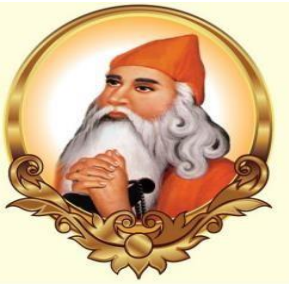

Department of Computer Science and Engineering

Scheme of Examination and Syllabus for Under Graduate Programme

Under Multiple Entry and Exit, Internship and CBCS-LOCF as per NEP-2020 w.e.f. session 2024-25 (in phased manner)

Subject: Computer Applications

Guru Jambheshwar University of Science &Technology
Hisar-125001, Haryana

(A+ NAAC Accredited State Govt. University)

Guru Jambheshwar University of Science and Technology
Hisar-125001, Haryana
('A+' NAAC Accredited State Govt. University)

Scheme of Examination & Syllabus for affiliated Degree Colleges for UG Programme
According to National Education Policy-2020

Subject: Computer Applications

SEMESTER -I								
Course Type	**Course Code**	**Nomenclature of PAPER**	**Credits**	**Contact hours**	**Internal Marks**	**End term marks**	**Total Marks**	**Duration of Exam (hrs)**
Discipline Specific Course	C24CAP101T	Computer Fundamental and Problem solving through C	3	3	20	50	70	2.5
	C24CAP101P	Computer Fundamental and Problem solving through C Lab	1	2	10	20	30	3
	C24CAP102T	Logical Organization of Computer	3	3	20	50	70	2.5
	C24CAP102P	Logical Organization of Computer Lab	1	2	10	20	30	3
	C24CAP103T	Introduction to Web Technologies	3	3	20	50	70	2.5
	C24CAP103P	Introduction to Web Technologies Lab	1	2	10	20	30	3
Minor Course/ Vocational Course	C24MIC124T (i) OR C24MIC124T (ii)	Information Technology OR Mathematical Foundation of Computer Science-I	2	2	15	35	50	2
Minor Course/ Vocational Course#	C24MIN124T	Essentials of Computer Science	4	4	30	70	100	3
Multidisciplinary Course	C24MDC132T	Foundations of Computer Science	2	2	15	35	50	2
	C24MDC132P	Foundations of Computer Science Lab	1	2	10	15	25	3
Skill Enhancement Course	C24SEC124T	PC Hardware and Networking	2	2	15	35	50	2
	C24SEC124P	PC Hardware and Networking-Lab	1	2	10	15	25	3
Value Added Course	C24VAC122T	E-Commerce	2	2	15	35	50	2

#For Scheme C only

SEMESTER-II

Type of Course	Course Code	Nomenclature of Paper/Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hrs)
Discipline Specific Course	C24CAP201T	Object Oriented Programming using C++	3	3	20	50	70	2.5
	C24CAP201P	Object Oriented Programming using C++ Lab	1	2	10	20	30	3
	C24CAP202T	Data Structure and applications	3	3	20	50	70	2.5
	C24CAP202P	Data Structure and applications Lab	1	2	10	20	30	3
	C24CAP203T	Concepts of Operating Systems	3	3	20	50	70	2.5
	C24CAP203P	Concepts of Operating Systems Lab	1	2	10	20	30	3
Minor Course/ Vocational Course	C24MIC224T (i) OR C24MIC224T (ii)	Database Technologies OR Mathematical Foundation of Computer Science-II	2	2	15	35	50	2
Minor Course/ Vocational Course#	C24MIN224T	Data Science and Analytics	4	4	30	70	100	3
Multidisciplinary Course	C24MDC232T	Internet and Web Design	2	2	15	35	50	2
	C24MDC232P	Internet and Web Design-Lab	1	2	10	20	30	3
Skill Enhancement Course	C24SEC224T	Web Designing Basics using HTML	2	2	15	35	50	2
	C24SEC224P	Web Designing Basics using HTML Lab	1	2	10	15	25	2
Value Added Course	C24VAC122T	E-Commerce	2	2	15	35	50	2

#For Scheme C only

Guru Jambheshwar University of Science and Technology
Hisar-125001, Haryana
('A+' NAAC Accredited State Govt. University)

Scheme of Examination & Syllabus for affiliated Degree Colleges for UG Programme
According to National Education Policy-2020
(Offered by the Department)

Subject: Computer Applications

SEMESTER-III

Type of Course	Course Code	Nomenclature of Paper/Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hrs)
Discipline Specific Course	C24CAP301T	Java Programming	3	3	20	50	70	2.5
	C24CAP301P	Java Programming Lab	1	2	10	20	30	3
	C24CAP302T	Linux and Shell programming	3	3	20	50	70	2.5
	C24CAP302P	Linux and Shell programming Lab	1	2	10	20	30	3
	C24CAP303T	Database Management System	3	3	20	50	70	2.5
	C24CAP303P	Database Management System Lab	1	2	10	20	30	3
Minor Course/ Vocational Course	C24MIC324T	Theory of Computation	4	4	30	70	100	3
Multidisciplinary Course	C24MDC332T	C Programming	2	2	15	35	50	2
	C24MDC332P	C Programming Lab	1	2	10	15	25	3
Skill Enhancement Course	C24SEC324T	Advance IT Skills	2	2	15	35	50	2
	C24SEC324P	Advance IT Skills Lab	1	2	10	15	25	3

(Offered by the Department)

SEMESTER-IV

Type of Course	Course Code	Nomenclature of Paper/Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hrs)
Discipline Specific Course	C24CAP401T	Cloud Computing	3	3	20	50	70	2.5
	C24CAP401P	Cloud Computing Lab	1	2	10	20	30	3
	C24CAP402T	Front end Development	3	3	20	50	70	2.5
	C24CAP402P	Front end Development Lab	1	2	10	20	30	3
	C24CAP403T	Computer Graphics	3	3	20	50	70	2.5
	C24CAP403P	Computer Graphics Lab	1	2	10	20	30	3
Minor Course/ Vocational Course	C24VOC424T	Data Analytics using R	2	2	15	35	50	2
	C24VOC424P	Data Analytics using R Lab	2	4	15	35	50	3
Value Added Course	C24VAC 313 T	Internet Ethics	2	2	15	35	50	2

Guru Jambheshwar University of Science and Technology
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('A+' NAAC Accredited State Govt. University)

Scheme of Examination & Syllabus for affiliated Degree Colleges for UG Programme
According to National Education Policy-2020
(Programme-wise)

Subject: Computer Applications

SEMESTER-III

Type of Course	Course Code	Nomenclature of Paper/Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hrs)
Discipline Specific Course	C24CAP301T	Java Programming	3	3	20	50	70	2.5
	C24CAP301P	Java Programming Lab	1	2	10	20	30	3
	C24CAP302T	Linux and Shell programming	3	3	20	50	70	2.5
	C24CAP302P	Linux and Shell programming Lab	1	2	10	20	30	3
	C24CAP303T	Database Management System	3	3	20	50	70	2.5
	C24CAP303P	Database Management System Lab	1	2	10	20	30	3
Minor Course/ Vocational Course		To be taken from MIC Pool	4	4	30	70	100	3
Multidisciplinary Course		To be taken from MDC Pool	2	2	15	35	50	2
		To be taken from MDC Pool	1	2	10	15	25	3
Skill Enhancement Course		To be taken from SEC Pool	2	2	15	35	50	2
		To be taken from SEC Pool	1	2	10	15	25	3
Ability Enhancement Course		To be taken from AEC Pool	2	2	15	35	50	2

(Programme-wise)

SEMESTER-IV

Type of Course	Course Code	Nomenclature of Paper/Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hrs)
Discipline Specific Course	C24CAP401T	Cloud Computing	3	3	20	50	70	2.5
	C24CAP401P	Cloud Computing Lab	1	2	10	20	30	3
	C24CAP402T	Front end Development	3	3	20	50	70	2.5
	C24CAP402P	Front end Development Lab	1	2	10	20	30	3
	C24CAP403T	Computer Graphics	3	3	20	50	70	2.5
	C24CAP403P	Computer Graphics Lab	1	2	10	20	30	3
Minor Course/ Vocational Course		To be taken from MIC/VOC Pool	2	2	15	35	50	2
		To be taken from MIC/VOC Pool	2	4	15	35	50	3
Ability Enhancement Course		To be Taken from AEC Pool	2	2	15	35	50	2
Value Added Course		To be taken from VAC Pool	2	2	15	35	50	2

Programme Outcomes (POs)

PO1: Computational Thinking and Problem-Solving Skills
Develop computational thinking and robust problem-solving skills to analyze, design, and implement efficient computing solutions to real-world problems.

PO2: Technical Proficiency in Computing
Attain proficiency in core areas of computing, including programming, data structures, algorithms, databases, and software engineering, to design and develop reliable software applications.

PO3: Innovation and Creativity
Foster a spirit of innovation and creativity by encouraging students to explore emerging technologies and develop novel solutions that address current and future challenges.

PO4: Entrepreneurship Skills
Build entrepreneurial skills to transform innovative ideas into viable enterprises, contributing to economic development and job creation.

PO5: Multidisciplinary Integration
Promote the integration of knowledge from various disciplines to enhance the ability to work on complex projects that require a holistic approach and collaboration across diverse fields.

PO6: Ethical Practices and Social Responsibility
Instill a strong sense of ethics and social responsibility, encouraging students to develop and deploy computing solutions that are socially, environmentally, and ethically responsible.

PO7: Lifelong Learning and Adaptability
Encourage a mindset of lifelong learning to stay current with rapidly evolving technologies and practices in the field of computer applications, fostering continuous personal and professional growth.

PO8: Effective Communication and Team Collaboration
Enhance communication and teamwork skills, enabling students to effectively articulate ideas, solutions, and technical information and collaborate successfully in multidisciplinary and multicultural environments.

Computer Applications
Computer Fundamental and Problem Solving through C (Semester-I)
Discipline Specific Course (DSC)

Paper Code: C24CAP101T
45 Hrs (3 Hrs /Week) **External Marks : 50**
Credits: 3 **Internal Marks : 20**
Exam. Time: 2.5 Hrs **Total Marks: 70**

Note: The examiner is required to set nine questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt five questions in all selecting one from each unit consisting of 10 marks each in addition to the compulsory Question No.1. All questions carry equal marks.

Course Objective: This course provides foundational knowledge in computer fundamentals and problem-solving using the C programming language. It covers key topics including computer characteristics, memory types, operating systems, and software threats. Students will learn C programming essentials such as data types, operators, control structures, arrays, functions, strings, pointers, and user-defined data types like structures and unions. The course emphasizes practical programming skills and problem-solving techniques.

Unit I

Computer Fundamentals: Characteristics of Computers, Strengths and Limitations of Computers, Classification of Computers, Functions, Application software, Utility software Memory: Primary Memory, Secondary Memory, Types of storage devices, Operating System**:** Definition, Functions, Features of Operating System
Threats: Physical & non-physical threats, Virus, Worm, Trojan, Spyware, Keylogers, Rootkits, Adware, Cookies, Phishing, Hacking, Cracking.

Unit II

Overview of C, Character Set, Constants and Variables, Identifiers and Keywords, Data Types, Assignment Statement, Symbolic Constant.
Input/output formatted function; Operators & Expression: Arithmetic, Relational, Logical, Bitwise, Unary, Assignment, Conditional Operators and Special Operators
Operator Hierarchy; Arithmetic Expressions, Evaluation of Arithmetic Expression,
Decision making with if statement, if-else statement, nested if statement, else-if ladder, switch and break statement,
Looping Statements: for, while, and do-while loop, jumps in loops.

Unit III

Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays - Declaration, Initialization and Memory representation.
Functions: definition, prototype, function call, passing arguments to a function: call by value; call by reference, recursive functions. Strings: Declaration and Initialization, String I/O, Array of Strings, String Manipulation Functions: String Length, Copy, Compare, Concatenate etc., Search for a Substring.

Unit IV

Pointers in C: Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays.
User defined data types: Structures - Definition, Advantages of
Structure, declaring structure variables, accessing structure members, Structure members initialization, Array of Structures; Unions - Union definition; difference between Structure and Union.

Text and Reference Books:

1. Gottfried, Byron S., Programming with C, Tata McGraw Hill.
2. Balagurusamy, E., Programming in ANSI C, Tata McGraw-Hill.
3. Jeri R. Hanly & Elliot P. Koffman, Problem Solving and Program Design in C, Addison Wesley.
4. Behrouz A. Forouzan Richard F. Gilberg, Computer Science: A Structured Approach Using C, Cengage Learning

5. Yashwant Kanetker, Let us C, BPB. Rajaraman, V., Computer Programming in C, PHI.
6. Yashwant Kanetker, Working with C, BPB.

Course Outcomes: After completing this Course, the learner will be able to:

CO1: Identify: Learn the basics of computer fundamentals
CO2: Understand: Understand C, data types and input/output statements, different types of operators, their hierarchies
CO3: Apply: Implement programs using arrays and strings.
CO4: Analyze and compare: Get familiar with advanced concepts like structures, union etc. in C language.

Mapping of CO-PO
C24CAP101T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Fundamental and Problem Solving through C Lab

Paper Code: C24CAP101P
30 Hrs (2 Hrs /Week) **External Marks: 20**
Credits: 1 **Internal Marks: 10**
Exam.Time: 3 Hrs **Total Marks: 30**

Note: An internal practical examination is conducted by the Course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, Hisar and the internal examiner is appointed by the Chairperson of the Department.

Course Objective: This practical lab course focuses on fundamental programming skills using C language, with an emphasis on problem-solving techniques. Students will complete a series of laboratory assignments that cover various topics such as basic arithmetic operations, control structures, array manipulation, and matrix operations. Assignments are designed to enhance practical coding skills and prepare students for more advanced programming tasks.

List of Laboratory Assignments:

1. To read radius of a circle and to find area and circumference
2. To read three numbers and find the biggest of three
3. To check whether the number is prime or not
4. To read a number, find the sum of the digits, reverse the number and check it for palindrome
5. To read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers
6. To read percentage of marks and to display appropriate message (Demonstration of else-if ladder)
7. To find the roots of quadratic equation
8. To read marks scored by n students and find the average of marks (Demonstration of single dimensional array)
9. To remove Duplicate Element in a single dimensional Array
10. To perform addition and subtraction of Matrices

Students are given ten or more laboratory assignments with soft and hard deadlines. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

Course Outcomes: After completing this Course, the learner will be able to:

CO1: Identify: Learn how to implement c program in a programming language.
CO2: Understand: Make the students familiar with various operators.
CO3: Apply: Learn the students how to deal control statement.

Mapping of CO-PO
C24CAP101P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
Logical Organization of Computer (Semester-I)
Discipline Specific Course (DSC)

Paper Code: C24CAP102T
45 Hrs (3 Hrs /Week) **External Marks : 50**
Credits: 3 **Internal Marks : 20**
Exam. Time: 2.5 Hrs **Total Marks: 70**

Note: The examiner is required to set nine questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt five questions in all selecting one from each unit consisting of 10 marks each in addition to the compulsory Question No.1. All questions carry equal marks.

Course Objectives: This course provides a comprehensive introduction to digital logic design and computer organization. It covers fundamental concepts such as number systems, binary arithmetic, Boolean algebra, logic gates, combinational and sequential circuits. Students will gain practical skills in designing and analyzing digital systems and circuits, which are foundational for advanced studies in computer architecture and electronics.

Unit I

Number Systems: Binary, Octal, Hexadecimal etc. Conversions from one number system to another, BCD Number System. BCD Codes: Natural Binary Code, Weighted Code, Self-complimenting Code, Cyclic Code.
Error Detecting and Correcting Codes. Character representations: ASCII, EBCDIC and Unicode.
Number Representations: Integer numbers - sign-magnitude, 1's & 2's complement representation. Real Numbers normalized floating point representations.

Unit II

Binary Arithmetic: Binary Addition, Binary Subtraction, Binary Multiplication, Binary Division using 1's and 2's Compliment representations, Addition and subtraction with BCD representations. Boolean Algebra: Boolean Algebra Postulates, basic Boolean Theorems, Boolean Expressions, Boolean Functions, Truth Tables, Canonical Representation of Boolean Expressions: SOP and POS, Simplification of Boolean Expressions using Boolean Postulates
& amp; Theorems, Karnaugh-Maps (up to four variables), Handling Don't Care conditions.

Unit III

Logic Gates: Basic Logic Gates – AND, OR, NOT, Universal Gates – NAND, NOR, Other Gates – XOR, XNOR etc. Their symbols, truth tables and Boolean expressions.
Combinational Circuits: Design Procedures, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Multiplexers, Demultiplexers, Decoder, Encoder, Comparators, Code Converters.

Unit IV

Sequential Circuits: Basic Flip- Flops and their working. Synchronous and Asynchronous Flip –Flops, Triggering of Flip- Flops, Clocked RS, D Type, JK, T type and Master-Slave Flip-Flops. State Table, State Diagram and State Equations. Flip-flops characteristics & Excitation Tables.
Sequential Circuits: Designing registers –Serial-In Serial-Out (SISO), Serial-In Parallel-Out (SIPO), Parallel-In Serial-Out (PISO) Parallel-In Parallel-Out (PIPO) and shift registers.

Text and Reference Books:

1. M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India Pvt. Ltd.
2. V. Rajaraman, T. Radhakrishnan, An Introduction to Digital Computer Design, Prentice Hall.
3. Andrew S. Tanenbaum, Structured Computer Organization, Prentice Hall of India Pvt. Ltd.
4. Nicholas Carter, Schaum's Outlines Computer Architecture, Tata McGraw-Hill.

Course Outcomes: After completing this Course, the learner will be able to:

CO1: Identify: Learn number systems, error detecting correcting code and representations of numbers in a computer system.
CO2: Understand: Understand computer arithmetic and Boolean algebra and simplification of Boolean expressions.
CO3: Apply: Understand working of logic gates and design various combinational circuits using these logic gates.
CO4: Analyze and compare: Get familiar with working of different types of flip-flops and design different types of registers.

Mapping of CO-PO
C24CAP102T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Logical Organization of Computer Lab

Paper Code: C24CAP102P
30 Hrs (2 Hrs /Week) **External Marks: 20**
Credits: 1 **Internal Marks: 10**
Exam.Time: 3 Hrs **Total Marks: 30**

Note: An internal practical examination is conducted by the Course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, Hisar.

Course Objectives: This practical lab focuses on the logical organization of computers. Students will work on ten or more assignments throughout the semester, involving number systems, binary arithmetic, logic gates, combinational circuits, and sequential circuits. The course emphasizes hands-on experience with both soft and hard deadlines for assignments, culminating in an internal and external practical examination

List of Laboratory Assignments:

1. Number System:
   - Problems based on Number System and their conversion.
   - Programs based on Number System conversion.
2. Binary Arithmetic
   - Problems based on Binary Arithmetic. Programs based on Binary Arithmetic.
   - Problems based on Boolean Expression and their simplification
3. Logic Gates
   - Understanding working of logic Gates.
4. Combinational Circuits:
   - Designing and understanding various combinational circuits.
5. Sequential Circuits
   - Designing and understanding various sequential circuits.

Students are given ten or more laboratory assignments with soft and hard deadlines. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

Course Outcomes: After completing this Course, the learner will be able to:

CO1: Identify: Learn how to work different Logic Gates. (LOTS: Level 1 - Remember)
CO2: Understand: Make the students familiar with truth tables of various GATE. (LOTS: Level 2 - Understand)
CO3: Apply: Learn the students how to deal complex circuit. (LOTS: Level 3 - Apply)
CO4: Analyze and compare: Compare different types of flip-flops and design different types of registers. (HOTS: Level 4 - Analyze)

Mapping of CO-PO
C24CAP102P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
Introduction to Web Technologies (Semester-I)
Discipline Specific Course (DSC)

Paper Code: C24CAP103T
45 Hrs (3 Hrs /Week) **External Marks : 50**
Credits: 3 **Internal Marks : 20**
Exam. Time: 2.5 Hrs **Total Marks: 70**

Note: The examiner is required to set nine questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt five questions in all selecting one from each unit consisting of 10 marks each in addition to the compulsory Question No.1. All questions carry equal marks.

Course Objective: This course provides foundational knowledge in web technologies. It covers the evolution and components of the web, including web clients, servers, and browsers. Students will learn to create and design web pages using HTML, CSS, and JavaScript. The course includes practical aspects of web publishing, graphic design, and client-side scripting to enhance web functionality and design.

Unit I

Introduction to Internet and World Wide Web (WWW); Evolution and History of World Wide Web, Web Pages and Contents, Web Clients, Web Servers, Web Browsers; Hypertext Transfer Protocol, URLs; Searching, Search Engines and Search Tools. Web Publishing: Hosting website; Internet Service Provider; Planning and designing website; Web Graphics Design, Steps For Developing website

Unit II

Creating a Website and Introduction to Markup Languages (HTML and DHTML), HTML Document Features & Fundamentals, HTML Elements, Creating Links; Headers; Text styles; Text Structuring; Text colour and Background; Formatting text; Page layouts, Images; Ordered and Unordered lists; Inserting Graphics; Table Creation and Layouts; Frame Creation and Layouts; Working with Forms and Menus; Working with Radio Buttons; Check Boxes; Text Boxes, HTML5

Unit III

Introduction to CSS (Cascading Style Sheets): Features, Core Syntax, Types, Style Sheets and HTML, Style Rule Cascading and Inheritance, Text Properties, CSS Box Model, Normal Flow Box Layout, Positioning, and other useful Style Properties; Features of CSS3.

Unit IV

The Nature of JavaScript: Evolution of Scripting Languages, JavaScript-Definition, Programming for Non-Programmers, Introduction to Client–Side Programming, Enhancing HTML Documents with JavaScript. Static and Dynamic web pages

Text and Reference Books:

1. Raj Kamal, Internet and Web Technologies, Tata McGraw-Hill.
2. Ramesh Bangia, Multimedia and Web Technology, Firewall Media.
3. Thomas A. Powell, Web Design: The Complete Reference, Tata McGraw-Hill
4. Wendy Willard, HTML Beginners Guide, Tata McGraw-Hill.
5. Deitel and Goldberg, Internet and World Wide Web, How to Program, PHI
6. David Flanagan, JavaScript: The Definitive Guide: The Definitive Guide.
7. Kogent Learning, Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML, AJAX – Black Book, Wiley India Pvt. Ltd.

Course Outcomes: After completing this Course, the learner will be able to:
CO1: Identify: Learn the basics of web development
CO2: Understand different types of web pages and websites.
CO3: Apply: Implement HTML and CSS for web page designing.
CO4: Analyze and compare Understand the design of web crawlers and search engines.

Mapping of CO-PO
C24CAP103T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Introduction to Web Technologies Lab

Paper Code: C24CAP103P
30 Hrs (2 Hrs /Week) **External Marks: 20**
Credits: 1 **Internal Marks: 10**
Exam.Time: 3 Hrs **Total Marks: 30**

Note: An internal practical examination is conducted by the Course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, Hisar and the internal examiner is appointed by the Chairperson of the Department.

Course Objectives: This course introduces students to web technologies through practical lab sessions. Students will work on various assignments to develop skills in HTML, CSS, and JavaScript. The course covers creating and styling web pages, using frames, and incorporating interactivity with JavaScript. Each student is required to complete a file of laboratory experiments, which includes designing and coding web pages, forms, and scripts. The course is designed to provide hands-on experience and prepare students for more advanced web development tasks.

List of Laboratory Assignments:

1. Create a web page using an ordered list and an unordered list.
2. Design a web page to show your institute with hyperlinks.
3. Create your resume on an HTML page.
4. Create a web page and divide the web page into four frames.
5. In one frame create three links that will display different
6. HTML forms in the remaining three frames respectively.
7. Create a web page to show the college record in the form of a table.
8. Write an HTML code to add internal CSS on a webpage
9. Design a blog-style personal website. Design a web page to display your college with hyperlinks.
10. Write a JavaScript function to calculate the sum of two numbers.
11. Write a JavaScript program to find the maximum number in an array.
12. Write a JavaScript function to check if a given string is a palindrome (reads the same forwards and backward).
13. Write a CSS file and attach it to any 3 HTML webpages.
14. Use Div and span in a page and colour two words with the same colours.
15. Using HTML, CSS create a styled checkbox with animation on state change
16. Design a web page that is like a compose page of e-mail. It should have:
    a. Text boxes for To, CC, and BCC respectively.
    b. Text field for the message.
    c. Send button.
    d. Option for selecting a file for attachment

Students are given ten or more laboratory assignments with soft and hard deadlines. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

Course Outcomes: After completing this Course, the learner will be able to:
CO1: Identify: Learn how to implement HTML program.
CO2: Understand: Make the students familiar with various tags.
CO3: Apply: Implement use of frame.
CO4: Analyze: and compare: Analyze various search engines.

Mapping of CO-PO
C24CAP103P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
Information Technology (Semester-I)
Minor Course (MIC)

Paper Code: C24MIC124T (i)
30 Hrs (2 Hrs /Week) **External Marks : 35**
Credits: 2 **Internal Marks : 15**
Exam. Time: 2 Hrs **Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives: This course provides an overview of essential information technologies. It covers the fundamentals of computer systems, including hardware, software, and data processing. Students will explore computer components, memory hierarchy, and various input/output devices. The course also delves into the Internet, web technologies, and cloud computing, offering practical insights into using spreadsheets and word processors. It aims to build foundational knowledge required for understanding digital security, operating systems, and data privacy.

Unit - I

Introduction to Computers, Characteristics and Limitations of Computers, Block Diagram of Computer, Classification of Computers, Hardware and Software, Types of software, Computer Languages. Data and information, Types of data & information, Data processing using Computer.

Unit - II

Units of a Computer, CPU, ALU, Types of Memory and Memory Hierarchy, Registers, Input Output devices, processing numerical data using Spreadsheets, Processing, and displaying textual data using word processor. Use of WWW, Internet, Web Browsers, Internet Connection Types, How Internet Works, ISPs, Search Engines, Emails and Its Working, Internet Security, Uses of Internet, Introduction to Cloud and its Applications.

Text and Reference Books:

1. Introduction to Information Technology by V. Rajaraman., PHI
2. Information Technology by P.K. Sinha, PHI

Course Outcomes: After completing this Course, the learner will be able to:

CO1: Identify: Understand the field of digital security and concepts of access control mechanisms.
CO2: Understand: To introduce keywords and jargon involved in securing browser.
CO3: Apply: Awareness and understanding on cyber-attacks and data privacy.
CO4: Analyze and compare: To understand the concept of Operating system and its working.

Mapping of CO-PO
C24MIC124T (i)

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
Mathematical Foundations for Computer Science-I (Semester-I)
Minor Course (MIC)

Paper Code: C24MIC124T (ii)
30 Hrs (2 Hrs /Week) **External Marks : 35**
Credits: 2 **Internal Marks : 15**
Exam. Time: 2 Hrs **Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objective: This course introduces fundamental concepts in Discrete Mathematics and their applications in computer science. It covers essential topics such as sets, relations, functions, propositional logic, predicate calculus, and matrix algebra. Emphasis is placed on understanding and applying mathematical principles, logic, and operations with matrices and determinants to solve problems and analyze systems. The course is designed to build a strong foundation for further studies in computer science and related fields.

Unit - I

Sets and Relations: Definition of sets, subsets, complement of a set, universal set, intersection and union of sets, De-Morgan's laws, Cartesian products, Equivalent sets, Countable and uncountable sets, Minset, Partitions of sets, Simple Applications. Definition of Relation, Properties of Relations, Equivalence Relation, Partial Order Relation, POSET, Lattice. Function: Domain and Range, Types of Functions, Composite and Inverse Functions.

Unit - II

Algebra of Logic: Proposition logic, basic logic, Logical Connectives, truth tables, tautologies, contradiction, Logical implication, Logical equivalence, Normal forms, Theory of Inference and deduction. Predicate Calculus: Predicates and quantifiers.
Algebra of Matrices: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint and Inverse of a matrix. Determinants: Definition, Minors, Cofactors, Properties of Determinants, Applications of determinants in finding area of triangle, Solving a system of linear equations.

References:

1. C. Y. Young (2021). Algebra and Trigonometry. Wiley.
2. S.L. Loney (2016). The Elements of Coordinate Geometry (Cartesian Coordinates) (2nd Edition). G.K. Publication Private Limited.
3. C.C. Pinter (2014). A Book of Set Theory. Dover Publications.

A. Tussy, R. Gustafson and D. Koenig (2010). Basic Mathematics for College Students (4th Edition). Brooks Cole

4. Kenneth H. Rosen, Discrete Mathematics and Its Applications, Tata McGraw-Hill, Fourth Edition.
5. Seymour Lipschutz and Marc Lipson, Theory and Problems of Discrete Mathematics, Schaum Outline Series, McGraw-Hill Book Co, New York.
6. Searle, Shayle R., and Andre I. Khuri.Matrix algebra useful for statistics. John Wiley & Sons, 2017.

Course Outcomes: After completing this Course, the learner will be able to:

CO1: Identify: Gain the knowledge fundamental concepts of Discrete mathematics like: Sets, Relations, Functions, Propositional Logic
CO2: Understand: Understand various concepts of matrices and determinants, and acquire the cognitive skills to apply different operations on matrices and determinants.
CO3: Apply: Define the fundamental concepts of Discrete mathematics like: Sets, Relations, Functions,Propositional Logic.
CO4: Analyze and compare: Apply the rules of inference and contradiction for proofs of various results

Mapping of CO-PO: (C24MIC124T (ii))

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
Essentials of Computer Science (Semester I)
Minor Course (MIN)

Course Code: C24MIN124T **External Marks : 70**
60 Hrs 4 Hrs/Week) **Internal Marks : 30**
Credit : 4 **Total Marks: 100**
Exam Time: 3 Hrs

Note: The maximum time duration for attempting the paper will be of 3 hours. The examiner is required to set five questions in all. The first question will be compulsory consisting of Seven short questions covering the entire syllabus consisting of 2 marks each. In addition to that Eight more questions will be set, two questions from each unit. The students shall be required to attempt Four questions in all selecting one question from each unit consisting of 14 marks each in addition to compulsory Question No. 1.

Course Objectives: This Course has been designed with an aim to provide students with an overview of the concepts and fundamentals of computers, information & Communication technology and GUI based operating system. This Course describes the data types and its digital representation, security issues and various ways of user's well-being as well as Green IT.

Unit - I

Computers and Devices: Define the term Information and Communication Technology (ICT), Identify different types of ICT services/uses like: Internet services, mobile technology, office productivity applications. Identify the main types of computers: desktops, laptops, tablets and main types of devices: smartphones, media players, digital cameras. Identify the main types of integrated and external equipment like: printers, screens, scanners, keyboards, mouse / track pad, webcam, speakers, microphone, docking station and common input/output ports: USB, HDMI.

Unit-II

GUI Based Operating System: Basics of Operating System: LINUX, WINDOWS. User Interface: Task Bar, Icons, Menu, Running an application. Operating System: Simple Setting, changing system Date and Time, Changing Display Properties, To Add or Remove a Windows Component, changing mouse properties: adding and removing printers. File and Directory Management: Creating and renaming of files and directories and common utilities.

Unit – III

Data types and its digital representation: Binary numeral system. Sum of two binary numbers and representation of real numbers. Representation of both positive and negative integers. Two's complement operations. Fixed-point and floating-point numbers. Binary codes: BCD Vs. ASCII codes. Error codes: Hamming distance, Parity codes, CRC codes.

Unit – IV

Security and Well-Being: Protecting data and recognise good password policies like: create with adequate length, adequate character mix, do not share, change regularly. Define firewall and outline its purpose. Understand the importance of regularly backing up data to a remote location. Importance of regularly updating software like: anti-virus, application, operating system software. Malware: Define and und identify different types of malware like: virus, worm, Trojan, spyware. Health and Green IT: Ways of user's well-being: take regular breaks, ensure appropriate lighting and posture. Device energy saving: turning off, adjusting automatic shutdown, backlight and sleep mode settings. Enhancing accessibilities: voice recognition software, screen reader, screen magnifier, on-screen keyboard, high contrast.

Text and Reference Books:

1. J. Glenn Brookshear, "Computer Science: An Overview", Addision-Wesley, Twelfth Edition, 2014.
2. PC Software for Windows 98 made simple, R.K. Taxali, Tata McGraw Hill Publishers, 2015.
3. Fundamental of digital systems. Thomas L. Floyd. Prentice Hall. 9th Ed. 2006.
4. Digital Design and Computer Architecture. David Money Harris y Sarah L. Harris. Morgan Kaufmann. 2007.
5. Fundamental of digital Logic gates and computations. M. Morris Mano y Charles R. Kime. Prentice Hall. 3rd Ed. 2005.

Course Outcomes: After completing this Course, the learner will be able to:

CO1 lists the key concepts relating to ICT, computers, devices and software.
CO2 describe the various types of GUI based operating system and effectively work on the system.
CO3 apply file management and efficiently organize files and folders, compress and extract large files.
CO4 design & implement the various policies of protecting data and devices from malware.
CO5 analyze to enhance computer accessibility by using voice recognition software and examine the ways of user well-being to promote green IT.

Mapping of CO-PO
C24MIN124T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								
CO5								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
Foundations of Computer Science (Semester-I)
Multidisciplinary Course (MDC)

Paper Code: C24MDC132T
30 Hrs (2 Hrs /Week) **External Marks : 35**
Credits: 2 **Internal Marks : 15**
Exam. Time: 2 Hrs **Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objective: This Course covers fundamental principles and practical aspects of computer system in an organized manner. Students learn about computer system fundamentals, different types of software, programming languages, and different problem-solving techniques. The Course will empower them to give fundamental programming constructs.

Unit - I

Computers and Devices: Define the term Information and Communication Technology (ICT), Identify different types of ICT services. Identify the main types of computers: desktops, laptops, tablets and main frame. Identify the main types of integrated and external equipment like: printers, scanners, keyboards, mouse and common input/output ports: USB, HDMI. Emails and Its Working, Uses of Internet.
Operating System: Basics of Operating System, Simple Setting, changing system Date and Time, Changing Display Properties, changing mouse properties, adding and removing printers. File and Directory Management, Creating and renaming of files and directories and common utilities.

Unit-II

Data types and its digital representation: Binary numeral system. Sum of two binary numbers and representation of real numbers. Representation of both positive and negative integers. Two's complement operations. Binary codes: BCD Vs. ASCII codes. Error codes: Hamming distance, Parity codes, CRC codes.

Text and Reference Books:

1. J. Glenn Brookshear, "Computer Science: An Overview", Addision-Wesley, Twelfth Edition, 2014.
2. PC Software for Windows 98 made simple, R. K. Taxali, Tata McGraw Hill Publishers, 2015.
3. Fundamental of digital systems. Thomas L. Floyd. Prentice Hall. 9th Ed. 2006.
4. Digital Design and Computer Architecture. David Money Harris y Sarah L. Harris. Morgan Kaufmann. 2007.
5. Fundamental of digital Logic gates and computations. M. Morris Mano, Charles R. Kime. Prentice Hall. 3rd Ed. 2005.

Course Outcomes: After completing this Course, the learner will be able to:

CO1. **Understand** fundamental concepts in ICT, computing, devices, and software applications.
CO2. **Demonstrate** proficiency in using computers, adjusting operating system settings, and utilizing built-in features effectively.
CO3. **Apply** advanced file management techniques to organize, compress, and extract files and folders efficiently.
CO4. **Implement** robust strategies for data protection, malware prevention, and regular data backup practices.
CO5. **Analyse** and **propose** strategies for enhancing Green IT practices, accessibility features, and promoting user health in computing environments.

Mapping of CO-PO
C24MDC132T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								
CO5								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Foundation of Computer Science Lab

Paper Code: C24MDC132P
30 Hrs (2 Hrs /Week) **External Marks : 15**
Credits: 1 **Internal Marks : 10**
Exam. Time: 3 Hrs **Total Marks: 25**

Note: The Internal and External assessment is based on the level of participation in Lab sessions and the timely submission of Lab experiments / assignments, the performance in Viva-Voce, the quality of the lab file and ethical practices followed. The Internal examination is conducted by the Course Coordinator. The External examination is conducted by External Examiner appointed by the Controller of Examination in association with the Internal Examiner appointed by the Chairperson of the Department.

Course Objectives: This course provides hands-on experience with fundamental computer science concepts through practical lab sessions. It covers operating system installations, basic command usage in DOS and Linux, printer and scanner components, email creation, web browsing, and system settings. Students will gain skills in using ICT services, database creation, computer interfaces, and security measures, while also fostering ethical practices and teamwork.

List of Experiments/ assignments

1. Lab Component- OS installation (Windows & Linux).
2. Basic DOS commands (Files & Directories).
3. Basic LINUX commands (Files & Directories).
4. Basic Knowledge of Printer & Scanner Components.
5. Creation of Email account.
6. Web Browsing, Emails, Searching of Contents.
7. Create of password with adequate length and character mix & symbols.
8. Make Settings of Backlight and Sleep Mode in computer system.
9. How to use On-screen Keyboard in computer system.

Note: The actual experiment / assignments will be designed by the Course coordinator. One assignment to be done in the groups of two or three students. The assignments must be meet the objectives of the Course and the levels of given Course outcomes. The list of assignments and schedule of submission will be prepared by Course coordinator in the beginning of the semester.

Course Outcomes: After completing this Course, the learner will be able to:

CO1. Implementation: Creation of database using DOS & LINUX commands.
CO2. Analysis: Enforce the uses of ICT services.
CO3. Compare: Analyse the interfaces of computer and its peripheral devices.
CO4. Integrate: Security for Well-Being.
CO5. Create: Execute Lab assignments for various problems
CO6. Demonstrate: Demonstrate ethical practices, self-learning and team spirit

Mapping of CO-PO
24MDC132P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								
CO5								
CO6								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
PC Hardware and Networking (Semester-I)
Skill Enhancement Course (SEC)

Paper Code: C24SEC124T
30 Hrs. (2 Hrs /Week) **External Marks: 35**
Credits: 2 **Internal Marks: 15**
Exam. Time: 2 Hrs **Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives: PC hardware & networking is the basic and essential Course for every graduate in computer science. This Course introduces various hardware components of computer like ROM, Hard Disks, SMPS, UPS etc. and various functionalities performed by these components. It also includes the various networking services with the help of different connectors provided in real world.

Unit - I

Introduction to computer hardware: Peripheral devices of a computer system, Add On cards: network interface card, sound card and graphics card, functions of various parts of a PC, SMPS, UPS, CMOS and its types, Mother Board, Types of Ports, Hard Disk and Types of Hard Disk, RAM, Cabinet, Processor and its types. BIOS: Introduction: Linker, loader, Connecting & disconnecting computer peripherals and components Mouse, Keyboard, Monitor,

Unit – II

Introduction to Computer Networks: Types of Computer Networks and their topologies. Transmission media - wired and wireless. Network hardware components: connectors, transceivers & media converters, repeaters, network interface cards and PC cards, repeaters, bridges, switches, routers, gateways, connecting ports. Introduction to the Internet, concepts of Internet and Intranet; IP addresses, DNS; Internet Services; E-mail, File transfer and FTP, World Wide Web and HTTP. Web Browsers, Search Engines, Uniform Resource Locator (URL), Web Servers. Internet Connections: Dialup, leased line, Modems, DSL service, Internet Service Provider.

Text and Reference Books:

1. B. Govindarajalu, IBM PC and Clones: Hardware, Troubleshooting and Maintenance, McGraw Hill Education, 2002
2. Digital Logic and Computer Design, M. Morris Mano, PHI, 2000
3. Computer Communications and Networking Technologies, Michael A. Gallo, William M. Hancock, CENGAGE Learning.
4. Foundations of Computing, P.K. Sinha, BPB.

Course Outcomes: After completing this Course, the learner will be able to:

CO1. **Describe** the various components of computer and their functionalities.
CO2. **Demonstrate** the use of various hardware components and their operations.
CO3. **Apply** various transmission media in network communication.
CO4. **Implement** how to establish the connection and use it using IP addresses.
CO5. **Define** the internet and intranet with their services available in now a day.
CO6. **Compare** the connectors with respect to efficiency of the required operations for solving real live problem.

Mapping of CO-PO
C24SEC124T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								
CO5								
CO6								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

PC Hardware and Networking Lab (Semester-I)

Paper Code: C24SEC124P
30 Hrs (2 Hrs /Week) **External Marks : 15**
Credits: 1 **Internal Marks : 10**
Exa. Time: 3 Hrs **Total Marks: 25**

Note: The Internal and External assessment is based on the level of participation in Lab sessions and the timely submission of Lab experiments/assignments, the performance in Viva-Voce, the quality of the lab file and ethical practices followed. The Internal examination is conducted by the Course Coordinator. The External examination is conducted by External Examiner appointed by the Controller of Examination.

Course Objectives: This lab course focuses on practical skills in PC hardware and networking. Students will gain hands-on experience in identifying and assembling PC components, configuring networking hardware, and installing various operating systems and software. The course covers topics such as cable design, network configuration, and device servicing, ensuring students develop a comprehensive skill set for managing and troubleshooting computer systems and networks.

List of Experiments/ assignments

1. To identify and check various components of a PC.
2. Installation/assembling of various PC components.
3. To learn handling and configuration of various hardware like RJ-45 connector, networking cables, crimping tools etc.
4. Design Cross and straight cable for networking.
5. Install windows operating system.
6. Install Linux (Ubuntu) operating system.
7. Install and Configure Dual OS Installation.
8. Install application software on PC
9. Install and Configure a DVD Writer and a Blu-ray Disc writer and recording DVD and Blu-ray disk.
10. Printer Installation and Servicing and troubleshoot
11. Configuring Hub and switches.
12. Connect the devices in a LAN network.
13. Running and using basic network commands like ping, trace etc.
14. Configure network topology like Star topology using hub.
15. Configure network topology like Star topology using hub.

Note: The actual experiment / assignments will be designed by the Course coordinator. One assignment to be done in the groups of two or three students. The assignments must be met the objectives of the Course and the levels of given Course outcomes. The list of assignments and schedule of submission will be prepared by Course coordinator in the beginning of the semester.

Course Outcomes: After completing this Course, the learner will be able to:

CO1. **Implementation:** the design of cables and installation of components
CO2. **Analysis:** the functionality of hardware and networking components
CO3. **Compare:** various devices and their functionalities like hub and switches
CO4. **Integrate:** PC components for working of device
CO5. **Create:** Network topology to understand various types of networks.
CO6. **Demonstrate:** the functionality and components of a PC

Mapping of CO-PO
C24SEC124P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								
CO5								
CO6								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
E-Commerce (Semester-I/Semester-II)
Value Aided Courses (VAC)

Paper code: C24VAC122T
30 Hrs. (2 Hrs /week) **External Marks: 35**
Credits: 2 **Internal Marks: 15**
Exam. Time: 2 Hrs **Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objective: The E-Commerce course introduces the principles and practices of online business. It covers the framework, architecture, and various models of e-commerce (B2B, B2C, C2C, B2G, G2C). Key topics include the comparison between e-commerce and traditional business practices, as well as the benefits and limitations of e-commerce. The course also explores Electronic Data Interchange (EDI), its components, benefits, drawbacks, and applications in financial transactions.

Unit I

Introduction to E-Commerce, E-Commerce framework, architecture and anatomy, E-Commerce and WWW, E-commerce practices vs. traditional business practices; E-Commerce models: B2B, B2C,C2C,B2G,G2C; Features of E-Commerce, Elements of E-Commerce, Benefits and Limitations of E-Commerce.

Unit II

Concepts of EDI (Electronic Data Interchange), EDI vs. Traditional methods, Benefits of EDI, Drawbacks of EDI, Components of EDI, EDI Implementation, Applications of EDI, Financial EDI.

Text and Reference Books:

1. E. Turban, J. Lee, D. King and H. M Chung, Electronic commerce-a Managerial Perspective, Prentice-Hall International, Inc., 2002.
2. V. Bhatia, E-commerce, Khanna Book Pub. Co.(P) Ltd., Delhi, 2000
3. Bharat Bhasker, Electronic Commerce -Framework, technologies and Applications, TMH Publications, 2013
4. David Whitely, Electronic Commerce, TMH, N Delhi, 2000.
5. Shurety, E-business with Net Commerce, Addison Wesley Longman, 1999.
6. Kosiur. Understanding E-Commerce, Prentice Hall of India, N. Delhi

Course Outcomes: After completing this Course, the learner will be able to:

CO1: Identify: Recognize and categorize the various components, models, and technologies used in e-commerce.
CO2: Understand: Comprehend the key concepts, strategies, and trends that drive e-commerce.
CO3: Apply: Implement e-commerce strategies and technologies in real-world scenarios.
CO4: Analyze and compare: Evaluate and contrast different e-commerce platforms, payment systems, and business strategies.

Mapping of CO-PO
C24VAC122T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
Object Oriented Programming using C++ (Semester-II)
Discipline Specific Course (DSC)

Paper Code: C24CAP201T
45 Hrs (3 Hrs /Week) **External Marks : 50**
Credits: 3 **Internal Marks : 20**
Exam. Time: 2.5 Hrs **Total Marks: 70**

Note: The examiner is required to set nine questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt five questions in all selecting one from each unit consisting of 10 marks each in addition to the compulsory Question No.1. All questions carry equal marks.

Course Objectives: This course introduces Object-Oriented Programming (OOP) concepts using C++. Students will learn to handle input/output operations, define and use functions, and utilize advanced OOP features including classes, objects, inheritance, and polymorphism. Emphasis is placed on understanding and applying concepts such as constructors, destructors, operator overloading, and exception handling to build robust and maintainable software.

Unit I

Input Output in C++: Unformatted and Formatted I/O Operations. I/O using insertion and extraction operators and streams in C++.
Functions: Declaration and Definition, return values, arguments, passing parameters by value, call by reference, call by pointer, Recursion, Inline Functions, Function overloading. Pointers, structures, and union in C++.

Unit II

Object-oriented features of C++: Class and Objects, Data hiding & encapsulation, abstraction, Data Members and Member Functions, accessing class members, empty class, local class, global class, Scope Resolution Operator and its Uses, Static Data Members, Static Member Functions, Structure vs Class, Friend function and friend class.
Constructors and Destructors: Constructors, Instantiation of objects,
Default constructor, Parameterized constructor, Copy constructor and its use, Destructors, Dynamic initialization of objects.

Unit III

Operator Overloading: Overloading unary and binary operators: arithmetic operators, manipulation of strings using operators.
Inheritance: Derived class, base class, Accessing the base class member, Inheritance: multilevel, multiple, hierarchical, hybrid; Virtual base class, Abstract class.

Unit IV

Virtual Functions, pure virtual functions; Polymorphism & its types
Exception Handling in C++: exception handling model, exception handling constructs - try, throw, catch, Order of catch blocks, catching all exceptions, Nested try blocks, handling uncaught exceptions.

Text and Reference Books:

1. Herbert Schildt, C++, The Complete Reference, Tata McGraw-Hill
2. Robert Lafore, Object Oriented Programming in C++, SAMS Publishing
3. Bjarne Stroustrup, The C++ Programming Language, Pearson Education
4. Balaguruswami, E., Object Oriented Programming in C++, Tata McGraw-Hill.
5. Richard Johnson, An Introduction to Object-Oriented Application Development, Thomson Learning.

Course Outcomes: After completing this Course, the learner will be able to:
CO1: Identify: Learn the input/output statements and functions in C++
CO2: Understand: Get familiar with OOPS concepts along with constructors and destructors in C++ language.
CO3: Apply: Learn the various concepts of operator overloading and inheritance.
CO4: Analyze and compare: Get familiar with concepts of virtual functions and exception handling in C++ language.

Mapping of CO-PO

C24CAP201T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Object Oriented Programming using C++ Lab

Paper Code: C24CAP201P
30 Hrs (2 Hrs /Week) **External Marks: 20**
Credits: 1 **Internal Marks: 10**
Exam.Time: 3 Hrs **Total Marks: 30**

Note: An internal practical examination is conducted by the Course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university.

Course Objective: The lab focuses on practical applications of Object-Oriented Programming (OOP) using C++. Students will complete a series of assignments to gain hands-on experience with OOP principles such as classes, constructors, destructors, operator overloading, and inheritance. Assignments include tasks like implementing simple interest calculations, swapping values, and using advanced features like matrix multiplication and polymorphism. Students will compile a file of their experiments and demonstrate their understanding through internal and external evaluations.

List of Laboratory Assignments:

1. Write a program that accepts principle, rate, and time from the
2. user and prints the simple interest.
3. Write a program to swap the values of two variables.
4. Write a program to check whether the given number is even or odd (using?: ternary operator).
5. Write a program to check whether the given number is positive or negative (using?: ternary operator).
6. Write a program that inputs three numbers and displays the largest number using the ternary operator.
7. WAP to initialize data members of the class using the constructor.
8. Pass values to the constructor and initialize the members of that class to those values.
9. Create a class called cube with the data members Length, Breadth, Height
10. Members functions:
    a. To accept the details.
    b. To calculate the volume of the cube.
    c. To display the details.
11. WAP to calculate the sum using constructor overloading.
12. WAP to demonstrate the use of destructor.
13. Create a C++ Program to show the order of constructor and destructor.
14. C++ Program to Find the Number of Vowels, Consonants, Digits, and White Spaces in a String
15. C++ Program to Multiply Two Matrices by Passing Matrix to Function
16. Increment ++ and Decrement -- Operator Overloading in C++ Programming
17. C++ Program to Add Two Complex Numbers
18. C++ Program to Show Function Overriding
19. C++ Program to Show Polymorphism in Class
20. C++ Program to Show Function Overloading
21. C++ Program to Show Inheritance

Students are given ten or more laboratory assignments with soft and hard deadlines. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

Course Outcomes: After completing this Course, the learner will be able to:
CO1: Identify: Learn how to implement C++ program in a programming language.
CO2: Understand: Make the students familiar with OOPS concept.
CO3: Apply: Learn the students how to deal with inheritance ad constructor.
CO4: Analyze and compare: Implement different kind of inheritance and compare them.

Mapping of CO-PO
C24CAP201P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
Data Structure and Applications (Semester-II)
Discipline Specific Course (DSC)

Paper Code: C24CAP202T
45 Hrs (3 Hrs /Week) **External Marks : 50**
Credits: 3 **Internal Marks : 20**
Exam. Time: 2.5 Hrs **Total Marks: 70**

Note: The examiner is required to set nine questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt five questions in all selecting one from each unit consisting of 10 marks each in addition to the compulsory Question No.1. All questions carry equal marks.

Course Objectives: This course provides a comprehensive introduction to data structures and their applications. It covers the definition and classification of data structures, algorithm performance analysis, and various data structures including arrays, strings, linked lists, stacks, queues, and trees. Students will learn about different searching and sorting techniques and how to evaluate the complexity of programs based on these concepts. Practical implementation and analysis are emphasized throughout the course.

Unit I

Data Structure Definition, Data Type vs. Data Structure, Classification of Data Structures, Data Structure Operations, Applications of Data Structures.
Algorithm Specifications: Performance Analysis and Measurement (Time and Space Analysis of Algorithms- Average, Best and Worst Case Analysis).
Arrays: Introduction, Linear Arrays, Representation of Linear Array in Memory, Two Dimensional and Multidimensional Arrays, Sparse Matrix and its Representation, Operations on Array: Algorithm for Traversal, Selection, Insertion, Deletion and its implementation.

Unit II

String Handling: Storage of Strings, Operations on Strings viz., Length, Concatenation, Substring, Insertion, Deletion, Replacement, Pattern Matching
Linked List: Introduction, Array vs. linked list, Representation of linked lists in Memory, Traversing a Linked List, Insertion, Deletion, Searching into a Linked list, Type of Linked List.

Unit III

Stack: Array Representation of Stack, Linked List Representation of Stack, Algorithms for Push and Pop, Application of Stack: Polish Notation, Postfix Evaluation Algorithms, Infix to Postfix Conversion, Infix to Prefix Conversion, Recursion. Introduction to Queues: Simple Queue, Double Ended Queue,
Circular Queue, Priority Queue, Representation of Queues as Linked List and Array, Applications of Queue. Algorithm on Insertion and Deletion in Simple Queue and Circular Queue. Priority Queues

Unit IV

Tree: Definitions and Concepts, Representation of Binary Tree, Binary Tree Traversal (Inorder, postorder, preorder), Binary Search Trees – Definition, Operations viz., searching, insertions and deletion; Searching and Sorting Techniques, Sorting Techniques: Bubble sort, Merge sort, Selection sort, Quick sort, Insertion Sort. Searching Techniques: Sequential Searching, Binary Searching.

Text and Reference Books:

1. Seymour Lipschutz, Data Structures, Tata McGraw- Hill Publishing Company Limited,
2. Schaum's Outlines.
3. Yedidyah Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, Data Structures
4. Using C, Pearson Education.
5. Trembley, J.P. And Sorenson P.G., An Introduction to Data Structures with Applications,

6. McGraw-Hill.
7. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Addison- Wesley
8. Behrouz A. Forouzan Richard F. Gilberg , Data Structure: A Pseudocode with, Cengage Learning

Course Outcomes: After completing this Course, the learner will be able to:

CO1: Identify learn the basics of data structure and algorithm complexities.
CO2: Understand acquire knowledge of arrays and strings.
CO3: Apply understand the idea of implementation for linked lists and stacks.
CO4: Analyze and compare learn various searching and sorting techniques along with the implementation of queues.
CO5: Evaluate program complexity based on learned concepts.

Mapping of CO-PO
C24CAP202T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								
CO5								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Data Structure and Applications Lab

Paper Code: C24CAP202P
30 Hrs (2 Hrs /Week) **External Marks: 20**
Credits: 1 **Internal Marks: 10**
Exam. Time: 3 Hrs **Total Marks: 30**

Note: An internal practical examination is conducted by the Course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, Hisar and the internal examiner is appointed by the Chairperson of the Department.

Course Objectives: This practical lab focuses on hands-on implementation and application of data structures using C. Students will work with arrays, strings, linked lists, stacks, queues, and trees. The course emphasizes understanding and applying data structures through programming, managing algorithmic complexity, and using pointers effectively.

List of Laboratory Assignments:

1. Write a program that uses functions to perform the following operations on an array i) Creation ii) Insertion iii) Deletion iv) Traversal.
2. Write a program that uses functions to perform the following operations on strings i) Creation ii) Insertion iii) Deletion iv) Traversal.
3. Write a program that uses functions to perform the following operations on a singly linked list i) Creation ii) Insertion iii) Deletion iv) Traversal.
4. Write a program that uses functions to perform the following operations on a doubly linked list i) Creation ii) Insertion iii) Deletion iv) Traversal
5. Write a program that implement stack (its operations) using i) Arrays ii) Linked list (Pointers).
6. Write a program that implements Queue (its operations) using i) Arrays and ii) Linked lists (Pointers).
7. Write a program that implements the following sorting i) Bubble sort ii) Selection sort iii) Quick sort.
8. Write programs for various types of tree traversals

Students are given ten or more laboratory assignments with soft and hard deadlines. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

Course Outcomes: After completing this Course, the learner will be able to:

CO1: Implement and **manipulate** various data structures in C
CO2: Demonstrate proficiency in using pointers for data structure operations.
CO3: Analyze the time complexity of different sorting algorithms.
CO4: Develop and debug programs to solve practical problems using data structures.
CO5: Apply theoretical concepts to design efficient algorithms and data structure solutions.

Mapping of CO-PO
C24CAP202P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								
CO5								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
Concepts of Operating Systems (Semester-II)
Discipline Specific Course (DSC)

Paper Code: C24CAP203T
45 Hrs (3 Hrs /Week) **External Marks : 50**
Credits: 3 **Internal Marks : 20**
Exam. Time: 2.5 Hrs **Total Marks: 70**

Note: The examiner is required to set nine questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt five questions in all selecting one from each unit consisting of 10 marks each in addition to the compulsory Question No.1. All questions carry equal marks.

Course Objectives: This course introduces the fundamental concepts of operating systems, including their functions, structures, and types. It covers key topics such as process management, CPU scheduling, synchronization, memory management, and file system implementation. Students will learn to analyze and apply various algorithms and techniques used in operating systems.

Unit I

Introductory Concepts: Operating System, Functions and Characteristics, Historical Evolution of Operating Systems, Operating System Structure. Types of Operating System: Real-time, Multiprogramming, Multiprocessing, Batch processing. Operating System Services, Operating System Interface, Service System Calls, and System Programs.
Process Management: Process Concepts, Operations on Processes, Process States, and Process Control Block. Inter-Process Communication.

Unit II

CPU Scheduling: Scheduling Criteria, Levels of Scheduling, Scheduling Algorithms, Multiple Processor Scheduling, Algorithm Evaluation. Synchronization: Critical Section Problem, Semaphores, Classical Problem of Synchronization, Monitors.
Deadlocks: Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery.

Unit III

Memory Management Strategies: Memory Management of Single-user and Multi-user Operating Systems, Partitioning, Swapping, Contiguous Memory Allocation, Paging and Segmentation;
Virtual Memory Management: Demand Paging, Page Replacement Algorithms, Thrashing.

Unit IV

Implementing File System: File System Structure, File System Implantation, File Operations, Type of Files, Directory Implementation, Allocation Methods, and Free Space Management.
Disk Scheduling algorithm - SSTF, Scan, C- Scan, Look, C-Look. SSD Management.

Text and Reference Books:

1. Silberschatz A., Galvin P.B. and Gagne G., Operating System Concepts, John Wiley & Sons.
2. Godbole, A.S., Operating Systems, Tata McGraw-Hill Publishing Company, New Delhi.
3. Deitel, H.M., Operating Systems, Addison- Wesley Publishing Company, New York.
4. Tanenbaum, A.S., Operating System- Design and Implementation, Prentice Hall of India, New Delhi.

Course Outcomes: After completing this Course, the learner will be able to:

CO1: Identify: Learn the basic concepts of operating systems and their services along with management.
CO2: Understand: understand the concept of process scheduling and acquire knowledge of process synchronization.
CO3: Apply: learn methods of memory management and virtual memory concepts.
CO4: Analyze and compare: learn to work with directory structure and security aspects.

Mapping of CO-PO
C24CAP203T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Concepts of Operating Systems Lab

Paper Code: C24CAP203P
30 Hrs (2 Hrs /Week) **External Marks: 20**
Credits: 1 **Internal Marks: 10**
Exam.Time: 3 Hrs **Total Marks: 30**

Note: An internal practical examination is conducted by the Course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university.

Course Objectives: This practical lab course, "Concepts of Operating Systems," is designed to provide students with hands-on experience in operating system functionalities and scheduling algorithms. Through a series of laboratory assignments, students will engage in tasks such as implementing various scheduling algorithms and performing file operations using C programming. The course aims to bridge theoretical knowledge with practical skills, enabling students to understand and apply operating system services and scheduling techniques effectively. By working on real-world examples and assignments, students will gain a comprehensive understanding of how operating systems manage processes and resources.

List of Laboratory Assignments:

1. Working with various operating systems, and performing different operations using operating systems.
2. Write a program to print file details including owner access permissions, and file access time, where file name is given as argument.
3. Write a program to copy files using system calls.
4. Write a program to implement the FCFS scheduling algorithm.
5. Write a program to implement the Round Robin scheduling algorithm.
6. Write a program to implement the SJF scheduling algorithm.
7. Write a program to implement a non-preemptive priority-based scheduling algorithm
8. Write a program to implement preemptive priority-based scheduling algorithm.
9. Write a program to implement the SRJF scheduling algorithm.
10. Write a program to calculate the sum of n numbers using the thread library.

Students are given ten or more laboratory assignments with soft and hard deadlines. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.
Course Outcomes: After completing this Course, the learner will be able to:

CO1: Identify: Learn the operating systems services along with management.
CO2: Understand: Learn how to implement scheduling algorithm in c program.
CO3: Apply: Make the students familiar with various algorithm burst time.
CO4: Analyze and compare: Learn the students how to calculate execution time of different scheduling and compare them.

Mapping CO-PO
C24CAP203P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
Database Technologies (Semester-II)
Minor Course (MIC)

Paper Code: C24MIC224T (i)
30 Hrs (2 Hrs /Week) **External Marks : 35**
Credits: 2 **Internal Marks : 15**
Exam. Time: 2 Hrs **Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives: This course includes a detailed coverage of principles of database design and models.

Unit - I

Basic Introduction: Data, Information, Records, Files and Database. Characteristics of Database Management System. DBMS over File Processing System. Advantages and Disadvantages of DBMS. Database Users and various types of DBMS users. Database Administrator (DBA) and responsibilities of DBA. Schema and Instance. Views of Database. Physical and Logical Data Independence. Database Languages. DBMS Architecture: 1-Tier, 2-Tier and 3-Tier Database Architecture. Data Models: Hierarchical, Network and Relational Data Models.

Unit – II

Entity-Relationship Model: Entity, Entity Sets, Entity Type, Attributes: Type of Attributes, Cardinality, Degree, Domain; Keys: Super Key, Candidate Key, Primary Key, Foreign Key. ER Diagram: Symbolic Notations for Designing ER Diagram, Relational Database Design: Functional Dependency, Types of Functional Dependency, Introduction to Normalization, Anomalies of unnormalized database, Normal Form: 1st Normal Form, 2nd Normal Form, 3rd Normal Form. Denormalization.

Text and Reference Books:

1. Database System Concepts, Sixth edition, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill-2010.
2. Database Systems: Models, Languages, Design and Application, Ramez Elmasri, Pearson Education 2014

Course Outcomes: After completing this Course, the learner will be able to:

CO1. **List or describe**: Describe fundamental of Database Management System.
CO2. **Select**: Discuss principles for basic Database Modelling.
CO3. **Apply:** Apply basic SQL commands for designing queries on Relational Databases.
CO4. **Implement:** Implement various operations of Relational Algebra.
CO5. **Apply**: Apply basic E-R Modelling for E-R diagram on a real-world database application.
CO6. **Compare**: Contrast various types of Normalization for real-world database

Mapping of CO-PO
C24MIC224T (i)

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								
CO5								
CO6								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
Mathematical Foundations for Computer Science-II (Semester-II)
Minor Course (MIC)

Paper Code: C24MIC224T (ii)
30 Hrs (2 Hrs /Week) **External Marks : 35**
Credits: 2 **Internal Marks : 15**
Exam. Time: 2 Hrs **Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives: This course introduces fundamental computing concepts and problem-solving techniques using the C programming language. It covers computer fundamentals, memory management, and operating systems, while emphasizing programming constructs, data types, and control structures in C. Students will learn to implement programs involving arrays, strings, and advanced features such as pointers, structures, and unions. The course aims to build a solid foundation in programming and problem-solving skills essential for further study in computer science.

Unit-I

Measure of Central Tendency: Overview of Mean, Arithmetic Mean, Geometric Mean, Harmonic Mean Median and Mode. Measure of Dispersion: Standard Deviation, Variance, Range, Percentile:, Quartile, Interquartile Range, Moments and Moments Generating Functions.

Unit-II

Probability: Definition and various approaches of probability, Addition theorem, Boole inequality, Conditional probability and multiplication theorem, Independent events, Bayes theorem and its applications. Random variable and probability functions: Definition and properties of random variables, Discrete and continuous random variables, Probability mass and density functions, Distribution function. Concepts of bivariate random variable: joint, marginal and conditional distributions. Correlation and regression, Rank correlation, Correlation coefficient,

Text /Reference Books:

1. M. Speigel, Probability and Statistics, Schaum Outline Series.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, S. Chand Pub., New Delhi.
3. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003

Course Outcomes: After completing this Course, the learner will be able to:

CO1: Identify: Gain the knowledge of concepts and related terminology of probability.
CO2: Understand: Understand statistics including random variables, expectations, probability distributions.
CO3: Apply: Solve the different problems of probability and statistics.
CO4: Analyze and compare: Compile and integrate the knowledge of probability and statistics to solve the real-world problems. Probability and Statistics Detailed contents.

Mapping of CO-PO: (C24MIC224T (ii))

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
Data Science and Analytics (Semester II)
Minor Course (MIN)

Course Code: C24MIN224T **External Marks : 70**
60 Hrs 4 Hrs/Week) **Internal Marks : 30**
Credit : 4 **Total Marks: 100**
Exam Time: 3 Hrs

Note: The maximum time duration for attempting the paper will be of 3 hours. The examiner is required to set nine questions in all. The first question will be compulsory consisting of Seven short questions covering the entire syllabus consisting of 2 marks each. In addition to that Eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all selecting one question from each unit consisting of 14 marks each in addition to compulsory Question No. 1.

Course Objective: This course provides an introduction to data science and analytics, focusing on data manipulation, exploratory data analysis, and predictive modeling. Students will learn to handle and analyze data using various tools and techniques.

Unit – 1

Data science preliminaries: Introduction to data science, scales of measurements and their implementation. Working with vectors, matrices and tabular data (data frames), reading and writing tabular data from and to the files. Various packages for reading and writing data from and to EXCEL files. Describing data with statistical summaries (mean, median, mode, variance and standard deviation). Discriminating between sample and population, Quantile-Quantile plot. Writing user-defined functions in R/Python.

Unit – II

Manipulating tabular data: Sorting tabular data, filtering cases, selecting variables, deriving new variables, grouping and summarizing data. Working with various packages (i.e. dplyr or any equivalent package in Python) for data manipulations and transformations, discovering correlation between attributes.

Exploratory data analysis: random and normally distributed variables, skewed normal distribution, z score, detecting outliers in data, handling missing values. Visualizing data through various plots and charts: pie chart, bar charts, histogram, frequency polygon, density plots, scatter plots, box & whisker plots, heat maps and contour plots., plotting the above graphs in Python.

Unit –III

Predictive Modeling: Introduction to predictive modeling, estimating a function, the trade-off between model accuracy and prediction accuracy and model interpretability, regression versus classification, measuring the quality of fit. Simple and multiple linear regression modeling: estimating the coefficients, assessing the accuracy of the coefficient estimates, assessing the accuracy of the model. Logistic regression modeling, building regression models in Python.

Unit– IV

Classification Modeling: Introduction to process of classification, decision tree, bayesian, k- nearest neighbour, support vector machine classification models and their implementation in Python. Evaluating a classification model: confusion matrix, accuracy, sensitivity, specificity, f-measure, kappa statistics, ROC and area under curve. Accuracy and interpretability of classification models.

Evaluating the accuracy of a classifier: Holdout or random sampling methods, cross- validation, bootstrap methods.

Text and Reference Books:

1. Saroj Dahiya Ratnoo and Himmat Singh Ratnoo, Essentials of R for Data Analytics, Wiley, 2021.
2. Han, J., Kamber, M, Pei, J., Data Mining Concepts and Techniques, Third edition, Morgan Kaufmann, 2012.
3. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, An Introduction to Statistical Learning with Applications in R, Springer, 2013.
4. Hadley Wickham and Garrett Grolemund, R for Data Science Import, Tidy, Transform and model Data, O'Reilly, 2017.
5. Roger D. Peng, R Programming for Data Science, Lean Publishing, 2015.6. W. N. Venables, D. M. Smith and the R core Team, An introduction to R, Notes on R: A Programming Environment for Data Analysis and Graphics, version 3.3.2, 2016.
7. Muller, A. C., & Guido, S. Introduction to Machine Learning with Python: A Guide for Data Scientists. O'Reilly 2016.

Course Outcomes: After completing this Course, the learner will be able to:

CO1. **List or describe**: Describe fundamental of Data analytics.
CO2. **Select**: Discuss principles for tabular representation.
CO3. **Apply:** Apply basic exploratory data analysis
CO4. **Implement:** Implement various operations in Python.
CO5. **Apply**: Apply basic regression modelling on real-world application.

Mapping of CO-PO
C24MIN224T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								
CO5								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
Internet and Web Design (Semester-II)
Multidisciplinary Course (MDC)

Paper Code: C24MDC232T
30 Hrs (2 Hrs /Week) **External Marks : 35**
Credits: 2 **Internal Marks : 15**
Exam. Time: 2 Hrs **Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives: This course provides an introduction to fundamental concepts of the Internet and web design, with a focus on HTML and CSS. Students will learn about Internet infrastructure, email protocols, web protocols, and the process of developing and publishing websites. The course covers essential web designing tools, including HTML for creating web pages and CSS for styling them. The aim is to equip students with the skills to design, analyze, and evaluate web pages effectively.

Unit I

Introduction to Internet: Internet Evolution and Concept, Internet Vs Intranet, Growth of Internet, Internet Service Provider (ISP) & its Function, Connectivity- Dialup, Leased line; URL, Protocols.
E-MAIL: Email Basics, Address, Features, Sending & Receiving Email, Email Protocols, Labels in Email, Email services providers, Internet chatting - Voice chat, Text chat.
World Wide Web (www): History of WWW, Web Browser, Webserver, Search Engines, working of Search Engine, Web Protocols (HTTP, FTP, SNMP etc.), TCP/IP layer with protocols.
Web Designing: Steps for developing a website; contents selection; Webpage, Home page; Domain Names; website publishing.

Unit II

HTML: Concepts of Hypertext, Versions of HTML, Elements of HTML, Syntax, Tags & Attributes, Head & Body Sections, Inserting Texts, Images, Hyperlinks, Backgrounds and Colour Controls, Different HTML Tags, Table Layout and Presentation, Creating Lists, Use of Font Size & Attributes, List Types and Its Tags, Use of Frames and Forms in Web Pages.
Cascading Style sheets: Introduction to CSS**,** External Style sheet**,** Internal style sheet**,** Inline style sheet**,** CSS Syntax- Selector, Property, Value**,** Overriding, Comments, colour, background, Font, images.

Text and Reference Books:

1. Raj Kamal, Internet and Web Technologies, Tata McGraw- Hill, 2002.
2. Wendy Willard, HTML Beginners Guide, Tata McGraw- Hill, 2009.
3. Deitel and Goldberg, Internet and World Wide Web, How to Program, PHI, 2004.

Course Outcomes: After completing this Course, the learner will be able to:

CO1: Recall the basic concepts of Internet and WWW.
CO2: Explain ISPs and different connection types for networking.
CO3: Apply basic web designing tool: HTML.
CO4: Analyze and discuss various components of a web page.
CO5: Evaluate and prepare a report describing or making recommendations for a website design.
CO6: Design a basic webpage having different elements of HTML & CSS.

Mapping of CO-PO
C24MDC232T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								
CO5								
CO6								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Internet and Web Design Lab

Paper Code: C24MDC232P
30 Hrs (2 Hrs /Week) **External Marks: 20**
Credits: 1 **Internal Marks: 10**
Exam.Time: 3 Hrs **Total Marks: 30**

Note: The Internal and External assessment is based on the level of participation in Lab sessions and the timely submission of Lab experiments / assignments, the performance in Viva-Voce, the quality of the lab file and ethical practices followed. The Internal examination is conducted by the Course Coordinator. The External examination is conducted by External Examiner appointed by the Controller of Examination.

Course Objectives: This practical lab course focuses on developing fundamental skills in web design and development. Students will learn to use HTML, CSS, and basic scripting to create and manage web pages. Key activities include designing web forms, incorporating multimedia elements, and applying styles. The course also introduces domain registration and ethical practices in web development. Through hands-on experiments, students will enhance their ability to build and debug web pages, evaluate coding practices, and create well-documented lab records.

List of Experiments:
1. Use the HTML tags for Font features.
2. Create Ordered and Unordered List in Table.
3. Create a simple webpage using HTML.
4. Designing of registration form with table and use of hyperlink.
5. Design a page with frames to include Images and Videos.
6. Add a cascading style sheet for designing the web page.
7. Use user defined function to get array of values and sort them in ascending order on web page
8. Demonstrate Request and Response object using HTML Form.
9. Register your website domain with DNS Provider.

Note: In addition to above experiments, the teacher concerned may add more experiments based on theory syllabus

Course Outcomes: After completing this Course, the learner will be able to:
CO1. **Develop** Different Web pages using appropriate syntax and semantics.
CO2. **Analyze and debug** webpage and fix errors effectively.
CO3. **Evaluate** the impact of different coding practices on the performance and readability of HTML tags.
CO4. **Design and execute** programs inserting image, videos etc in webpage.
CO5. **Create** lab assignment record that includes problem definitions, solutions, results, and conclusions.
CO6. **Demonstrate** ethical practices while creating website projects individually or in groups.

Mapping of CO-PO
C24MDC232P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								
CO5								
CO6								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
Web Designing Basics using HTML (Semester-II)
Skill Enhancement Course (SEC)

Paper Code: C24SEC224T
30 Hrs. (2 Hrs /Week) **External Marks: 35**
Credits: 2 **Internal Marks: 15**
Exam. Time: 2 Hrs **Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives: This course covers fundamental concepts in HTML, CSS, and JavaScript during teaching students learn to design and develop interactive websites with multimedia integration and responsive design principles. They learn to create structured HTML documents, style webpages with CSS, and add dynamic functionality using JavaScript, including event handling, and asynchronous programming techniques.

Unit - I

HTML5 Basic: Introduction to HTML Document, Elements and Tags, Text Formatting, Headings and Paragraphs, Adding Line Breaks and Horizontal Rules, Lists (Ordered, Unordered, Definition), Anchor Tags, Linking to External Resources (Images, Stylesheets, Scripts). HTML Tables, Forms, Input Types, Textboxes, Radio Buttons, Checkboxes, form submission methods (GET and POST), Dropdown Menus and Select Boxes, Grouping Form Elements with FieldSets and Legends, form Attributes, Embedding Multimedia (Images, Audio, Video)

Unit – II

Cascading Style Sheets: Introduction to CSS and Basic Styling, Role of CSS in Web Design, Syntax and Structure of CSS Rules, Selectors and Specificity, Inline Styles, External vs. Internal Stylesheets, Box Model (Margin, Border, Padding, Content), Box Elements (Width, Height, Borders, Margins, Padding), Display Properties (Block, Inline, Inline-Block), Positioning Elements (Static, Relative, Absolute, Fixed). CSS Advanced Techniques for Styling Text (Font Properties, Text Decoration, Text Alignment), Working with Colors and Backgrounds (Color Values, Background Images, Gradients), Managing Lists and Tables, Styling Links and Navigation Menus, CSS Flexbox/Grid Layouts and Properties, CSS Transitions Properties (Duration, Timing Function, Delay), Debugging and Troubleshooting CSS Issues.

Text and Reference Books:

1. "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics" by Jennifer Niederst Robbins, 2018, 5th Ed., O'Reilly Media
2. "Head First HTML and CSS" by Elisabeth Robson and Eric Freeman, 2012, O'Reilly Media
3. "Responsive Web Design with HTML5 and CSS" by Ben Frain, 2014, 1st Edition, Packt Publishing.
4. "HTML, CSS, and JavaScript All in One" by Julie C. Meloni and Jennifer Kyrnin, 2020, 3rd Edition, Sams Publishing.
5. "HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery", 2016 2nd Edition, Kindle Edition, Dreamtech Press.

Course Outcomes: After completing this Course, the learner will be able to:

CO1. List or describe fundamental concepts of HTML, CSS, and JavaScript.
CO2. Apply appropriate elements, properties, and techniques in web development.
CO3. Create well-structured, visually appealing, and interactive webpages.
CO4. Implement forms, styling, and functionality to enhance user experience.
CO5. Utilize modern techniques like responsive design using JSON, XML and DOM manipulation.
CO6. Compare and evaluate different development approaches and tools.

Mapping of CO-PO
C24SEC224T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								
CO5								
CO6								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Web Designing Basics using HTML Lab (Semester-II)

Paper Code: C24SEC224P
30 Hrs (2 Hrs /Week) **External Marks : 15**
Credits: 1 **Internal Marks : 10**
Exa. Time: 3 Hrs **Total Marks: 25**

Note: The Internal and External assessment is based on the level of participation in Lab sessions and the timely submission of Lab experiments/assignments, the performance in Viva-Voce, the quality of the lab file and ethical practices followed. The Internal examination is conducted by the Course Coordinator. The External examination is conducted by External Examiner appointed by the Controller of Examination.

Course Objectives: This course introduces fundamental principles of web design using HTML, covering HTML document structure, elements, tags, text formatting, lists, tables, forms, and multimedia embedding. It includes basic CSS for styling and responsive design principles to create well-designed, user-friendly web pages.

List of Experiments/ assignments

1. Basic HTML Document Creation: Create a simple HTML document with necessary elements like <!DOCTYPE>, <html>, <head>, <title>, and <body>.
2. Demonstrate various text formatting elements such as , , <u>, <s>, etc.
3. Create ordered, unordered, and definition lists. Include hyperlinks to external resources using <a> tags.
4. Construct a table with rows and columns. Develop a simple form containing input types like textboxes, radio buttons, checkboxes, dropdown menus, and text areas.
5. Embed images, audio, and video files within an HTML document using appropriate tags.
6. Add meta tags for description, keywords, and charset. Include comments within the HTML document for better readability.
7. Validate HTML code using W3C validator. Create a responsive webpage using media queries and viewport meta tags.
8. Implement semantic elements such as <nav>, <main>, <article>, <section>, <header>, and <footer> for better SEO.
9. Implement advanced form features like file uploads and hidden inputs. Utilize HTML5 APIs like Canvas, Geolocation, and Local Storage.
10. Embed external content such as YouTube videos and Google Maps using iframes.
11. Apply basic CSS styles to HTML elements including font properties, colors, backgrounds, and text alignment.
12. Demonstrate the concept of margin, border, padding, and content. Style box elements with width, height, borders, margins, and padding.
13. Understand and implement various display properties like block, inline, and inline-block. Experiment with positioning elements statically, relatively, absolutely, and fixedly.
14. Apply advanced CSS techniques for styling text such as font properties, text decoration, and alignment. Experiment with different color values, background images, and gradients.
15. Style lists and tables with custom designs. Design navigation menus and style hyperlinks accordingly.
16. Implement CSS Flexbox and Grid layouts for better page structuring. Add transitions with properties like duration, timing function, and delay to enhance user experience.
17. Debug and troubleshoot CSS issues using browser developer tools and techniques like validation and code review.

Note: The actual experiment / assignments will be designed by the course coordinator. One assignment to be done in the groups of two or three students. The assignments must be meet the objectives of the course and the levels of given course outcomes. The list of assignments and schedule of submission will be prepared by course coordinator in the beginning of the semester.

Course Outcomes: After completing this Course, the learner will be able to:

- **CO1. Implementation:** Students will be able to implement HTML web pages.
- **CO2. Analysis:** students will develop the ability to analyse and interpret HTML and CSS code to understand its structure.
- **CO3. Compare:** students will compare and contrast different approaches to web design, including the use of HTML and CSS, to achieve specific design goals and user requirements.
- **CO4. Integrate:** students will integrate multimedia elements such as images, audio, and video seamlessly into HTML documents.
- **CO5. Create:** able to create well-designed and visually appealing web pages using HTML and basic CSS styling techniques.
- **CO6. Demonstrate:** student will demonstrate responsive web pages and showcasing their ability to create user-friendly.

Mapping of CO-PO
C24SEC224P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								
CO5								
CO6								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Applications
Java Programming
(Semester-III) Discipline Specific Course (DSC)

Paper Code: C24CAP301T
45 Hrs (3 Hrs / Week) **External Marks : 50**
Credits: 3 **Internal Marks : 20**
Exam. Time: 2.5 Hrs **Total Marks: 70**

Note: The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains five short answer questions covering entire syllabus. Rest eight more questions (each question of at least two parts) will be set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt five questions in all by selecting one question from each of unit in addition to compulsory Question No.1. All questions will carry equal marks.

Course Objective: This course provides foundational knowledge in object-oriented methodology. It covers key topics including data types, variables, operators, control structures, and functions in Java. Students will learn Java's built-in libraries for handling collections, input/output operations, strings, and utilities. Students will be able to create and manage multiple threads in Java applications. Focus on synchronization and thread safety to handle concurrent tasks.

Unit I

Object-Oriented Programming and Java Fundamentals: Structure of Java programs, Classes and Objects, Data types, Type Casting, Looping Constructs. The Byte-code
Arrays and Strings: Arrays, Arrays of Characters, String handling Using String Class; Operations of String Handling

Unit II

Interfaces: Interface basics; Defining, implementing and extending interfaces; Implementing multiple inheritance using interfaces Packages: Basics of packages, Creating and accessing packages, System packages, Creating user-defined packages

Unit III

Exception handling using the main keywords of exception handling: try, catch, throw, throws, and finally. Nested try, multiple catch statements, creating user-defined exceptions. File Handling Byte Stream, Character Stream, File I/O Basics, File Operations

Unit IV

AWT and Event Handling: The AWT class hierarchy, Events, Event sources, Event classes, Event Listeners, Relationship between Event sources and Listeners, Delegation event model, Creating GUI applications using AWT.

Text and Reference Books:

1. Schildt, H. (2018). Java: The Complete Reference. 10th edition. McGraw-Hill Education.
2. Balaguruswamy E. (2014). Programming with JAVA: A Primer. 5th edition. India: McGraw Hill Education
3. Horstmann, C. S. (2017). Core Java - Vol. I – Fundamentals (Vol. 10). Pearson Education
4. Schildt, H., & Skrien, D. (2012). Java Fundamentals - A Comprehensive Introduction. India: McGraw Hill Education.
5. Ivor Horton, Beginning JAVA, WROX Public, 2005

Course Outcomes: After completing this course, the learner will be able to:

CO1: Identify: Learn the basics features of OOPs
CO2: Understand: Understand the concept of classes and objects, their attributes and behaviors,
CO3: Apply: Implement simple Javaprograms.
CO4: Analyze and compare: different types inheritance using interfaces
CO5: Evaluating: Exception Handling and File Handling.

Mapping of CO-PO
C24CAP301T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								
CO5								

*Attainment Levels: None, 1: Low, 2: Medium, 3: High

Computer Applications
Java Programming Lab
(Semester-III) Discipline Specific Course (DSC)

Paper Code: C24CAP301P
30 Hrs (2 Hrs /Week) **External Marks: 20**
Credits: 1 **Internal Marks: 10**
Exam.Time: 3 Hrs **Total Marks: 30**

Note: An internal practical examination is conducted by the course coordinator. The end-of-semester practical examination is conducted jointly by external and internal examiners. The external examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, GJUS&T Hisar, and the internal examiner is appointed by the Chairperson of the Department.

Course Objective: This practical lab course will provide a strong understanding of basic Java programming elements and data abstraction using problem representation and the object-oriented framework. The objective of the lab course is to inculcate proficiency in students to design and develop market-based software applications.

List of Laboratory Assignments:

1. WAP to find the sum of 10 numbers, entered as command line arguments.
2. WAP to find the area of a rectangle and circle using Interface.
3. WAP to implement multiple inheritance.
4. WAP to show the concept of packages.
5. WAP to handle the exception using try and multiple catch blocks and a finally block.
6. WAP for Implementing Calculator in an Applet, use appropriate Layout Manager.
7. Write Applet code to add two integers in the text box, and their sum should appear in the third text box.
8. Write an AWT program in Java to find the sum, multiplication, and average of three numbers entered in three text fields by clicking the corresponding labeled button. The result should be appearing in the fourth text field.
9. Write Applet code to show all the activities of Mouse using Mouse listener and Mouse Motion listener.
10. What are various stream classes in Java? Write Java code to read characters from a file and write into another file.
11. What are AWT classes? Write a Java program to generate even numbers and odd numbers in Text Field “T1 and T2, respectively,” while pressing the buttons “Even” and "Odd.”.
12. Write a program to copy the text from one file to another using a byte stream.

Students are given ten or more laboratory assignments with soft and hard deadlines. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

Course Outcomes: After completing this course, the learner will be able to:

CO1: Identify: Implement Java programs using object-oriented concepts for problem solving.
CO2: Understand: syntax and logical errors in java programs
CO3: Apply: exception handling for making robust Java code.
CO4: Design: Java applications using File I/O and GUI.

Mapping of CO-PO
C24CAP101P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: None, 1: Low, 2: Medium, 3: High

Computer Applications
Linux and Shell Programming
(Semester-III) Discipline Specific Course (DSC)

Paper Code: C24CAP302T

45 Hrs (3 Hrs / Week)	**External Marks : 50**
Credits: 3	**Internal Marks : 20**
Exam. Time: 2.5 Hrs	**Total Marks: 70**

Note: The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains five short answer questions covering entire syllabus. Rest eight more questions (each question of at least two parts) will be set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt five questions in all by selecting one question from each of unit in addition to compulsory Question No.1. All questions will carry equal marks.

Course Objective: This course typically aims to understand the history and evolution of Linux. Learn about Linux distributions and their differences. Explore the Linux file system structure and permissions. It covers essential Linux commands and text processing tools. Students will learn file, directory, user, and group management. Students will be able to learn shell script syntax and implement functions and modular scripts.

Unit I

Introduction to Linux: Linux distributions, Overview of Linux operating system, Linux architecture, Features of Linux, Accessing Linux system, Starting and shutting down system, Logging in and Logging out, Comparison of Linux with other operating systems.

Unit II

Commands in Linux: general-purpose commands, file-oriented commands, directory-oriented commands, communication-oriented commands, process-oriented commands, etc. Regular expressions & filters in Linux: Simple filters, viz. more, wc, diff, sort, uniq, grep; introducing regular expressions.

Unit III

Linux file system: Linux files, inodes and structure, file system, file system components, standard file system, file system types. Processes in Linux: Starting and Stopping Processes, Initialization Processes, Mechanism of Process Creation, Job Control in Linux Using At, Batch, cron, & Time.

Unit IV

Shell Programming: vi editor, shell variables, I/O in shell, control structures, loops, subprograms, creating & executing shell scripts in Linux.

Text and Reference Books:

1. Yashwant Kanetkar, Unix & Shell programming – BPB Publications.
2. Richard Petersen, The Complete Reference – Linux, McGraw-Hill.
3. M.G.Venkateshmurthy, Introduction to Unix & Shell Programming, Pearson Education.
4. Stephen Prata, Advanced UNIX-A Programmer's Guide, SAMS Publication.
5. Sumitabha Das, Your Unix - The Ultimate Guide, Tata McGraw-Hill.

Course Outcomes: After completing this course, the learner will be able to:

CO1: Identify: Learn the basics Commands for file management, process control, and user management.
CO2: Understand: Understand Linux Architecture and modify file permissions and ownership
CO3: Apply: Handle background and foreground processes
CO4: Analyze and compare: Schedule jobs using cron and at commands and other shell environments
CO5: Evaluating: Configure and troubleshoot basic network settings in Linux

Mapping of CO-PO
C24CAP302T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								
CO5								

***Attainment Levels: None, 1: Low, 2: Medium, 3: High**

Computer Applications
Linux and Shell Programming Lab
(Semester-III) Discipline Specific Course (DSC)

Paper Code: C24CAP302P
30 Hrs (2 Hrs / Week) **External Marks: 20**
Credits: 1 **Internal Marks: 10**
Exam.Time: 3 Hrs **Total Marks: 30**

Note: An internal practical examination is conducted by the course coordinator. The end-of-semester practical examination is conducted jointly by external and internal examiners. The external examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, GJUS&T Hisar, and the internal examiner is appointed by the Chairperson of the Department.

Course Objective: This course Linux and Shell Programming Lab is designed to provide hands-on experience with the Linux operating system and shell scripting. The primary objectives of this lab are to understand the Linux environment and proficiency in shell scripting. The objective of the lab course is to implement text processing and data handling.

List of Laboratory Assignments:

1. Basic Linux command
2. Basic Shell Programming (Fibonacci Series generation, Factorial of a given number, Checking for Armstrong number)
3. Designing an Arithmetic calculator
4. Generation of Multiplication table
5. Base Conversion (Decimal to Binary, Binary to Decimal)
6. Finding the information about the login name and file name.
7. Write a shell script to exchange the contents of two variables.
8. Write a shell script that accepts three subject marks scored by a student and declares the result.
9. Write a shell script program to find the area of a square, rectangle, circle, and triangle.
10. Write a shell script to print integer numbers from 1 to 20.

Students are given ten or more laboratory assignments with soft and hard deadlines. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

Course Outcomes: After completing this course, the learner will be able to:

CO1: Identify: Perform operations like file creation, copying, moving, renaming, and deleting
CO2: Understand: Linux file system, including mounting and unmounting drives
CO3: Apply: write shell scripts using Bash scripting to automate routine tasks.
CO4: Analyze and compare: Implement File Handling and Text Processing

Mapping of CO-PO
C24CAP302P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: None, 1: Low, 2: Medium, 3: High

Computer Applications
Database Management System
(Semester-III) Discipline Specific Course (DSC)

Paper Code: C24CAP303T
45 Hrs (3 Hrs / Week) **External Marks : 50**
Credits: 3 **Internal Marks : 20**
Exam. Time: 2.5 Hrs **Total Marks: 70**

Note: The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains five short answer questions covering entire syllabus. Rest eight more questions (each question of at least two parts) will be set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt five questions in all by selecting one question from each of unit in addition to compulsory Question No.1. All questions will carry equal marks.

Course Objective: This course aims to provide students with a strong foundation in database concepts, design, implementation, and management. The key objectives of this course include understanding the fundamentals of database systems and exploring various database models and database design principles. After this course, students will learn relational algebra and relational calculus. In this course, students will be able to explain the normalization techniques to improve database design.

Unit I

Basic Concepts: Data, Information, Records, Files, Schema, Instance, etc. Limitations of File-Based Approach, Characteristics of Database Approach, Database Management System (DBMS), DBMS Functions and Components, Database Interfaces, Database Administrator, Role and Responsibilities of Database Administrator,

Database Architecture: 1-Tier, 2-Tier & Three Levels of Architecture, External, Conceptual and Internal Levels, Schemas, Mappings and Instances, Data Independence: Logical and Physical Data Independence.

Unit II

Data Models: Hierarchical, Network, and Relational Data Models. Entity-Relationship Model: Entity, Entity Sets, Entity Type, Attributes: Types of Attributes, Keys, Integrity Constraints, Designing of ER Diagram, Symbolic Notations for Designing ER Diagram,

Unit III

SQL: Meaning, Purpose and Need of SQL, Data Types, SQL Components: DDL, DML, DCL, and DQL, Basic Queries, Join Operations and Sub-queries, Views, Specifying Indexes. Constraints and its Implementation in SQL.

Relational Algebra: Basic Operations: Select, Project, Join, Union, Intersection, Difference, and Cartesian Product, etc. Relational Calculus: Tuple Relational and Domain Relational Calculus. Relational Algebra Vs. Relational Calculus.

Unit IV

Relational Model: Functional Dependency, Characteristics, Inference Rules for Functional Dependency, Types of Functional Dependency, Normalization: Benefits and Need of Normalization, Normal Forms Based on Primary Keys: (1NF, 2NF, 3NF, BCNF), Multivalued Dependencies, 4NF, Join Dependencies, 5NF, Domain Key Normal Form.

Text and Reference Books:

1. Elmasri & Navathe, Fundamentals of Database Systems, Pearson Education.
2. A Silberschatz, H Korth, S Sudarshan, Database System and Concepts, McGraw-Hill.
3. Thomas Connolly Carolyn Begg, Database Systems, Pearson Education.
4. C. J. Date, An Introduction to Database Systems, Addison Wesley.

Course Outcomes: After completing this course, the learner will be able to:

CO1: Identify: Learn fundamental concepts, architecture, and applications of DBMS.
CO2: Understand: Understand real-world requirements and design different data models.
CO3: Apply: Find data anomalies and apply normalization techniques.
CO4: Analyze and compare: Analyze a given database application scenario to use an ER model for conceptual design of the database.

Mapping of CO-PO
C24CAP303T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

***Attainment Levels: None, 1: Low, 2: Medium, 3: High**

Computer Applications
Database Management System Lab
(Semester-III) Discipline Specific Course (DSC)

Paper Code: C24CAP303P
30 Hrs (2 Hrs / Week) **External Marks: 20**
Credits: 1 **Internal Marks: 10**
Exam.Time: 3 Hrs **Total Marks: 30**

Note: An internal practical examination is conducted by the course coordinator. The end-of-semester practical examination is conducted jointly by external and internal examiners. The external examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, GJUS&T Hisar, and the internal examiner is appointed by the Chairperson of the Department.

Course Objective: The DBMS Lab is designed to provide hands-on experience in database design, implementation, and querying using SQL and database management tools. The main objectives of this lab are to understand the basics of database systems and to design and implement databases. After this course, students will be able to write SQL queries to perform basic operations such as data retrieval, insertion, updating, and deletion. Students will learn to apply constraints and indexing techniques like implementing primary keys, foreign keys and unique constraints.

List of Laboratory Assignments:

1. Performing various SQL statements. Creating various tables and performing all possible queries based on syllabus. For example:
   i). Create a database and write the commands to carry out the following operation:
   a. Alter table
   b. Describe table
   c. Drop table
   ii). Create a database and write the programs to carry out the following operation:
   a. Add a record in the database
   b. Delete a record in the database
   c. Modify the record in the database
   d. Generate queries
   e. Generate the report
   f. List all the records of database in ascending order
   iii). Create a database and write the programs to carry out the following constraints:
   a. Key constraints
   b. Domain constraints
   c. Referential integrity constraints
   iv). Create a database and write the commands to carry out the following set operation on the database:
   a. Union
   b. Intersect
   c. Minus

2. Understanding relational model concepts
3. Understanding normalization
4. Understanding various concepts of databases.

Course Outcomes: After completing this course, the learner will be able to:

CO1: Identify: Design and Implement Databases
CO2: Understand: fundamental SQL operations like creating, inserting, updating, and deleting records
CO3: Apply: implement joins, sub-queries, views, aggregate functions, and group operations
CO4: Analyze and compare: Define primary keys, foreign keys, unique, not null, and check constraints to maintain data integrity.

Mapping of CO-PO
C24CAP303P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: None, 1: Low, 2: Medium, 3: High

Computer Applications
Theory of Computation
(Semester-III) Course (Minor Course)

Paper Code: C24MIC324T
60 Hrs (4 Hrs /Week) **External Marks: 70**
Credits: 4 **Internal Marks: 30**
Exam. Time: 3 Hrs **Total Marks: 100**

Note: The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains Seven short answer questions covering entire syllabus. Rest eight more questions (each question of at least two parts) will be set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt five questions in all by selecting one question from each of unit in addition to compulsory Question No.1. All questions will carry equal marks.

Course Objective: The objective of this course is to provide the in-depth coverage of theoretical computer science. It provides an insight about basic concepts of automata, formal languages, and computational models of all types. Explores all classes of formal languages such as Regular, Context-Free, Context-Sensitive, and Recursively Enumerable.

Unit I

Finite State Machines: Finite Automata, Designing of DFA and NDFA, Equivalence of DFA and NFA with proof, Regular Expressions and Regular languages, Regular Expressions, Kleene's Theorem, FSM with Output: Moore and Mealy Machines, Minimization of FA.

Unit II

Formal Grammars: Definition, Chomsky Classification of Languages, Relation between classes of Languages, Operations on Languages, Parse Trees, Ambiguity, Closure properties of CFL, Pumping Lemma for CFL. Removal of Useless Symbols and UNIT-Production, Chomsky Normal Form.

Unit III

Pushdown Automaton: Introduction, Types of PDA, Designing of PDA's, Pushdown Automata for Context-Free Languages, Context-Free Grammars for Pushdown Automata, Decidable Properties of Context-Free Languages, Application of Pushdown Machines. Unrestricted Grammars, Context-Sensitive Grammars and Languages Linear Bounded Automata (LBA),

Unit IV

Turing Machines (TM), General Model of Computation, TM as Language Acceptors, Restricted and Universal TM; TM and Computers. Nondeterministic Turing machines, Recursive and recursively-enumerable languages and Properties, the Halting Problem, Cook's Theorem,

Text and Reference Books:

1. John C. Martin, Introduction to Languages and the Theory of Computation, McGraw Hill.
2. Peter Linz, An introduction to formal language & automata, Jones & Bartlett publications.
3. Hopcroft J. E. & Ullman J. D, Formal languages and their relation to Automata, Pearson Education.
4. Lewis, H.R. & Papadimitrious, C. H., Elements of the theory of computation, PHI Learning.
5. Michael Sipser, Introduction to the Theory of Computation, Cengage Learning.

Course Outcomes: After completing this Course, the learner will be able to:

CO1: Identify: basic terminology related to theory of computation
CO2: Understand: the concepts of basic machines like FA, NFA, Moore, Mealy etc.
CO3: Apply: automata for any given pattern and find its equivalent regular expressions.
CO4: Analyze and compare different types of grammar.
CO5. Design various machines for real life problems.

Mapping of CO-PO C24CAP101T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High

Computer Science
C Programming (Semester-III)
Multi Disciplinary Course (MDC)

Paper Code: C24MDC332T
30 Hrs (2 Hrs /Week) **External Marks: 35**
Credits:2 **Internal Marks: 15**
Exam Time: 2 Hrs **Total Marks: 50**

Note: The end semester examination will be of 35 marks. The examiner is required to set five questions in all. The first question will be compulsory, consisting of five short questions covering the entire syllabus, each carrying three marks. In addition to these, four more questions (each question may have two parts) will be set, comprising two questions from each unit. The student is required to attempt three questions in all, selecting one question from each unit, each carrying 10 marks, in addition to the compulsory Question Number 1.

Course Objective: This course provides foundational knowledge in problem-solving using the C programming language. It covers C programming essentials such as data types, operators, control structures, arrays, functions, strings, pointers, and user-defined data types like structures and unions. The course emphasizes practical programming skills and problem-solving techniques.

Unit I

Overview of C: Character Set, Constants and Variables, Identifiers and Keywords, Data Types, Assignment Statement, Symbolic Constant, Formatted input/output function

Operators & Expression: Arithmetic, Relational, Logical, Bitwise, Increment and decrement operators, Assignment Operator, Conditional Operators and Special Operators, Arithmetic Expressions, Evaluation of Arithmetic Expression, Operator Precedence and Associativity,

Decision making with if statement, if-else statement, nested if statement, else-if ladder, Switch and Break statement, **Looping Statements:** for, while, and do-while loop, jumps in loops.

Unit II

Arrays: Declaration and Initialization of One Dimensional arrays, Declaration and Initialization of two Dimensional Arrays, Declaration and Initialization of String Variable, String Handling Functions: String Length, Copy, Compare, Concatenate, Search for a Substring etc.

Functions: definition, prototype, function call, passing arguments to a function: call by value; call by reference. **Structure and Union:** Structure definition, declaring structure variables, accessing structure members, Union definition, Difference between Structure and Union.

Text and Reference Books:

1. Gottfried, Byron S., Programming with C, Tata McGraw Hill.
2. Balagurusamy, E., Programming in ANSI C, Tata McGraw Hill.
3. Yashwant Kanetker, Let us C, BPB.
4. Rajaraman, V. , Computer Programming in C, PHI.

Course Outcomes: After completing this Course, the learner will be able to:

CO1: Identify: Learn the basics of C Language
CO2: Understand: Understand data types and input/output statements, different types of operators, their hierarchies
CO3: Apply: Implement programs using arrays and strings.
CO4: Analyze and compare: Get familiar with advanced concepts like structures, union etc. in C language.

Mapping of CO-PO
C24MDC305T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels:-None, 1:Low, 2:Medium, 3:High

Computer Science
C Programming Lab (Semester-III)
Multi Disciplinary Course (MDC)

Paper Code: C24MDC332P
30Hrs (2Hrs /Week) **External Marks: 15**
Credits:1 **Internal Marks:10**
Exam Time:3 Hrs **Total Marks:25**

Note: An internal practical examination is conducted by the Course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, GJUS&T Hisar and the internal examiner is appointed by the Principal of the college.

Course Objective: This practical lab course focuses on fundamental programming skills using C language, with an emphasis on problem-solving techniques. Students will complete a series of laboratory assignments that cover various topics such as basic arithmetic operations, control structures, array manipulation, and matrix operations. Assignments are designed to enhance practical coding skills and prepare students for more advanced programming tasks.

List of Laboratory Assignments:

1. To read radius of a circle and to find area and circumference of a circle.
2. To read three numbers and find the greatest out of three numbers.
3. To find the roots of quadratic equation.
4. To check whether the number is prime or not.
5. To find the factorial of a number.
6. To find the sum of the digits of a number, reverse the number, and also check the number is palindrome or not.
7. To read percentage of marks and to display appropriate message.
8. To read marks scored by n students and find the average of marks.
9. To check whether a given number is present in one dimensional integer Array.
10. To perform addition, multiplication of Matrices.

Students are given ten or more laboratory assignments with soft and hard deadlines. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory assignment done.

Course Outcomes: After completing this Course, the learner will be able to:

CO1: Identify: Learn how to implement c program in a programming language.
CO2: Understand: Make the students familiar with various data types, operators.
CO3: Apply: Learn how to deal with control statement, arrays.
CO4: Analyze and compare: Compare various conditional statement and loops

Mapping of CO-PO
C24MDC305P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels:-None, 1:Low, 2:Medium, 3:High

Computer Applications
Advance IT Skills
(Semester-III) Skill Enhancement Course (SEC)

Paper Code: C24SEC324T **External Marks : 35**
30 Hrs (2 Hrs /Week) **Internal Marks : 15**
Credits: 2 **Total Marks: 50**
Exam. Time: 2 Hrs

Note: The end semester examination will be of 35 marks. The examiner is required to set five questions in all. The first question will be compulsory, consisting of five short questions covering the entire syllabus, each carrying three marks. In addition to these, four more questions (each question may have two parts) will be set, comprising two questions from each unit. The student is required to attempt three questions in all, selecting one question from each unit, each carrying 10 marks, in addition to the compulsory Question Number 1.

Course Objectives:

- To provide knowledge of web technologies, e-governance, and digital financial tools.
- To develop awareness about cyber security threats and preventive measures.
- To introduce emerging IT trends and their real-world applications.
- To equip students with practical skills in digital transactions, cyber security, and future technologies.

Unit I

Web Technologies & Internet Basics: Website Address, URL, and Internet Protocols (HTTP, HTTPS, TCP/IP), Modes of Internet Connection (WiFi, LAN, Broadband, USB Tethering), Identifying and Using IP, MAC, and IMEI of Devices, Safe Browsing Practices & Cyber Hygiene.

E-Governance & Digital Services: Overview of E-Governance Services (Railway Reservation, Passport, eHospital, etc.), Digital Identity & Authentication (e-KYC, Digital Signatures), Role of AI in E-Governance.
Digital Financial Tools: OTP & QR Code-based Transactions, UPI, AEPS, USSD, eWallets, PoS Transactions, NEFT, RTGS, IMPS, Online Bill Payments.

Unit II

Cybersecurity & Threats: Introduction to Cybersecurity & Types of Cybercrimes, Social Engineering, Phishing, Malware, and Ransomware Attacks, Reporting Cybercrimes & IT Act 2000 (Amendments), Data Privacy & Online Safety.

Emerging Technologies & Industry Applications: Internet of Things (IoT) & Smart Devices, Big Data Analytics & Artificial Intelligence, Cloud Computing & Blockchain Technology, Virtual Reality & Augmented Reality.

Text and Reference Books:

Textbooks:

1. "Fundamentals of Computers" – E. Balagurusamy, McGraw Hill
2. "E-Governance: Concepts and Case Studies" – C.S.R. Prabhu, PHI Learning
3. "Digital Payments and Cyber Security" – Pavan Duggal, Universal Law Publishing
4. "Emerging Technologies for IT" – K. Chandrasekaran, CRC Press

Reference Books:

1. **"Computer Networking: A Top-Down Approach"** – James F. Kurose & Keith W. Ross, Pearson
2. **"E-Government: The Science of the Possible"** – J. Satyanarayana, PHI Learning
3. **"Cryptography and Network Security"** – William Stallings, Pearson
4. **"Blockchain Basics: A Non-Technical Introduction"** – Daniel Drescher, Apress

Course Outcomes: After completing this Course, the learner will be able to:

CO1: Identify – Recognize key concepts of web technologies, e-governance services, digital payments, and cyber security.
CO2: Understand – Explain the working of internet protocols, digital financial tools, cyber threats, and emerging IT trends**.**
CO3: Apply – Utilize e-governance services, digital payment methods, and safe browsing practices effectively.
CO4: Analyze – Evaluate cybersecurity threats, online frauds, and the role of regulations like the IT Act 2000.
CO5: Explore – Investigate the applications of emerging technologies like IoT, AI, Cloud Computing etc.

Mapping of CO-PO

C24SEC324T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								

***Attainment Levels: - None, 1: Low, 2: Medium, 3: High**

Computer Applications
Advance IT Skills Lab
(Semester-III) Skill Enhancement Course (SEC)

Paper Code: C24SEC324P **External Marks : 15**
30 Hrs (2 Hrs /Week) **Internal Marks : 10**
Credits: 1 **Total Marks: 25**
Exam. Time: 3 Hrs

Note: An internal practical examination is conducted by the Course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, GJUS&T, Hisar and the internal examiner is appointed by the Chairperson of the Department.

Course Objective: This practical lab course focuses on enhancing the IT Skills of the students, with an emphasis on evolving IT techniques. Students will complete a series of laboratory assignments that cover various topics such as Web Technologies, E-Governance, Cyber Security and Threat Prevention etc.. Assignments are designed to enhance practical IT skills and prepare students for more advanced IT tasks.

List of Laboratory Assignments:

1. Understanding Internet Devices – Identify and configure IP, MAC, and IMEI addresses on different devices.
2. Accessing E-Governance Services – Navigate and use online platforms like Railway Reservation, Passport, or eHospital services.
3. Blog Writing & Publishing – Create and publish a simple blog on a blogging platform (Blogger, WordPress, or Medium).
4. Performing UPI Transactions – Make a demo transaction using UPI and generate a QR code for payments.
5. Simulating an Online Fund Transfer – Conduct a mock NEFT/RTGS/IMPS transaction on a banking demo portal.
6. Using E-Wallets & PoS(Point of Sale) Transactions – Perform a payment through an e-wallet (e.g., Paytm, Google Pay) and simulate a PoS transaction.
7. Identifying & Reporting Phishing Emails – Analyze an email for phishing indicators and report it using a cyber security portal.
8. Password Security & Data Privacy Check – Test password strength and explore two-factor authentication (2FA) settings.
9. Demonstration of Preventive Measures for Cyber Threats – Set up basic security settings like firewall, antivirus, and secure browsing.
10. Exploring No-Code/Low-Code Development – Create a simple chat bot or form using a no-code platform (e.g., Google Forms, Chatbot.com).
11. Basic Hands-on with Cloud Computing – Store and share files securely using Google Drive or One Drive.

Course Outcomes for Advanced IT Skills Lab

After completing this course, the learner will be able to:

CO1: Identify – Understand and recognize various web technologies, e-governance services, and digital financial tools.
CO2: Understand – Gain knowledge of secure online transactions, digital payment methods, and cybersecurity practices.
CO3: Apply – Perform hands-on activities related to UPI transactions, e-governance services, cybersecurity threat detection, and cloud storage.
CO4: Analyze – Assess cybersecurity risks, identify phishing attempts, and implement preventive security measures.
CO5: Create – Develop and publish digital content such as blogs, chatbots, and secure online transactions using digital tools.

Mapping of CO-PO

C24SEC324P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								

***Attainment Levels: - None, 1: Low, 2: Medium, 3: High**

Computer Applications
Cloud Computing
(Semester-IV) Discipline Specific Course (DSC)

Paper Code: C24CAP401T
45 Hrs (3 Hrs / Week) **External Marks : 50**
Credits: 3 **Internal Marks : 20**
Exam. Time: 2.5 Hrs **Total Marks: 70**

Note: The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains five short answer questions covering entire syllabus. Rest eight more questions (each question of at least two parts) will be set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt five questions in all by selecting one question from each of unit in addition to compulsory Question No.1. All questions will carry equal marks.

Course Objective: The main objective of this course is to explain the benefits, challenges, and real-world applications of cloud computing**.** To study the fundamental concepts of cloud computing, enabling technologies, cloud service models, and security concerns. Students will learn to understand the systems, protocols, and mechanisms to support cloud computing.

Unit I

Overview of Computing Paradigm: Recent trends in Computing, Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing, evolution of cloud computing, Business Drivers for adopting cloud computing

Introduction to Cloud Computing: Cloud Computing (NIST Model), introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Properties, Advantages & Disadvantages, Applications of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing, Role of Open Standards

Unit II

Cloud Computing Architecture: Cloud computing stack, Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Components of cloud computing, Role of Networks in Cloud Computing, Protocols Used.

Service Models (XaaS): Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), Deployment Models: Public cloud, private cloud, hybrid cloud, community cloud. Difference between Private, Public, and Hybrid Clouds.

Unit III

Cloud Storage Management: Key aspects of cloud storage management, benefits and challenges in cloud storage management, tools, and real-world applications.

Cloud Virtualization: Introduction to Virtualization, Types of Virtualization, Advantages of Virtualization, Key Features, Challenges, and Real-World Applications of Virtualization.

Unit IV

Cloud Security: Infrastructure Security, Network level security, Host level security, Application level security, Data security and Storage, Data privacy and security Issues, Cloud Migration: Strategy, 7-step Model to migrate, Overview of major cloud service providers: Amazon web services, Google cloud platform

Text and Reference Books:

1. Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2010.
2. Andrzej M. Goscinski, James Broberg, Rajkumar Buyya, Cloud Computing: Principles and Paradigms, Wile, 2011.
3. Nikos Antonopoulos, Lee Gillam, Cloud Computing: Principles, Systems, and Applications, Springer, 2012.
4. Ronald L. Krutz, Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley-India, 2010.

Course Outcomes: After completing this course, the learner will be able to

CO1: Identify: understand core issues of cloud computing and enabling technologies;
CO2: Understand: design services based on cloud computing platforms;
CO3: Apply: Apply the fundamental concepts in data centers to understand the trade-offs in power, efficiency and cost.
CO4: Analyze and compare: analyze the cloud securities.
CO5: Evaluating: evaluate the cloud technologies.

Mapping of CO-PO
C24CAP401T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: None, 1: Low, 2: Medium, 3: High

Computer Applications
Cloud Computing Lab
(Semester-IV) Discipline Specific Course (DSC)

Paper Code: C24CAP401P
30 Hrs (2 Hrs/Week) **External Marks: 20**
Credits: 1 **Internal Marks: 10**
Exam.Time: 3 Hrs **Total Marks: 30**

Note: An internal practical examination is conducted by the course coordinator. The end-of-semester practical examination is conducted jointly by external and internal examiners. The external examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, GJUS&T Hisar, and the internal examiner is appointed by the Chairperson of the Department.

Course Objective: The Course Objectives of a Cloud Computing Lab focus on providing hands-on experience with cloud platforms, services, and tools. The lab aims to help students develop practical skills in deploying, managing, and optimizing cloud-based solutions.

List of Laboratory Assignments:

1. Create an AWS cloud account.
2. Describe various Amazon Web Services and their uses.
3. Create a Linux EC2 instance in AWS.
4. Create and connect the Amazon Relational Database (RDS).
5. Create a Google Cloud Account on the Google Cloud Platform.
6. Explain various services provided by GCP.
7. Create and access a Google compute engine instance.
8. Create and query data in Google BigQuery.
9. Create a cloud storage bucket and save files in it.
10. Install Google App Engine. Create a Hello World app and other simple web applications using Python or Java.
11. Use GAE Launcher to launch the web applications.
12. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs

Course Outcomes: After completing this course, the learner will be able

CO1: Identify: use of cloud platforms.
CO2: Understand : cloud service dashboards and deploy basic cloud resources.
CO3: Apply: design and deploy a web application in a PaaS environment.
CO4: Analyze and compare: web applications on cloud platform

Mapping of CO-PO
C24CAP401P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: None, 1: Low, 2: Medium, 3: High

Computer Applications
Front-end Development
(Semester-IV) Discipline Specific Course (DSC)

Paper Code: C24CAP402T
45 Hrs (3 Hrs / Week) **External Marks : 50**
Credits: 3 **Internal Marks : 20**
Exam. Time: 2.5 Hrs **Total Marks: 70**

Note: The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains five short answer questions covering entire syllabus. Rest eight more questions (each question of at least two parts) will be set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt five questions in all by selecting one question from each of unit in addition to compulsory Question No.1. All questions will carry equal marks.

Course Objective: The Front-End Development course aims to provide students with the essential skills to design, develop, and optimize interactive and responsive web applications. The main objectives include the responsibilities of a front-end developer and the use of forms, tables, multimedia elements, and SEO-friendly markup.

Unit I

Objects in JavaScript: Introduction to objects, Type of objects in JavaScript, creating objects, Object methods, Constructor function, Prototype in JavaScript, Inheritance using prototype chains. Regular Expressions: Introduction to RegExp, Regular expression usage, Modifiers, RegExp patterns, RegExp methods, String methods for RegExp, Type conversion in JavaScript

Unit II

Event handling: JavaScript events, Event handler, Event flow, Event bubbling and capturing, Event listeners, Event types. Document Object Model (DOM): Introduction to DOM, Types of DOM, DOM standards and methods, Manipulating documents using DOM, Handling images, Table manipulation, Animation, Node and Node-list handling

Unit III

Browser Object Model (BOM): Introduction to BOM, DOM vs BOM differences, Window object and methods, BOM navigator, BOM history, BOM location, BOM timer, Introduction to Cookies, Session, and Persistent Cookies. Form Handling: Introduction to Forms, Form Processing, Forms Objects, Accessing Data from Forms, Form Validation, Additional Features in Forms, Validation APIs.

Unit IV

Introduction to jQuery: jQuery Syntax, jQuery Selectors, jQuery Events, jQuery Effects, jQuery HTML, jQuery Traversing, jQuery AJAX, jQuery Misc.

Text and Reference Books:

1. David Flanagan, JavaScript: The Definitive Guide: The Definitive Guide.
2. Kogent Learning, Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML, AJAX – Black Book, Wiley India Pvt. Ltd.
3. JavaScript and jQuery: Interactive Front-End Web Development by Jon Duckett
4. Head First JavaScript Programming: A Brain-Friendly Guide by Elisabeth Robson and Eric Freeman

Course Outcomes: After completing this course, the learner will be able to:

CO1: Identify: the basic concept of objects and regular expressions in JavaScript
CO2: Understand: the structure of a web page and how browsers render content
CO3: Apply: CSS3 for styling, layouts, and responsive designs
CO4: Analyze and compare: component-based development and state management
CO5: Evaluating: website performance using lazy loading, caching, and code splitting.

Mapping of CO-PO
C24CAP402T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: None, 1: Low, 2: Medium, 3: High

Computer Applications
Front-end Development Lab
(Semester-IV) Discipline Specific Course (DSC)

Paper Code: C24CAP402P
30 Hrs (2 Hrs / Week) **External Marks: 20**
Credits: 1 **Internal Marks: 10**
Exam.Time: 3 Hrs **Total Marks: 30**

Note: An internal practical examination is conducted by the course coordinator. The end-of-semester practical examination is conducted jointly by external and internal examiners. The external examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, GJUS&T Hisar, and the internal examiner is appointed by the Chairperson of the Department.

Course Objective: The Front-End Development Lab aims to provide hands-on experience in designing, developing, and testing interactive and responsive web applications using modern front-end technologies. Learn how to set up a front-end development environment and understand the role of HTML, CSS, and JavaScript in building web pages. Writing JavaScript for Interactivity Implement DOM manipulation to create dynamic web pages.

List of Laboratory Assignments:

1. Use of JavaScript in Web page designing
2. Creation of Event listeners in JavaScript
3. Update and modify website elements dynamically using asynchronously retrieved data
4. Style HTML content with JavaScript
5. Iterate over arrays and objects using JavaScript for syntax.
6. JavaScript Program to Create Objects (4 Different Ways)
7. JavaScript Program to Iterate Over an Object
8. JavaScript Program to Find Max/Min Value of an Attribute in an Array of Objects
9. JavaScript Program to Remove Duplicates from an Array of Objects
10. Writing programs for event handling in JavaScript.
11. Write a JavaScript function to add rows to a table.
12. Write a JavaScript program to remove items from a drop-down list.
13. Write a JavaScript program to calculate sphere volume.
14. Write a JavaScript program to get the window width and height
15. Using BOM navigation and location
16. Creating cookies and sessions.
17. How can you create forms and perform validations on the forms?
18. How can you use jQuery and perform various functions using jQuery?

Students are given ten or more laboratory assignments with soft and hard deadlines. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

Course Outcomes: After completing this course, the learner will be able to

CO1: Identify: semantic and accessible HTML5 pages
CO2: Understand: forms, tables, multimedia elements, and SEO-friendly structures.
CO3: Apply: Implement responsive web design using Flexbox, Grid, and Media Queries.
CO4: Analyze and compare: website loading speed and efficiency using optimization techniques.

Mapping of CO-PO
C24CAP402P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								

*Attainment Levels: None, 1: Low, 2: Medium, 3: High

Computer Applications
Computer Graphics
(Semester-IV) Discipline Specific Course (DSC)

Paper Code: C24CAP403T
45 Hrs (3 Hrs / Week) **External Marks : 50**
Credits: 3 **Internal Marks : 20**
Exam. Time: 2.5 Hrs **Total Marks: 70**

Note: The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains five short answer questions covering entire syllabus. Rest eight more questions (each question of at least two parts) will be set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt five questions in all by selecting one question from each of unit in addition to compulsory Question No.1. All questions will carry equal marks.

Course Objective: The course aims to provide students with the foundational knowledge and practical skills required to design, develop, and manipulate graphical content. The key objectives include the architecture of graphics systems and the study of translation, scaling, rotation, shearing, and reflection. In this course, students will learn and apply line and circle drawing algorithms. Students can implement parallel and perspective projections for 3D rendering.

Unit I

Introduction: History of Computer Graphics (CG), Applications of Computer Graphics, Components of interactive graphics systems Display devices: Refresh CRT, Color CRT, Plasma Panel displays LCD Panels, Raster-scan System, Random scan System, Graphic software, Input/Output Devices, Tablets

Unit II

Output Primitives: Points and Lines, Line Drawing Algorithms: DDA algorithm, Bresenham's algorithm, Circle drawing Algorithms: Polynomial Method, Bresenham's algorithm. Parametric representation of Cubic Curves, Bezier Curves

Unit III

2D Transformation: Use of Homogeneous Coordinates Systems, Composite Transformation: Translation, Scaling, Rotation, Mirror Reflection, Rotation about an Arbitrary Point. Clipping and Windowing, Clipping Operations. Line Clipping Algorithms: The Midpoint subdivision method, Cohen-Sutherland Line Clipping Algorithms, Polygon Clipping, Sutherland Hodgeman Algorithms, Text Clipping.

Unit IV

3-D Graphics: 3-D object representations, 3-D Transformations: Translation, Rotation, Scaling, Projections, Hidden surface elimination: Back face removal, Depth Buffer algorithm, Scan-line algorithm, Depth sort algorithm, Shading.

Text and Reference Books:

1. Donald Hearn, M. Pauline Baker, Computer Graphics, Pearson Education.
2. J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Computer Graphics – Principles and Practice, Pearson Education.
3. Newmann & Sproull, Principles of Interactive Computer Graphics, McGraw Hill.
4. Rogers, David F., Procedural Elements of Computer Graphics, McGraw Hill.
5. Zhigang Xiang, Roy Plastock, Computer Graphics, Tata McGraw Hill.

Course Outcomes: After completing this course, the learner will be able to:

CO1: Identify: understand the concepts of computer graphics
CO2: Understand: learn and implement point, line, and circle drawing algorithms.
CO3: Apply: acquire knowledge of two-dimensional transformations and line clipping algorithms
CO4: Analyze and compare: understand 3-D graphics concepts and acquire skills for designing 3-D graphics
CO5: Evaluating: design programs based on theoretical concepts of computer graphics.

Mapping of CO-PO
C24CAP403T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: None, 1: Low, 2: Medium, 3: High

Computer Applications
Computer Graphics Lab
(Semester-IV) Discipline Specific Course (DSC)

Paper Code: C24CAP403P
30 Hrs (2 Hrs /Week) **External Marks: 20**
Credits: 1 **Internal Marks: 10**
Exam.Time: 3 Hrs **Total Marks: 30**

Note: An internal practical examination is conducted by the course coordinator. The end-of-semester practical examination is conducted jointly by external and internal examiners. The external examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, GJUS&T Hisar, and the internal examiner is appointed by the Chairperson of the Department.

Course Objective: The Computer Graphics Lab is designed to provide hands-on experience in implementing fundamental graphics concepts using programming techniques. The main objectives include understanding the basics of computer graphics and implementing basic drawing algorithms.

List of Laboratory Assignments:

1. Implement a DDA line drawing algorithm for all types of slope.
2. Implement Bresenham's line drawing algorithm for all types of slopes.
3. Implement Bresenham's Circle drawing algorithm.
4. Implement Bresenham's Ellipse drawing algorithm.
5. Implement various 2-D transformations on objects like lines, rectangles, etc.
6. Implement to clip a line using the Midpoint subdivision algorithm
7. Implement to clip a line using Cohen-Sutherland algorithm
8. Implement 3-D transformations on objects.

Students are given ten or more laboratory assignments with soft and hard deadlines. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

Course Outcomes: After completing this course, the learner will be able to:

CO1: Identify: DDA (Digital Differential Analyzer) Algorithm
CO2: Understand: translation, scaling, rotation, shearing, and reflection in 2D and 3D
CO3: Apply: Cohen-Sutherland and Liang-Barsky line clipping algorithms
CO4: Analyze and compare: 3D objects with proper transformations and viewing angles

Mapping of CO-PO
C24CAP403P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								

*Attainment Levels: None, 1: Low, 2: Medium, 3: High

Computer Applications
Data Analytics Using R (Semester-IV)
Minor Course / Vocational Course

Paper Code: C24VOC424T
30 Hrs (2 Hrs / Week) **External Marks: 35**
Credits: 2 **Internal Marks: 15**
Exam. Time: 2 Hrs **Total Marks: 50**

Note: The end semester examination will be of 35 marks. The examiner is required to set five questions in all. The first question will be compulsory, consisting of five short questions covering the entire syllabus, each carrying three marks. In addition to these, four more questions (each question may have two parts) will be set, comprising two questions from each unit. The student is required to attempt three questions in all, selecting one question from each unit, each carrying 10 marks, in addition to the compulsory Question Number 1.

Course Objective: This course provides foundational knowledge in the R language and data analysis using the R programming language. It includes working with data in various ways with the help of programming in R. Students will learn about R's environment and programming essentials such as factors, arrays and matrices, data frames, functions, and I/O in R. With this course, students learn about how to visualize data in R.

Unit I

About R's Environment: Basics of R and RStudio, Setting Variables, knowing about objects in R, Attributes of objects, str () and summary () functions, R's workspace, creating sequences in R, Operators in R, Packages in R, Creating script files in R.
Vectors in R: Type of vectors, Accessing and manipulating vectors, Basic arithmetic operations on numeric vectors, finding descriptive summary like mean, median, mod, range, quartiles, standard deviation, etc. of numeric vectors, Comparing vectors, sorting vectors, character vectors, and operations on character vectors.
Factors in R: What are factors in R? Useful operations on factors,
Arrays and Matrices in R: Arrays in R, Creating, accessing and manipulating matrices; Naming the dimensions of matrices, Arithmetic operations on matrices, concatenating matrices, replicating matrices, and various operations on matrices.
Lists: Creating a List. Add/Delete elements to or from a list, merging lists, Converting List to Vector.

Unit II

Data Frames: Creating and accessing data frames, Finding and assigning column and row names to data frames, Binding data frames, Various operations on data frames.

Control Structures: If, If-else, If-else if-else, and switch statements; explicit and implicit loops in R, break and next statements.
Functions in R: defining functions, calling functions, scope of variables in functions, returning values from functions.
Input Output in R: Reading and writing txt and CSV files in R.
Visualizing Data in R: Creating bar charts, histograms, polygons and boxplots.

Text and Reference Books:

1. Venables W. N., Smith D. M. and the R Core Team, "An Introduction to R, 2016.
2. Teetor Paul, R Cookbook, O'Reilly Media, 2011.
3. Chang Winston, R Graphics Cookbook, O'Reilly, 2012.
4. Ratnoo Saroj Dahiya, Ratnoo Himmat Singh, Essentials of R for Data Analytics, Wiley, 2021.

Course Outcomes: After completing this course, the learner will be able to:

CO1: Define the data analytics terminology and concepts related to R programming.
CO2: Describe the operations on data stored in vectors, matrices, and data frames.
CO3: Apply the required operations to manipulate data stored in various R objects.
CO4: Compare various data objects and their related operations in R**.**
CO5: Create appropriate plots for data visualization.

Mapping of CO-PO C24MIC424T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8
CO1								
CO2								
CO3								
CO4								
CO5								

*Attainment Levels: None, 1: Low, 2: Medium, 3: High

Computer Applications
Data Analytics Using R Lab (Semester-IV)
Minor Course / Vocational Course

Paper Code: C24VOC424P
60 Hrs (4 Hrs / Week) **External Marks: 35**
Credits: 2 **Internal Marks: 15**
Exam Time: 3 Hrs **Total Marks: 50**

Note: An internal practical examination is conducted by the course coordinator. The end-of-semester practical examination is conducted jointly by external and internal examiners. The external examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, GJUS&T Hisar, and the internal examiner is appointed by the Chairperson of the Department.

Course Objective: This practical lab course focuses on fundamental programming skills using the R language, with an emphasis on data analytics techniques. Students will complete a series of laboratory assignments that cover various topics such as creating and manipulating objects, functions and loops, graphs and charts Assignments are designed to enhance practical coding skills and prepare students for more statistics concepts for data exploration.

List of Laboratory Assignments:

1. Download and install the R programming environment and install packages such as MASS and GGPLOT2 using the install.packages() command in R.
2. Write a R program to take input from the user (name and age) and display the values.
3. Write a R program to get the details of objects in the memory.
4. Implement integer and character vector in R and perform various operations on them.
5. Create a vector of factor type data for the hair colors (black, grey, and dark brown) of ten people and find levels and modal values of factor data.
6. Create a matrix of 5 students and their marks in 4 subjects. Give appropriate dimension names to the matrix of marks.
7. Create a R program to demonstrate matrix addition, subtraction, and multiplication.
8. Implement data frames in R. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.
9. Create a list containing a vector, a matrix, and a list, and give names to the elements in the list. Access the first and second elements of the list.
10. Create a R program to find whether a given number is positive, negative, or zero.
11. Implement various control structures in R.
12. Create a script file to compute the sum, range, mean, and standard deviation of the numeric variable in the BOSTON dataset.
13. Plot IRIS dataset in different forms: histogram and boxplot.
14. Write a R program to create a simple bar plot of five subject marks.

Students are given ten or more laboratory assignments with soft and hard deadlines. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

Course Outcomes: After completing this course, the learner will be able to:
CO1: Identify: Learn different R data types for developing programs.
CO2: Understand: Show the installation of the R programming environment.
CO3: Apply: Make use of different R data structures.
CO4: Design: Develop programming logic using R packages.
CO5: Analyze: Analyze the datasets using R programming capabilities.

Mapping of CO-PO C24VOC424P

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8
CO1								
CO2								
CO3								
CO4								
CO5								

*Attainment Levels: None, 1: Low, 2: Medium, 3: High

Internet Ethics
(Semester-IV) Value Added Course (VAC)

Paper Code: C24VAC313T
30 Hrs (2 Hrs /Week) **External Marks : 35**
Credits: 2 **Internal Marks : 15**
Exam. Time: 2 Hrs **Total Marks: 50**

Note: The end semester examination will be of 35 marks. The examiner is required to set five questions in all. The first question will be compulsory, consisting of five short questions covering the entire syllabus, each carrying three marks. In addition to these, four more questions (each question may have two parts) will be set, comprising two questions from each unit. The student is required to attempt three questions in all, selecting one question from each unit, each carrying 10 marks, in addition to the compulsory Question Number 1.

Course Objective: This course covers Internet Ethics and Cybersecurity, focusing on ethical principles, digital citizenship, and emerging challenges. It explores cyber threats, legal frameworks, and issues like privacy, AI ethics, and cybercrimes. Students will develop ethical awareness and analyse security concerns in the digital world.

Unit I

Foundations of Internet Ethics: Basics of Internet Ethics-definition, scope, and historical evolution, Core Ethical Principles- Respect, responsibility, fairness, and transparency; Digital Citizenship; Ethical Challenges in Digital world- Privacy and surveillance, Intellectual Property and Copyright, Cybersecurity and Hacking, Cyberbullying; Emerging Issues in Internet Ethics- Artificial Intelligence in decision making, Digital Divide and accessibility, Environmental impact of the Internet.

Unit II

Cyber Security: Concept of cyber security, Issues and challenges of cyber security; Cyber crimes- Classification of cyber crimes, Emerging cyber threats- Financial frauds, malware and ransomware attacks;
Legal perspective of Cyber crime : IT Act 2000, cyber offences under the IT act, Personal Data Protection Bill, Cyber Appellate Tribunal, Process for filing complaints and appeals.

Text and Reference Books:

1. Tiji Thomas, Stephen James, Dr. Terry Jacob Mathew, “Informatics and Cyber Ethics”, Prakash Publication
2. Craig B, “Cyber Law: The Law of the Internet and Information Technology”. Pearson Education
3. Vakul Sharma, "Handbook of Cyber Laws" Macmillan India Ltd, Second Edition, PHI, 2003

Course Outcomes: After completing this Course, the learner will be able to:

CO1: **Recall** fundamental concepts of Internet ethics (LOTS: Level 1 - Remember)
CO2: **Understand** ethical challenges in the digital world, such as privacy, intellectual property, cybersecurity, and cyberbullying. (LOTS: Level 2 - Understand)
CO3: **Apply** ethical principles in digital citizenship and evaluate emerging (LOTS: Level 3 - Apply)
CO4: **Analyse** cyber threats, security concerns, and legal frameworks. (HOTS: Level 4 - Analy

Mapping of CO-PO C24VAC313T

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1								
CO2								
CO3								
CO4								

*Attainment Levels: - None, 1: Low, 2: Medium, 3: High