral Model, Component Assembly Model, RUP and Agile processes.

UNIT II (18 HOURS)

Requirement Elicitation, Analysis, and Specification: Functional and Non-functional requirements, Requirement Sources and Elicitation Techniques, Analysis Modeling for Function-oriented and Object-oriented software development, Requirement Validation.

UNIT III (18 HOURS)

Software Design: The Software Design Process, Design Concepts and Principles, Software Modeling and UML, Architectural Design, Architectural Views and Styles, User Interface Design, Function-oriented Design, Component Based Design, Design Metrics.

UNIT IV (18 HOURS)

Software Testing: Purpose- – Testing Vs Debugging - Bugs – Types of Bugs -Levels of Testing – Testing Approaches – Types of Testing – Test Cases - Test Plan- Flow/Graphs and Path Testing – Achievable paths – Path instrumentation – Transaction Flow Testing Techniques – Data Flow Testing Strategies -Linguistic –Metrics – Structural Metrics.

UNIT V (18 HOURS)

Software Maintenance and Software Project Management: Need of Maintenance – Software configuration Management – Software Change Management - Project Scheduling and Tracking, Risk Assessment and Mitigation, Software Quality Assurance (SQA), Project Plan, Project Metrics.

PRESCRIBED BOOKS:

1. Roger. S. Pressman, 2023, Software Engineering A Practitioners approach, 9th Edition, Tata McGraw-Hill, New Delhi.
2. Rajib Mal, 2018, -Fundamental of Software engineering, 5th Edition , PHI, New Delhi, 2018.

REFERENCE BOOKS:

1. I. Sommerville, 2015, Software Engineering, 10th Edition, Addison Wesley, Boston.
2. N. E. Fenton, S. L. Pfleenger, 2020, 3rd edition, Software Metrics, Thomson Asia, Singapore.

E-LEARNING RESOURCES:

1. <https://www.geeksforgeeks.org/software-testing-basics/>
2. <https://www.javatpoint.com/software-testing-tutorial>

GUIDELINES TO THE QUESTION PAPER SETTERS**QUESTION PAPER PATTERN**

Section	Question Component	Numbers	Marks	Total
A	Definition / Principles Answer any 10 out of 12 questions	1 – 12	3	30
B	Short Answer Answer any 5 out of 7 questions	13–19	6	30
C	Essay 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
I	3	2	2
II	3	1	1
III	2	1	1
IV	2	2	1
V	2	1	1
TOTAL	12	7	6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	3	3	3
CO 2	3	3	2	3	3
CO 3	3	3	3	2	3
CO 4	3	3	3	3	2
CO 5	3	2	3	3	3
AVG	3	2.8	2.8	2.8	2.8

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	2	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	2	3
CO 5	3	3	3	3	3
AVG	3	2.8	3	2.8	3

PO-PSO-CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Explain basic software process models used in development.	PO1, PO3	PSO1, PSO4, PSO5	K2
CO 2	Apply software engineering techniques to collect and analyze software requirements.	PO2, PO3	PSO1, PSO2, PSO5	K3
CO 3	Design software using design principles and UML diagrams.	PO1,PO2	PSO1, PSO3, PSO4	K6
CO 4	Perform various software testing and identify bugs.	PO4, PO5	PSO1, PSO4, PSO5	K5
CO 5	Analyze and manage software maintenance and project activities	PO3, PO4, PO5	PSO1, PSO2, PSO3, PSO4	K4

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Seminar / Presentation	10	5
Class activity 2	Quiz (MCQ)	10	5
Class activity 3	Surprise Class Test	10	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			

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: CORE - XIV
COURSE NAME: FOUNDATIONS OF ARTIFICIAL INTELLIGENCE	COURSE CODE: 26UBIT314
SEMESTER: V	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE:

Aims to provide a strong foundation in AI concepts, explore its applications, and develop practical skills in problem-solving using AI techniques.

COURSE OUTCOMES:

CO 1: Explain the basic concepts, history, and applications of Artificial Intelligence.

CO 2: Apply problem-solving and search techniques to solve AI problems.

CO 3: Use knowledge representation and reasoning methods in AI systems.

CO 4: Develop simple programs using Prolog for AI problem solving.

CO 5: Analyze various AI applications such as NLP, robotics, and speech systems.

UNIT I

(18 HOURS)

INTRODUCTION

Introduction: Definition of Artificial Intelligence- Foundations of AI, history, the state of art AI today - Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems

UNIT II

(18 HOURS)

PROBLEM SOLVING METHODS

Problem solving Methods: Control Strategies - Search Strategies- Uninformed - Informed - Heuristics – Hill Climbing – Depth first and Breadth First Local Search Algorithms and Optimization Problems - Searching with Partial Observations – Constraint's Satisfaction Problem – Constraint Propagation - Backtracking Search – Game playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games.

UNIT III

(18 HOURS)

REPRESENTATION OF KNOWLEDGE

Knowledge representation: Knowledge representation using Predicate Logic – Unification – Forward Chaining - Backward Chaining – Resolution - Ontological Engineering - Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information.

UNIT IV**(18 HOURS)****PROLOG PROGRAMMING**

Prolog for AI: Rules- Syntax- Constants- variables- characters- operators- Equality & unification - Arithmetics - Satisfying goals Trees- lists- Recursive search- Mapping- Recursive Comparison- Joining Structures - Backtrack: Multiple solutions- The 'Cut'- Uses of Cut- problems with Cut.

UNIT V**(18 HOURS)****APPLICATIONS**

AI applications: Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving.

PRESCRIBED BOOKS:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach, Prentice Hall, 2020 4th Edition.
2. Gerhard Weiss, Multi agent Systems, Second Edition, MIT Press, 2016.

REFERENCE BOOKS:

1. Kevin Night and Elaine Rich, Nair B., 2017, 3rd edition “Artificial Intelligence (SIE)”, McGraw Hill.
2. William F. Clocksin and Christopher S. Mellish, Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, 2012.
3. PROLOG: Programming for Artificial Intelligence, BRATKO, Pearson
4. Prolog by Example: by Helder Coelho, Jose C. Cotta, Springer

E-LEARNING RESOURCES:

1. <https://www.britannica.com/technology/artificial-intelligence>
2. <https://www.geeksforgeeks.org/what-is-artificial-intelligence/>

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	3	1	1
III	2	1	1
IV	2	2	1
V	2	1	1
TOTAL	12	7	6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	2
CO 4	3	3	3	2	3
CO 5	3	3	3	3	3
AVG	3	2.8	3	2.6	2.8

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	2	2
CO 2	3	3	3	3	3
CO 3	3	2	3	2	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	3	2.6	2.8

PO-PSO-CO-QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Explain the basic concepts, history, and applications of Artificial Intelligence.	PO1, PO2	PO 1, PSO1, PSO3, PSO5	K2, K5
CO 2	Apply problem-solving and search techniques to solve AI problems.	PO1, PO2, PO3	PO 3, PSO1, PSO3, PSO4, PSO 5	K3
CO 3	Use knowledge representation and reasoning methods in AI systems.	PO3, PO4	PO 3, PO 4, PSO1, PSO2, PSO4, PSO5	K3
CO 4	Develop simple programs using Prolog for AI problem solving.	PO3, PO4, PO5	PO 2, PSO1, PSO2, PSO4, PSO5	K6
CO 5	Analyze various AI applications such as NLP, robotics, and speech systems.	PO2, PO3	PSO1, PSO2, PSO4, PSO5	K4

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Problem Solving / Coding Tasks	10	5
Class activity 2	Seminar / Presentation	10	5
Class activity 3	Surprise Class Test / Quiz	10	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

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: CORE - XV
COURSE NAME: PRACTICAL-V: ARTIFICIAL INTELLIGENCE USING PROLOG LAB	COURSE CODE: 26UBIT315P
SEMESTER: V	MARKS:100
CREDITS: 4	TOTAL HOURS: 75
PRACTICAL	

COURSE OBJECTIVE:

To help students learn the basics of logic programming and AI, including search methods, knowledge representation, and problem-solving using tools like Prolog.

COURSE OUTCOMES:

CO 1: Apply Prolog programming and logic programming concepts to implement AI programs.

CO 2: Implement AI search techniques including uninformed, informed, and heuristic methods.

CO 3: Describe knowledge representation and inference methods.

CO 4: Examine theorem proving techniques in Artificial Intelligence.

CO 5: Solve real-world problems using knowledge representation and reasoning.

PROGRAMS:

1. Write simple facts for the statements using PROLOG.
2. Write a program to categorize animal characteristics using PROLOG.
3. Write a program in PROLOG to implement simple calculator.
4. Write a program to generate calendar for the given year and month.
5. Write a program to implement Breadth First Search.
6. Write a program to implement Depth First Search.
7. Write a program to implement Tic Tac toe problem.
8. Write a program to implement Hill Climbing problem.
9. Write a program to implement Towers of Hanoi problem.
10. Write a program to implement N Queen problem.
11. Write a program to implement Water Jug problem.
12. Write a program to implement 8 puzzle problem.
13. Write a program to implement A* algorithm.
14. Write a program to implement simple Chatbot.
15. Write a program to implement Robot (traversal) problem using means End Analysis.

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	2
CO 3	3	3	3	2	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	3	3	2.8	2.8

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	2	3	3	2
CO 3	2	3	3	3	3
CO 4	3	3	3	3	3
CO 5	2	3	3	3	2
AVG	2.8	2.8	3	3	2.8

PO-PSO-CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Apply Prolog programming and logic programming concepts to implement AI programs.	PO3, PO4	PSO1, PSO4, PSO5	K3
CO 2	Implement AI search techniques including uninformed, informed, and heuristic methods.	PO3, PO4	PSO1, PSO3, PSO4, PSO5	K3
CO 3	Describe knowledge representation and inference methods.	PO1, PO2	PSO1, PSO3, PSO5	K5
CO 4	Examine theorem proving techniques in Artificial Intelligence.	PO2, PO3	PSO2, PSO4, PSO5	K5
CO 5	Solve real-world problems using knowledge representation and reasoning.	PO4, PO5	PSO1, PSO4, PSO5	K5

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

CIA COMPONENT

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 90 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Practical Record Book	Handwritten record of experiments, observations, results and conclusions	10	5
Class activity 1	Debugging Test	5	5
Class activity 2	Problem-solving Exercise	5	5
Class activity 3	Quiz with (MCQ)	5	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			

PROGRAMME: For other Programmes except BSc. IT	BATCH: 2026-29
PART: III	COURSE COMPONENT: ELECTIVE – I (INTER DISCIPLINARY ELECTIVE)
COURSE NAME: DATA VISUALIZATION USING ADVANCED EXCEL	COURSE CODE: 26UBIT3E1
SEMESTER: V	MARKS:100
CREDITS: 4	TOTAL HOURS: 75
THEORY	

COURSE OBJECTIVE:

Learn basics of Microsoft Excel and understand data visualization techniques

COURSE OUTCOMES:

CO 1: Demonstrating the basic mechanics and navigation of an Excel spreadsheet.

CO 2: Formatting techniques and presentation styles.

CO 3: Learning the use and utility of functions and formulas on excel spreadsheet.

CO 4: Learning formulas, creating charts and graphs that can easily explain information or data.

CO 5: Analyzing data using Pivot Tables and Pivot Charts.

UNIT I

(15 HOURS)

Introduction: Cell Editing, Usage of Formulae, File Manipulations, Worksheet Preparation, Drawing Graphs, Usage of Auto Formatting. Inserting Clip arts and Pictures, Frame movements, Insertion of new slides

UNIT II

(15 HOURS)

Functions- Built-in Functions, Logical Functions, Text Functions, Date and Time Functions, Aggregate functions. Conditional Formatting.

UNIT III

(15 HOURS)

Uses of Advanced Excel Formulas -VLOOKUP, HLOOKUP, SUMIF, SUMIFS, SUMPRODUCT, DSUM, COUNTIF, COUNTIFS, IF, IFERROR, ISERROR, SEARCH, INDEX.

UNIT IV

(15 HOURS)

Data Analysis: What-IF Analysis, Sorting, Filtering Data, AutoFilter, Pivot tables, Totals and Subtotals Various Methods of Filter.

UNIT V

(15 HOURS)

Creating Worksheet Charts: Creating Charts- Selecting Charts and Chart Elements - Moving and Resizing Charts- Chart Type, Inserting Objects into a Chart- Changing Chart Labels- Applying WordArt Styles to Chart Elements - Saving Custom Chart Templates

PRESCRIBED BOOKS:

4. Kumar Bittu, Microsoft Office 2017
5. Frag Curtis, Step by Step Microsoft Excel 2013
6. John Walkenbach, 101 Excel 2013 Tips, Tricks and Time savers.
7. Salkind Neil Statistics for people who (Think They) Hate Statistics, Using MS- Excel 2021
8. Jordan Goldmeyer, “Advanced Excel Essentials” , APress, 2015 edition.

REFERENCE BOOKS:

4. John Walkenbach, “Microsoft Excel 365 Bible”, Wiley Publications ,2022

E-LEARNING RESOURCES:

1. <https://www.datacamp.com/tutorial/visualizing-data-in-excel>
2. https://policyviz.com/wp-content/uploads/woocommerce_uploads/2017/07/A-Guide-to-Advanced-Data-Visualization-in-Excel-2016-Final.pdf

GUIDELINES TO THE QUESTION PAPER SETTERS**QUESTION PAPER PATTERN**

Section	Question Component	Numbers	Marks	Total
A	Definition / Principles <i>Answer any 10 out of 12 questions</i>	1 – 12	3	30
B	Short Answer <i>Answer any 5 out of 7 questions</i>	13–19	6	30
C	Essay <i>Answer any 4 out of 6 questions</i>	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

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	2.8	2.8	3

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	2	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	2
AVG	2.8	3	2.8	3	2.8

PO-PSO-CO-QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Demonstrating the basic mechanics and navigation of an Excel spreadsheet.	PO2, PO3	PSO1, PSO2, PSO3	K2
CO 2	Formatting techniques and presentation styles.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO5	K4
CO 3	Learning the use and utility of functions and formulas on excel spreadsheet.	PO3, PO4	PSO1, PSO3, PSO5	K1
CO 4	Learning formulas, creating charts and graphs that can easily explain information or data.	PO3, PO4	PSO1, PSO2, PSO4, PSO 5	K1
CO 5	Analyzing data using Pivot Tables and Pivot Charts.	PO3, PO4, PO5	PSO1, PSO2, PSO 5	K4

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Seminar / Presentation	10	5
Class activity 2	Quiz (MCQ)	10	5
Class activity 3	Surprise Class Test	10	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			

PROGRAMME: B.C.A, BSc (CS), BSc (IT), BSc (DA), B.Sc CS with AI	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:

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

UNIT I

(18 HOURS)

Networking and Server Infrastructure

Introduction to Networking Devices and LAN/WAN - IPv4 and IPv6. Routers and Switches Overview. Datacenter Overview and Server Form Factors - Server Management Portals (IPMI/iLO/iDrac) and Events - Introduction to Storage: NAS, DAS, SAN - RAID Levels and Comparisons (Fibre Channel, iSCSI, FCoE) - Operating Systems Overview (Server & Client) - Domain vs. Workgroup - File Systems: FAT, NTFS, ReFS, EXT3, EXT4 - Installing and Managing OS (Windows Server, Linux) - Firewall Fundamentals (Hardware/Software)

Unit II

(18 HOURS)

Windows Server Administration

Windows Server Core Installation, Upgrades, Patch Management & Migrations - Storage Spaces, iSNS, DCB, and MPIO - Data Deduplication and Disk Management - High Availability, Fail-over

Clustering, iSCSI, NLB - Deployment Images using MDT and WSUS - PowerShell DSC and Monitoring Tools - Performance Monitoring and Event Logs

Unit III

Active Directory & Security

AD DS, DNS Server Role, Zones, and Transfers - AD DS Replication and Sites - Group Policy Management and Templates - Securing Domain Controllers and Accounts - Audit Authentication and Managed Service Accounts - Certificate Services (CAs, Templates, Revocation, Recovery) - AD FS, AD RMS, and Smart Cards - Backup & Restore of Active Directory

Unit IV

Linux Server Administration and Virtualization

RHEL / Cent OS Overview, Boot Process and GRUB2 - Filesystem Hierarchy, Shell Environment, Text Editors - User and Group Management, File Permissions, ACLs - RPM, YUM, Dependency Management, Patching, System Logging, Snapshots, Backup/Restore. Virtualization: Hypervisors, Hyper-V, VMware vSphere/vCenter - Configuring VMs, Networking, Storage, HA/DRS - vMotion, Templates, Resource Pools, switches.

Unit V

Cloud, Backup and Monitoring

Cloud Computing Fundamentals, Deployment Models - SaaS, PaaS, IaaS and Key Providers (AWS, Azure, GCP) - Cloud Security, Navigation, and Resource Management- AWS EC2, S3, VPC, IAM; Azure VM, Storage, Networking. Backup Technologies: Disk, Tape, VM Backups, Restoration, Deduplication, Troubleshooting. Infra Monitoring Tools Overview: Nagios.

Textbooks

1. Mustafa Toroman, "**Hands-On Cloud Administration in Azure**" , Packt, 2020.
2. Sara Perrott, "**Windows Server 2019 & PowerShell All-in-One for Dummies**", Wiley, 2021.
3. Sander van Vugt, "**Red Hat RHCSA 8 Cert Guide: EX200**", Pearson IT Certification, 2021.
4. Nick Marshall, "**Mastering VMware vSphere 7**", Wiley, 2021.

LIST OF PROGRAMS:

Windows Server

(30 HOURS)

1. Windows Server Installation & Configuration

- Install Windows Server (Core & GUI).
- Patching

2. Install & Configure Active Directory Domain Services (AD DS)

- Promote server to DC, join clients to the domain.
- Enforce password policy, restrict drives, desktop configuration.

3. Implement Failover Cluster and Network Load Balancing (NLB)

- Build a high-availability cluster for file share service.
- Cluster Troubleshooting – High Availability, Fail-Over

4. PowerShell Scripting for Automation Tasks

- Write scripts for backup, log rotation, monitoring, Patching, Checking stale records

Linux Server

(30 HOURS)

5. Install Linux (RHEL/CentOS) and Set Up Users & ACLs

- Partitioning, user creation, chmod, setfacl, etc.
- Patching
- Configuring Network interfaces – NMTUI/NMCLI
- Server Troubleshooting – Boot, Package, Services, Discover services

6. Service Monitoring and Patch Management using YUM

- Enable repo, install updates, monitor with top, systemctl.

7. Create and Manage VMs in VMware / Hyper-V

- Install hypervisor, create VM, snapshot, clone, Delete

Cloud Computing

(30 HOURS)

8. Launch and Access EC2 Instances on AWS

- Key pair creation, EC2 instance launch, inbound rules, remote access.

9. Configure S3 Bucket and Lifecycle Policies

- Create bucket, enable versioning, lifecycle rules to archive/delete.

10. Create and Manage VPC with Subnets and Security Groups (AWS)

- Design private/public subnets, attach IGW, and route tables.

11. Azure VM Deployment and Storage Blob Configuration

- Create VM, configure VNet, attach a blob container for backup.

12. IAM Role and Policy Creation in AWS

- Create custom IAM roles and attach to EC2 instance for access control.

13. Configure Cloud Backup using AWS/Azure Services

- Snapshot of EC2 instance / Azure VM backup vault.

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	3	2	3
CO 2	3	3	2	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	3	2.8	2.8	3

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	2
CO 3	3	3	3	2	3
CO 4	2	3	3	3	3
CO 5	3	3	3	3	3
AVG	2.8	3	3	2.8	2.8

PO-PSO-CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Explain networking, server infrastructure, storage systems, and operating system fundamentals for enterprise environments.	PO1, PO2	PSO1,PSO2, PSO3,PSO4, PSO5	K2, K5
CO 2	Apply Windows Server administration techniques for system configuration, storage management, and performance monitoring.	PO1,PO2, PO3	PSO1,PSO2, PSO3,PSO4, PSO5	K3
CO 3	Analyze Active Directory services and security mechanisms for efficient domain management.	PO2, PO3, PO4	PSO1,PSO2, PSO3,PSO4, PSO5	K3, K4
CO 4	Apply Linux administration and virtualization techniques for managing systems and virtual environments.	PO4, PO5	PSO1,PSO2, PSO3,PSO4, PSO5	K3
CO 5	Analyze cloud services, backup strategies, and infrastructure monitoring tools for effective IT management.	PO2, PO3, PO4, PO5	PSO1,PSO2, PSO3,PSO4, PSO5	K3, K4

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

CIA COMPONENT

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 90 minutes	100	10
Assignment	Assignment based on experimental concepts	10	5
Practical Record Book	Handwritten record of experiments, observations, results and conclusions	10	5
Class activity 1	Debugging Test	5	5
Class activity 2	Problem-solving Exercise	5	5
Class activity 3	Quiz with (MCQ)	5	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			

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: ELECTIVE - II
COURSE NAME: MACHINE LEARNING	COURSE CODE: 26UBIT3E4
SEMESTER: V	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE:

A comprehensive course on machine learning fundamentals, models, techniques, and practical applications.

COURSE OUTCOMES:

CO 1: Analyze ML fundamentals and apply end-to-end processes for building effective machine learning systems.

CO 2: Apply machine learning concepts and algorithms to build predictive models.

CO 3: Discuss and apply various learning models including trees, rules, linear, and probabilistic models.

CO 4: Outline the advanced techniques in feature engineering and model ensembles.

CO 5: Acquire skills in applying distance-based and probabilistic models using nearest-neighbour, clustering and Naïve Bayes

UNIT I (18 HOURS)

The Fundamentals of Machine Learning: The Machine Learning Landscape - Types of Machine Learning Systems - Main Challenges of Machine Learning - Testing and Validating. End-to-End Machine Learning Project - Look at the Big Picture - Get the Data - Discover and Visualize the Data to Gain Insights - Prepare the Data for Machine Learning Algorithms - Select and Train a Model - Fine-Tune Your Model - Launch, Monitor, and Maintain Your System.

UNIT II (18 HOURS)

Ingredients of machine learning: Tasks – Models – Features. Supervised Learning: Classification – Binary classification and related tasks – Scoring and ranking – class probability estimation – multi-class classification. Unsupervised Learning: Regression – Unsupervised and descriptive learning. Concept Learning: The hypothesis space – paths through the hypothesis space – beyond conjunctive concepts – learnability.

UNIT III (18 HOURS)

Tree Models: Decision trees – Ranking and probability estimation trees – tree learning as variance reduction. Rule Models: Learning ordered rule lists – learning unordered rule sets – descriptive rule learning – first-order rule learning. Linear Models: The least-squares method – The perceptron – Support vector machines.

UNIT IV**(18 HOURS)**

Distance-based Models: Neighbours and exemplars – Nearest-neighbour classification – Distance-based clustering – K-Means algorithm – Hierarchical clustering. Probabilistic Models: The normal distribution and its geometric interpretations – probabilistic models for categorical data – Naïve Bayes model for classification – probabilistic models with hidden values – Expectation- Maximization.

UNIT V**(18 HOURS)**

Features: Kinds of features – Feature transformations – Feature construction and selection. Model ensembles: Bagging and random forests – Boosting – Mapping the ensemble landscape. Machine Learning experiments: What to measure – How to measure it – How to interpret it.

PRESCRIBED BOOKS:

1. Flach, P, “Machine Learning: The Art and Science of Algorithms that Make Sense of Data”, Cambridge University Press, 2012
2. Aurélien Géron, “Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems”, First Edition, 2017 (Chapters 1 and 2)

REFERENCE BOOKS:

4. John D. Kelleher, Brian Mac Namee, Aoife D'Arcy, “Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies”, The MIT Press, First Edition, 2012
5. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012
6. Stephen Marsland, “Machine Learning - An Algorithmic Perspective”, Chapman and Hall/CRC Press, Second Edition, 2014.

E-LEARNING RESOURCES:

1. <https://www.geeksforgeeks.org/machine-learning/>
2. <https://www.ibm.com/topics/machine-learning>

GUIDELINES TO THE QUESTION PAPER SETTERS**QUESTION PAPER PATTERN**

Section	Question Component	Numbers	Marks	Total
A	Definition / Principles <i>Answer any 10 out of 12 questions</i>	1 – 12	3	30
B	Short Answer <i>Answer any 5 out of 7 questions</i>	13–19	6	30
C	Essay <i>Answer any 4 out of 6 questions</i>	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

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	3	3	2.8	3

PSO-CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	2	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	2	3	3
CO 5	2	3	3	3	3
AVG.	2.8	3	2.8	2.8	3

PO-PSO-CO-QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Analyze ML fundamentals and apply end-to-end processes for building effective machine learning systems.	PO1, PO3	PSO1, PSO2, PSO5	K4
CO 2	Apply machine learning concepts and algorithms to build predictive models.	PO1, PO3	PSO1, PSO2, PSO3, PSO5	K3
CO 3	Discuss and apply various learning models including trees, rules, linear, and probabilistic models.	PO2, PO3	PSO1, PSO2, PSO3	K3
CO 4	Outline the advanced techniques in feature engineering and model ensembles.	PO2, PO3, PO4	PSO 1, PSO2, PSO4, PSO5	K2
CO 5	Master the process of model evaluation and experimentation in real-world applications.	PO3, PO4, PO5	PSO1, PSO4, PSO5	K5

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Seminar / Presentation	10	5
Class activity 2	Quiz (MCQ)	10	5
Class activity 3	Surprise Class Test	10	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

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: ELECTIVE - II
COURSE NAME: CYBER SECURITY	COURSE CODE: 26UBIT3E5
SEMESTER: V	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE:

provides the foundation for understanding the key issues associated with protecting information assets. The purpose of the course is to provide the student with an overview of the field of information security and assurance.

COURSE OUTCOMES:

CO 1: Understand the broad set of technical, social & political aspects of Cyber Security.

CO 2: Explore about Various types of Hackers and Threats and ways of sniffing.

CO 3: Understand the importance of ethical hacking tool and Process.

CO 4: Implementing ethical hacking tools in an organization.

CO 5: Apply methods for authentication, access control, intrusion detection and prevention and conduct research in Cyber Security.

UNIT I

INTRODUCTION

(18 HOURS)

Introduction to Cyber Security - Importance and challenges in Cyber Security - Cyberspace - Cyber threats - Cyber warfare - CIA Triad - Cyber Terrorism - Cyber Security of Critical Infrastructure - Cyber security - Organizational Implications.

UNIT II

HACKERS AND CYBER CRIMES

(18 HOURS)

Types of Hackers - Hackers and Crackers - Cyber-Attacks and Vulnerabilities - Malware threats - Sniffing - Gaining Access - Escalating Privileges - Executing Applications - Hiding Files - Covering Tracks - Worms - Trojans - Viruses - Backdoors.

UNIT III

ETHICAL HACKING AND SOCIAL ENGINEERING

(18 HOURS)

Ethical Hacking Concepts and Scopes - Threats and Attack Vectors - Information Assurance - Threat Modeling - Enterprise Information Security Architecture - Vulnerability Assessment and Penetration Testing - Types of Social Engineering - Insider Attack - Preventing Insider Threats - Social Engineering Targets and Defense Strategies.

UNIT IV

CYBER FORENSICS AND AUDITING

(18 HOURS)

Introduction to Cyber Forensics - Computer Equipment and associated storage media - Role of forensics Investigator - Forensics Investigation Process - Collecting Network based Evidence - Writing Computer Forensics Reports - Auditing - Plan an audit against a set of audit criteria -

UNIT V

(18 HOURS)

CYBER ETHICS AND LAWS

Introduction to Cyber Laws - E-Commerce and E-Governance - Certifying Authority and Controller - Offences under IT Act- Computer Offences and its penalty under IT Act 2000 - Intellectual Property Rights in Cyberspace.

PRESCRIBED BOOKS:

1. Donaldson, S., Siegel S., Williams, C.K., Aslam A (2015), “Enterprise Cyber security - How to Build a Successful Cyber defense Program against Advanced Threats”, Apress, 1st Edition.
2. Nina Godbole, Sumit Belapure (2011), “Cyber Security”, Wiley.

REFERENCE BOOKS:

1. Roger Grimes (2017), “Hacking the Hacker”, Wiley, 1st Edition
2. Cyber Law by Bare Act, Govt of India, It Act 2000.

E-LEARNING RESOURCES:

1. <https://www.investopedia.com/terms/e/erp.asp>
2. <https://www.oracle.com/erp/what-is-erp/>

GUIDELINES TO THE QUESTION PAPER SETTERS **QUESTION PAPER PATTERN**

Section	Question Component	Numbers	Marks	Total
A	Definition / Principles Answer any 10 out of 12 questions	1 – 12	3	30
B	Short Answer Answer any 5 out of 7 questions	13–19	6	30
C	Essay 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
I	3	2	2
II	3	1	1
III	2	1	1
IV	2	2	1
V	2	1	1
TOTAL	12	7	6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	3	2	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	3	3	2.6	3

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	2	3	3	3
CO 3	3	3	3	2	3
CO 4	3	3	3	3	3
CO 5	2	3	3	3	3
AVG	2.8	2.8	3	2.8	3

PO-PSO-CO QUESTION PAPER MAPPING

CO No	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Understand the broad set of technical, social & political aspects of Cyber Security.	PO1, PO2	PSO4, PSO5	K2, K5
CO 2	Explore about Various types of Hackers and Threats and ways of sniffing.	PO4, PO5	PSO2, PSO4, PSO5	K4
CO 3	Understand the importance of ethical hacking tool and Process.	PO2, PO3	PSO2, PSO3, PSO5	K2
CO 4	Implementing ethical hacking tools in an organization.	PO4, PO5	PSO 4, PSO5	K1, K4
CO 5	Apply methods for authentication, access control, intrusion detection and prevention and conduct research in Cyber Security.	PO2, PO3, PO4	PSO4, PSO5	K3

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Seminar / Presentation	10	5
Class activity 2	Quiz (MCQ)	10	5
Class activity 3	Surprise Class Test	10	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

ENVIRONMENTAL STUDIES

SUBJECT CODE: 26UEVS401	THEORY	MARKS 100
SEMESTER: V	CREDITS: 2	TOTAL HOURS: 30

COURSE OBJECTIVE:

To make students realize the importance of Environmental Studies.

COURSE OUTCOMES:

- CO1: Define the scope and importance of environmental studies and its relevance to sustainable development.
- CO2: Identify different types of natural resources and classify them as renewable, non-renewable, and potentially renewable.
- CO3: Describe the concept of biodiversity and list major conservation strategies.
- CO4: Identify the causes and types of environmental pollution and recall common prevention measures.
- CO5: List basic disaster management plans for common environmental hazards and recall preparedness measures at community level.

UNIT-1:

(6 HOURS)

Multidisciplinary nature of environmental studies Definition, scope and importance.

UNIT-2:

(6 HOURS)

Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems. - Forest resources: Use and over-exploitation, deforestation, case studies. - Timber extraction, mining, dams and their effects on forest and tribal people. - Water resources: Use and over- utilization of surface and ground water - floods, drought, conflicts over water, dams- benefits and problems. - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. 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-3:

(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: -. Forest ecosystem, Grassland ecosystem. Desert ecosystem. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT-4:**(6 HOURS)****Biodiversity and its conservation**

- Introduction – Definition: genetic, species and ecosystem diversity. – Bio geographical 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-5:**(6 HOURS)****Environmental Pollution****Definition**

- Cause, 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 waste.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: floods, earthquake, cyclone and landslides.

RECOMMENDED TEXTS

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.

REFERENCE BOOKS

1. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, .T.2001,Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p.

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Workbook / Notebook Maintenance	10	5
Class activity 1	Quiz	10	5
Class activity 2	Seminar / Presentation	10	5
Class activity 3	Unit wise Class Test	10	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			

PROGRAMME: B.Sc INFORMATION TECHNOLOGY	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:

- CO1. Apply academic knowledge to real-world IT problems.
- CO2. Develop domain knowledge, multidisciplinary, and professional skills.
- CO3. Gain industry exposure through practical experience.
- CO4. Practice ethical and sustainable computing approaches.
- CO5. 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: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: CORE - XVI
COURSE NAME: IOT SYSTEMS DESIGN AND COMMUNICATION TECHNOLOGIES	COURSE CODE: 26UBIT316
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS: 75
THEORY	

COURSE OBJECTIVE:

To understand IoT Fundamentals, Protocols, Design, Data Analytics, and Case Studies.

COURSE OUTCOMES:

CO 1: Explain the fundamentals, architecture, and components of IoT systems.

CO 2: Apply IoT communication protocols and networking technologies.

CO 3: Design IoT systems using embedded platforms like Arduino and Raspberry Pi.

CO 4: Analyze IoT data and cloud-based supporting services.

CO 5: Examine real-world IoT applications and Industry 4.0 concepts.

UNIT I

(18 HOURS)

Fundamentals of IoT: Evolution of Internet of Things, Enabling Technologies, M2M Communication, IoT World Forum (IoTWF) standardized architecture, Simplified IoT Architecture, Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT II

(18 HOURS)

IoT Protocols IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, 6LoWPAN, Application Transport Methods: SCADA, Application Layer Protocols: CoAP and MQTT.

UNIT III

(18 HOURS)

Design and development: Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks- IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, Arduino Board details

UNIT IV

(18 HOURS)

Data analytics and supporting services Data Analytics: Introduction, Structured Versus Unstructured Data, Data in Motion versus Data at Rest, IoT Data Analytics Challenges, Data Acquiring, Organizing in IoT/M2M, Supporting Services: Computing Using a Cloud Platform for IoT/M2M Applications/Services, Everything as a service and Cloud Service Models.

UNIT V**(18 HOURS)****Case Studies/Industrial Applications**

IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipment, Industry 4.0 concepts.

PRESCRIBED BOOKS:

1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017
2. Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015

REFERENCE BOOKS:

6. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit2).
7. “From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence”, Jan Ho“ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.
8. Architecting the Internet of Things, Dieter Uckelmann, Mark Harrison, Michahelles and Florian (Eds), Springer,2011.
9. Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, Michael Margolis, Arduino Cookbook and O’Reilly Media,2011.

E-LEARNING RESOURCES:

1. <https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/>
2. <https://www.ibm.com/topics/internet-of-things>

GUIDELINES TO THE QUESTION PAPER SETTERS

Section	Question Component	Numbers	Marks	Total
A	Definition / Principles Answer any 10 out of 12 questions	1 – 12	3	30
B	Short Answer Answer any 5 out of 7 questions	13–19	6	30
C	Essay 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
I	3	1	2
II	3	2	1
III	2	1	1
IV	2	2	1
V	2	1	1
TOTAL	12	7	6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	2	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	3	2.6	3

PSO – CO MAPPING

	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	2	3	3
CO 2	3	3	3	3	3
CO 3	3	3	3	2	3
CO 4	3	3	3	3	3
CO 5	3	3	3	2	2
AVG	3	3	2.8	2.6	2.8

PO-PSO-CO-QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Explain the fundamentals, architecture, and components of IoT systems.	PO 1, PO 2,	PSO1, PSO2	K2, K5
CO 2	Apply IoT communication protocols and networking technologies.	PO2	PSO1, PSO3	K3
CO 3	Design IoT systems using embedded platforms like Arduino and Raspberry Pi.	PO2, PO3	PSO1, PSO5	K6
CO 4	Analyze IoT data and cloud-based supporting services.	PO2,PO3	PSO1, PSO4	K4
CO 5	Examine real-world IoT applications and Industry 4.0 concepts.	PO4, PO5	PSO1, PSO3	K5

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Seminar / Presentation	10	5
Class activity 2	Quiz (MCQ)	10	5
Class activity 3	Surprise Class Test	10	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

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: CORE - XVII
COURSE NAME: NATURAL LANGUAGE PROCESSING	COURSE CODE: 26UBIT317
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE:

This course deals with processing text data using probabilistic model with n-grams and preprocessing techniques. Concepts of text classification, text summarization, semantic analysis drives the subject to machine translation. This course will boost student knowledge to a level that can help to develop NLP applications like surveys, chatbots QA system etc. which is required in ecommerce platforms.

COURSE OUTCOMES:

CO 1: Describe the basic concepts and requirements of Natural Language Processing.

CO 2: Comprehensive and systematic approach.

CO 3: Outline text preprocessing and semantic analysis techniques in NLP.

CO 4: Analyse text using key NLP techniques to retrieve information.

CO 5: Utilize NLP applications such as document similarity, clustering, and speech recognition for text analysis.

UNIT I

(18 HOURS)

Introduction to NLP:

What is NLP? Challenges of NLP, History of NLP, Advantages of NLP, Disadvantages of NLP, Components of NLP, Applications of NLP, how to build an NLP pipeline? Phases of NLP, NLP APIs, NLP Libraries.

UNIT II

(18 HOURS)

Natural Language Processing Models and Algorithm:

Unigram Language Model, Bigram, Trigram, N-gram, Advanced smoothing for language modelling, Applications of Language Modeling, Natural Language Generation, Parts of Speech Tagging, Morphology, Named Entity Recognition

UNIT III

(18 HOURS)

Text Processing:

Continuous Bag-Of-Words, embedding representations for words Lexical Semantics, Word Sense Disambiguation, Knowledge-Based and Supervised Word Sense Disambiguation, Tokenization, Cleaning, Tokenizing, Removing Special Characters, Expanding Contractions, Removing Stop words, Correcting Words, Stemming, Lemmatization, Understanding Text structure.

UNIT IV

(18 HOURS)

Text Analysis, Summarization and Extraction:

Text Classification, Text Summarization, Information Extraction, Named Entity Recognition, Question Answering in Multilingual Setting; NLP in Information Retrieval, Cross-Lingual IR

UNIT V

(18 HOURS)

Applications of NLP:

Unsupervised Learning on Text Clustering by Document Similarity – Distance Metrics, Partitive Clustering, Hierarchical Clustering: Analyzing Document Similarity, Document Clustering, Speech recognition.

PRESCRIBED BOOKS:

1. Foundations of Statistical Natural Language Processing, Chris Manning and Hinrich Schütze, MIT Press.
2. Speech and Language Processing - An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition Second Edition by Daniel Jurafsky and James H. Martin, Pearson Education India
3. Text analytics with python, Dipanjan Sarkar, Apress

REFERENCE BOOKS:

1. Computational Nonlinear Morphology: With Emphasis on Semitic Languages, Kiraz, George Anton; Cambridge University Press.
2. Oxford Handbook of Computational Linguistics.
3. Natural Language Understanding, James Allen. The Benjamin/Cummings Publishing Company Inc.
4. Natural Language Processing with Python – Analyzing Text with the Natural Language Toolkit, Steven Bird, Ewan Klein, and Edward Loper.

E-LEARNING RESOURCES:

1. <https://www.javatpoint.com/nlp>
2. <https://www.kaggle.com/learn/natural-language-processing>
3. <https://nptel.ac.in/courses/106/105/106105158/>
4. <https://nptel.ac.in/>

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 4 out of 6 questions (each in 1200 words)</i>	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

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	2.8	2.8	3

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	2	3	3
CO 2	3	3	3	3	3
CO 3	2	3	3	3	3
CO 4	2	3	3	3	3
CO 5	3	3	3	3	3
AVG	2.6	2.8	2.8	3	3

PO-PSO - CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Describe the basic concepts and requirements of Natural Language Processing.	PO 1, PO 2	PSO1, PSO2, PSO4	K4
CO 2	comprehensive and systematic approach.	PO1, PO3	PSO3, PSO5	K4
CO 3	Outline text preprocessing and semantic analysis techniques in NLP.	PO2, PO3	PSO1, PSO2, PSO4	K2
CO 4	Analyse text using key NLP techniques to Retrieve information.	PO2, PO3, PO4	PSO1, PSO3, PSO5	K4
CO 5	Utilize NLP applications such as document similarity, clustering, and speech recognition for text analysis.	PO 3, PO 4, PO 5	PSO1, PSO2, PSO4, PSO5	K3

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Seminar / Presentation	10	5
Class activity 2	Quiz (MCQ)	10	5
Class activity 3	Surprise Class Test	10	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			

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: CORE - XVIII
COURSE NAME: R PROGRAMMING FOR DATA SCIENCE	COURSE CODE: 26UBIT318
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS: 75
THEORY	

COURSE OBJECTIVE:

Understand R Programming Environment and explore Mathematical and Statistical Functions.

COURSE OUTCOMES:

CO 1: Explain the basic concepts of R, its environment, and package handling.

CO 2: Apply variables, operators, control structures, and loops in R programming.

CO 3: Apply Mathematical and statistical functions in R

CO 4: Implement graphical usage in R for data analysis.

CO 5: Analyze data using statistical methods and visualization techniques in R.

UNIT I (15 HOURS)

Introduction to R: What is R? – Why R? – Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, comments – Handling Packages in R: Installing a R Package, few commands to get started: installed packages (), package Description(), help(), find. Package(), library() - Input and Output – Entering Data from keyboard – Printing fewer digits or more digits – Special Values functions: NA, Inf.

UNIT II (15 HOURS)

R - Variables: Variable assignment, Data types of Variables, Finding Variable ls(), Deleting Variables- R Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators - R Decision Making: if statement, if – else statement, if– else if statement, switch statement – R Loops: repeat loop, while loop, for loop - Loop control statement: break statement, next statement.

UNIT III (15 HOURS)

R Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame – R-Function : function definition, built in functions, user-defined function, calling a function, calling a function without an argument, calling a function with argument values

UNIT IV (15 HOURS)

R-Strings – Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower()-Dates and Times -Dates in R -Times in R -Operations on Dates and Times-Managing Data Frames with the dplyr package -Data Frames -The dplyr Package -dplyr Grammar-Installing the dplyr package - select() -filter() -arrange()-rename() -mutate()-group_by()

UNIT V**(15 HOURS)**

Descriptive Statistics: Data Range, Frequencies, Mode, Mean and Median: Mean Applying Trim Option, Applying NA Option, Median - Mode - Standard Deviation – Correlation - Spotting Problems in Data with Visualization: visually Checking Distributions for a single Variable - R –Pie Charts: Pie Chart title and Colors – Slice Percentages and Chart Legend, 3D Pie Chart – R Histograms – Density Plot - R – Bar Charts: Bar Chart Labels, Title and Colors.

PRESCRIBED BOOKS:

1. The Art of R Programming: A Tour of Statistical Software Design, Norman Matloff, No Starch Press, Latest Edition
2. Beginning R: The Statistical Programming Language, Mark Gardener, Wiley

RECOMMENDED BOOKS:

12. R in Action, Rob Kabacoff, Manning 3rd edition 2022.
13. The Art of R Programming, Norman Matloff, Cengage Learning 2011.

E-LEARNING RESOURCES:

1. <https://r4ds.had.co.nz>
2. <https://swirlstats.com>
3. <https://www.coursera.org/learn/r-programming>

GUIDELINES TO THE QUESTION PAPER SETTERS**QUESTION PAPER PATTERN**

Section	Question Component	Numbers	Marks	Total
A	Definition / Principles Answer any 10 out of 12 questions	1 – 12	3	30
B	Short Answer Answer any 5 out of 7 questions	13–19	6	30
C	Essay 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
I	3	2	2
II	3	1	1
III	2	1	1
IV	2	2	1
V	2	1	1
TOTAL	12	7	6

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	2	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	2
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	2.8	2.8	2.8

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	2	2	3	2
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	2.8	3	2.8

PO-PSO-CO-QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Explain the basic concepts of R, its environment, and package handling.	PO 1, PO 2	PSO1, PSO4, PSO5	K2, K4
CO 2	Apply variables, operators, control structures, and loops in R programming.	PO 3	PSO1, PSO3, PSO5	K3
CO 3	Apply Mathematical and statistical functions in R	PO 3	PSO1, PSO2, PSO4, PSO5	K3
CO 4	Implement graphical usage in R for data analysis.	PO 4	PSO1, PSO3, PSO4, PSO5	K5
CO 5	Analyze data using statistical methods and visualization techniques in R.	PO 4, PO 5	PSO1, PSO4, PSO5	K4

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Problem Solving / Coding Tasks	10	5
Class activity 2	Seminar / Presentation	10	5
Class activity 3	Surprise Class Test / Quiz	10	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

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: CORE - XIX
COURSE NAME: PRACTICAL -VI: R PROGRAMMING FOR DATA SCIENCE LAB	COURSE CODE: 26UBIT319P
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS: 60
PRACTICAL	

COURSE OBJECTIVE:

Understand and apply the basics in R Programming from Statistical Perspective

COURSE OUTCOMES:

CO 1: Develop basic programs in R using sequential programming.

CO 2: Write programs using control structures.

CO 3: Write programs using R data structures.

CO 4: Implement the mathematical and statistical functions in R.

CO 5: Implement data visualizations with packages.

PRACTICAL PROGRAMS:

1. Write an R program that prompts the user to enter their Name, Roll No, Marks (5 Subjects) and then calculate the total and average, then print a summary message using the input.
2. Using a for loop, print all the even numbers between 1 and 50 in ascending and descending order.
3. Create an R script that checks the number (1-7) and prints the day of the week (Mon-Sun) using if-else statements and provides an appropriate message.
4. Write a R Program to create a simple calculator and perform the necessary mathematical calculations using the appropriate operators.
5. Create a matrix in R with dimensions 3x3. Perform matrix addition, subtraction, multiplication and division.
6. Create a vector of values and perform the necessary vector operations.
7. Write a user-defined function in R that calculates the factorial and the Fibonacci series of a given integer. Test the function with an argument value of 5 and display the result.
8. Perform the necessary string functions on the following text-“ Event: Halloween Party Date: 2023-10-31 Time: 19:00 Location: Haunted Mansion Theme: Spooky” and provide the required results expected in the following questions:
 - Extract and display the name of the event, which is "Halloween Party."
 - Extract and display the event date, and format it as "31st October, 2023."
 - Retrieve and print the event time in the format "07:00 PM."
 - Extract and display the event location, which is "Haunted Mansion."
 - Find and print the theme of the event.

- Create a new string that contains the event information in reverse order, i.e., "Theme: Spooky Location: Haunted Mansion Time: 07:00 PM Date: 31st October 2023 Event: Halloween Party."
9. Install and load the "dplyr" package. Create a data frame containing information about employees (Name, Age, Salary). Use the "filter ()" function to filter and display employee with salary greater than 35000.
 10. Given a vector of exam scores, calculate and print the range, max, min, mean, and median of the scores. Then, create a summary report with these statistics.
 11. You have two vectors representing the scores of two different subjects for a group of students. Calculate the standard deviation for each subject's scores and then find the correlation between these two subjects' scores.
 12. Create a pie chart to represent the distribution of expenses (e.g., rent, food, entertainment) in a monthly budget. Include a title, customize the colors, and display slice percentages and a chart legend.
 13. Create a bar chart to compare the sales figures of different products in a store. Add labels, a title, and customize the colors to make the chart informative and visually appealing.
 14. Customize a histogram for the number of books read by a group of readers, including appropriate bin selection, labels, colors, and legend.
 15. Customize a density plot to visualize the distribution of monthly expenses for two different departments in a company. Include labels, titles, and distinctive colors for each department.

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	2	3	3
CO 2	3	2	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	2.8	2.8	3

PSO – CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	2	3
CO 2	3	2	2	3	2
CO 3	3	3	3	3	3
CO 4	3	3	3	2	3
CO 5	2	3	3	3	3
AVG	2.8	2.8	2.8	2.6	2.8

PO-PSO-CO-QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Develop basic programs in R using sequential programming.	PO1, PO2	PSO1, PSO4, PSO5	K6
CO2	Write programs using control structures.	PO1, PO2, PO3	PSO1, PSO3, PSO5	K6
CO3	Write programs using R data structures.	PO1, PO2, PO3	PSO1, PSO3, PSO4, PSO5	K6
CO4	Implement the mathematical and statistical functions in R.	PO3, PO4, PO5	PSO1, PSO4, PSO5	K3
CO5	Implement data visualizations with packages	PO4, PO5	PSO 1, PSO 2, PSO 4, PSO 5	K3

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

CIA COMPONENT

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	Assignment based on experimental concepts	10	5
Practical Record Book	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
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. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: CORE-XX
COURSE NAME: PROJECT	COURSE CODE: 26UBIT320
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS: 60
PRACTICAL	

COURSE OBJECTIVE:

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

COURSE OUTCOMES:

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

A project should be done by the students based on concepts they have already learnt in the first two years of the programme. It may be based on database concepts, object-oriented concepts, image processing, data Science, optimization tools, Big Data, etc. The project work constitutes an important component of the B.Sc.(IT) programme, and it is to be carried out with due care and should be executed with seriousness by the students. The objective of this project is to help the student develop the ability to apply theoretical and practical tools/ techniques to solve real life problems related to industry, academic institutions and research laboratories.

Guidelines: A student is expected to devote about 3 months in planning, analyzing, designing and implementing the project. The initiation of project should be with the project proposal that is to be treated as an assignment:

Project Evaluation: The evaluation of the project will be based on the project reports submitted by the student, a presentation and a demonstration.

CIA COMPONENT

Continuous Internal Assessment - Components			
Assessment Type	Nature	Maximum Marks	Weightage
Mid-Semester Examination	Project Title, Analysis and Design Presentation / viva-vice	50	10
Model Examination	Project Implementation Presentation / viva-vice	100	10
Assignment	Project Description	10	5
Workbook / record book / notebook	Project Documentation	10	5
Class activity 1	Project Review 1	10	5
Class activity 2	Project Review 2	10	5
Class activity 3	Mock Viva	10	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			

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: ELECTIVE – III
COURSE NAME: CLOUD COMPUTING	COURSE CODE: 26UBIT3E3
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE:

To equip students with the knowledge and skills to understand, design, and manage cloud computing systems, including architecture, service models, virtualization, and cloud applications.

COURSE OUTCOMES:

CO 1: Apply the cloud computing fundamentals, deployment models and infrastructure for effective cloud adoption.

CO 2: Explain the ability to understand and manage enterprise and cloud data storage systems.

CO 3: Obtain skill on different cloud service models (IaaS, PaaS, SaaS) and to deploy web services on cloud platforms.

CO 4: Explore cloud risk management, data and tools for building and managing secure cloud applications.

CO 5: Discuss and implement cloud-based applications and services across platforms such as Microsoft Azure and Google Cloud.

UNIT I

(18 HOURS)

Cloud Computing Foundation

Cloud Computing Basics: Introduction to Cloud Computing – History of cloud computing- Importance of cloud computing- Characteristics of cloud computing- Move to Cloud Computing: Pros & Cons of Cloud Computing-Technologies in cloud computing- Migrating into cloud-Seven-step model-Types of Cloud: public and private cloud-cloud infrastructure-cloud application architecture – Working of Cloud Computing: Cloud service models-cloud deployment models- Trends in cloud computing.

UNIT II

(18 HOURS)

Cloud Computing Architecture

Cloud Computing Technology: Cloud lifecycle model-Role of cloud modelling and architecture-Reference model for cloud computing- Cloud Industry standard – Cloud Architecture: Cloud computing architecture-Developing holistic cloud computing reference model- Cloud Modeling and Design: Model for federated cloud computing- Cloud Ecosystem model- Cloud Governance- Virtualization: Foundation – Virtualization application-pitfalls of virtualization.

UNIT III**(18 HOURS)****Data Storage and Computing**

Data storage : Introduction to Enterprise Data Storage – Data Storage management- File systems- Using grids for data storage- Cloud Storage: Overview of cloud storage-Data management for cloud storage – Cloud Storage from LANs to WANs: Distributed Data Storage- Applications utilizing cloud storage – Cloud Computing Services : Understanding service and applications by type- SaaS-PaaS-IaaS – Cloud Computing at Work: Cloud service development tools-Management/administrative services.

UNIT IV**(18 HOURS)****Cloud Computing and Security**

Introduction : Risks management- Cloud impact- Enterprise wide risk management- Types of risks- Data Security: Security issues and challenges- Homo Sapiens and digital information-Content Level Security (CLS) – Cloud Security Services: Confidentiality, integrity and availability- Security authorization challenges in cloud-Secure cloud software requirements- secure cloud software testing – Cloud Computing Tools : Tools and technologies for cloud-Parallel computing- cloud computing application platforms- Tools for building cloud- Programming in cloud-Cloud Mashup: Overview-Realizing resource mashups.

UNIT V**(18 HOURS)****Cloud Applications**

Moving Applications to the Cloud -Cloud Opportunities- Managing devices and desktop in cloud- Scientific applications in cloud- Microsoft Cloud Services: Windows Azure platform- Microsoft cloud services – Google Cloud Applications: Google applications utilizing cloud-Google App engine – Amazon Cloud Services: Understanding Amazon web components and services- Elastic Compute Cloud (EC2) – Cloud Applications: Cloud-based solutions-Cloud software for private banking- Cloud software for asset management-cloud software for fund management.

PRESCRIBED BOOKS:

1. Cloud Computing: A Practical Approach for learning and implementation by A. Srinivasan and J. Suresh (2nd Edition, 2014, Pearson, ISBN- 9788131776513).
2. Cloud Computing: A Hands-On Approach by Arshdeep Bahga and Vijay Madisetti (1st Edition, 2014, VPT, ISBN-13: 978-0996025515).
3. Cloud Computing: Principles and Paradigms by Rajkumar Buyya (1st Edition, 2011, Wiley, ISBN-13: 978-0470887998)

REFERENCE BOOKS:

1. Cloud Computing for Dummies by Judith Hurwitz, Robin Bloor, Marcia Kaufman, and Fern Halper (1st Edition, 2013, Wiley, ISBN-13: 978-1118643302)
2. Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS) by Michael J. Kavis (1st Edition, 2014, Wiley, ISBN-13: 978-1118630180)

E-LEARNING RESOURCES:

1. <https://www.edx.org/course/introduction-to-cloud-computing>
2. <https://www.cloudskillsboost.google>
3. <https://www.coursera.org/specializations/cloud-computing>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

Section	Question Component	Numbers	Marks	Total
A	Definition / Principles <i>Answer any 10 out of 12 questions</i>	1 – 12	3	30
B	Short Answer <i>Answer any 5 out of 7 questions</i>	13–19	6	30
C	Essay <i>Answer any 4 out of 6 questions</i>	20– 25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS

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

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	3	3	3
CO 2	3	3	2	3	3
CO 3	3	3	3	2	3
CO 4	3	3	3	3	2
CO 5	3	3	3	3	3
AVG	3	3	2.8	2.8	2.8

PSO – CO MAPPING

	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	2	3
CO 2	3	3	3	3	3
CO 3	3	3	2	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	2
AVG	3	3	2.8	2.8	2.8

PO-PSO-CO-QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Apply the cloud computing fundamentals, deployment models and infrastructure for effective cloud adoption.	PO2, PO3	PSO1, PSO3, PSO5	K3
CO 2	Explain the ability to understand and manage enterprise and cloud data storage systems	PO3, PO4	PSO1, PSO3	K2, K4
CO 3	Obtain skill on different cloud service models (IaaS, PaaS, SaaS) and to deploy web services on cloud platforms.	PO2, PO3, PO4, PO5	PSO1, PSO4, PSO5	K3
CO 4	Explore cloud risk management, data and tools for building and managing secure cloud applications.	PO3, PO4, PO5	PSO1, PSO2, PSO4, PSO5	K5
CO 5	Discuss and implement cloud-based applications and services across platforms such as Microsoft Azure and Google Cloud.	PO3, PO4, PO5	PSO1, PSO3, PSO4, PSO5	K6

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Seminar / Presentation	10	5
Class activity 2	Quiz (MCQ)	10	5
Class activity 3	Surprise Class Test	10	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			

ROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: ELECTIVE -III
COURSE NAME: MOBILE COMPUTING	COURSE CODE: 26UBIT3E6
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE:

To Understand Working of Wireless devices and interconnectivity

COURSE OUTCOMES:

- CO 1: Describe the fundamental concepts of mobile communication
- CO 2: Explain next-generation mobile communication systems.
- CO 3: Apply the concepts of wireless LAN in Bluetooth and security management
- CO 4: Analyze various protocols of all layers for mobile and ad hoc wireless communication networks.
- CO 5: Explain IP and TCP layers of Mobile Communication

UNIT I

(18 HOURS)

Introduction - Mobile and Wireless Devices – Simplified Reference Model – Need for Mobile Computing –Wireless Transmissions –Multiplexing – Spread Spectrum and Cellular Systems-Medium Access Control – Comparisons.

UNIT II

(18 HOURS)

Telecommunication Systems – GSM – Architecture – Sessions – Protocols – Hand Over and Security – UMTS and IMT – 2000 – Satellite Systems.

UNIT III

(18 HOURS)

Wireless Lan - IEEE S02.11 – Hiper LAN – Bluetooth – Security and Link Management.

UNIT IV

(18 HOURS)

Mobile network layer - Mobile IP – Goals – Packet Delivery – Strategies – Registration –Tunneling and Reverse Tunneling – Adhoc Networks – Routing Strategies.

UNIT V

(18 HOURS)

Mobile transport layer - Congestion Control – Implication of TCP Improvement – Mobility –Indirect – Snooping – Mobile – Transaction oriented TCP - TCP over wireless – Performance.

PRESCRIBED BOOKS:

1. J.Schiller, 2003, Mobile Communications, 2nd edition, Pearson Education, Delhi.

REFERENCE BOOKS:

1. Hansmann, Merk, Nicklous, Stober, 2004, Principles of Mobile Computing, 2nd Edition,

Springer (India).

2. Pahlavan, Krishnamurthy, 2003(2002), Principle of wireless Networks: A Unified Approach, Pearson Education, Delhi.
3. MartynMallick, 2004, Mobile and Wireless Design Essentials, Wiley Dreamtech India Pvt. Ltd., New Delhi.
4. W.Stallings, 2004, Wireless Communications and Networks, 2nd Edition, Pearson Education, Delhi.

E-LEARNING RESOURCES:

1. <https://www.techtarget.com/searchmobilecomputing/definition/nomadic-computing>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

Section	Question Component	Numbers	Marks	Total
A	Definition / Principles Answer any 10 out of 12 questions	1 – 12	3	30
B	Short Answer Answer any 5 out of 7 questions	13–19	6	30
C	Essay 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
I	3	2	2
II	3	1	1
III	2	1	1
IV	2	2	1
V	2	1	1
TOTAL	12	7	6

PSO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	3	3	3	3
CO 2	3	2	3	3	3
CO 3	3	3	3	2	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	3	2.8	3

PSO – CO MAPPING

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO 2	3	3	3	3	3
CO 3	2	3	3	3	2
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	2.8	3	3	2.8	2.8

PO-PSO-CO QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Describe the fundamental concepts of mobile communication	PO1,PO2	PSO1, PSO5	K6
CO 2	Explain next-generation mobile communication systems.	PO2, PO3	PSO1, PSO3, PSO5	K2, K5
CO 3	Apply the concepts of wireless LAN in Bluetooth and security management	PO2, PO3	PSO1, PSO4, PSO5	K3
CO 4	Analyze various protocols of all layers for mobile and ad hoc wireless communication networks.	PO2, PO3, PO4, PO5	PSO1, PSO2, PSO4	K4
CO 5	Explain IP and TCP layers of Mobile Communication	PO2, PO3	PSO1, PSO3,PSO4, PSO5	K2, K5

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Seminar / Presentation	10	5
Class activity 2	Quiz (MCQ)	10	5
Class activity 3	Surprise Class Test	10	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			

PROGRAMME: B.Sc. INFORMATION TECHNOLOGY	BATCH: 2026-29
PART: III	COURSE COMPONENT: ELECTIVE - III
COURSE NAME: PARALLEL COMPUTING	COURSE CODE: 26UBIT3E7
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE:

To learn the major concepts and ideas in parallel computing and its applications and to understand various models of parallelism.

COURSE OUTCOMES:

CO 1: Learn parallel computing concepts, architectures, performance evaluation, and applications for efficient problem solving.

CO 2: Explain Flynn's, Handler's, structural, and grain size-based classifications.

CO 3: Analyze and design interconnection networks, permutation concepts, and performance metrics.

CO 4: Apply parallel computer architecture and operating system concepts, including pipelining, vector and multithreading.

CO 5: Acquire skills to measure parallel computing performance and apply modern parallel programming and virtual machine concepts.

UNIT I

(18 HOURS)

Introduction To Parallel Computing- History of Parallel Computers - Problem Solving in Parallel - Performance Evaluation - Elementary Concepts -The Need of Parallel Computation – Levels of Parallel Processing - Dataflow Computing - Applications of Parallel Processing.

UNIT II

(18 HOURS)

Introduction to Classification of Parallel Computers -Types of Classification - Flynn's Classification -Handler's Classification -Structural Classification - Classification Based on Grain Size.

UNIT III

(18 HOURS)

Introduction to Interconnection Networks - Network Properties- Design issues of Interconnection Network- Various Interconnection Networks-Concept of Permutation Network - Performance Metrics.

UNIT IV

(18 HOURS)

Introduction to Parallel Computer Architecture - Pipeline Processing - Vector Processing –

Array Processing - Superscalar Processors - VLIW Architecture - Multi-threaded Processors.

Introduction to Operating System for Parallel Computer - Parallel Programming Environment Characteristics- Synchronization Principles- Multitasking Environment.

UNIT V

(18 HOURS)

Introduction of Performance Evaluations - Metrics for Performance Evaluation – Factors Causing Parallel Overheads- Laws for Measuring Speedup Performance - Tools for Performance Measurement - Performance Analysis- Performance Instrumentations. **Introduction to Recent Trends in Parallel Computing**- Recent Parallel Programming Models –Parallel Virtual Machine.

PRESCRIBED BOOKS

1. Rajaraman V. and Siva Ram Murthy C. Parallel Computers – Architecture and Programming, Second Edition, Prentice Hall of India .
2. Selim G. Akl Parallel Computation, Models and Methods: Prentice Hall of India.
3. Kai Hwang: Advanced Computer Architecture: Parallelism, Scalability, Programmability (2001), Tata McGraw Hill, 2001.

REFERENCE BOOKS

1. Hennessy J. L. and Patterson D. A. Computer Architecture: A Qualitative Approach, Morgan Kaufman (1990) Thomas L. Casavant, Pavel Tvrđik, František Plasil, Parallel Computers: Theory and Practice

E-LEARNING RESOURCES

1. <https://www.geeksforgeeks.org/introduction-to-parallel-computing/>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

Section	Question Component	Numbers	Marks	Total
A	Definition / Principles <i>Answer any 10 out of 12 questions</i>	1 – 12	3	30
B	Short Answer <i>Answer any 5 out of 7 questions</i>	13–19	6	30
C	Essay <i>Answer any 4 out of 6 questions</i>	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

PO – CO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO5
CO 1	3	2	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
AVG	3	2.8	3	2.8	3

PSO – CO MAPPING

	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	2	3	3
CO 4	3	3	3	2	3
CO 5	3	3	3	3	3
AVG	3	3	2.8	2.8	3

PO-PSO-CO-QUESTION PAPER MAPPING

CO No:	COURSE OUTCOME	POs ADDRESSED	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Learn parallel computing concepts, architectures, performance evaluation, and applications for efficient problem solving.	PO1, PO2	PSO1, PSO3	K2
CO 2	Explain Flynn's, Handler's, structural, and grain size-based classifications.	PO2, PO3	PSO1, PSO2, PSO4	K2, K5
CO 3	Analyze and design interconnection networks , permutation concepts, and performance metrics.	PO2, PO3	PSO1, PSO4, PSO5	K4
CO 4	Apply parallel computer architecture and operating system concepts, including pipelining, vector and multithreading	PO2, PO3, PO4	PSO1, PSO3, PSO5	K3
CO 5	Acquire skills to measure parallel computing performance and apply modern parallel programming and virtual machine concepts.	PO3, PO4, PO5	PSO1, PSO3, PSO4, PSO5	K5

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

CIA COMPONENT

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	Written Assignment on Course-related topics	10	5
Workbook / record book / notebook	Notebook Maintenance for Handwritten notes	10	5
Class activity 1	Seminar / Presentation	10	5
Class activity 2	Quiz (MCQ)	10	5
Class activity 3	Surprise Class Test	10	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			