



**Department of Computer Science and Engineering
Academic Year 2024-25**

**M.Tech (CSE)
1st Semester Scheme & Syllabus
BATCH: 2024-26
CREDITS: 80**

S.No	CONTENTS	Pg. No
1	Institution Vision, Mission, Goals and Quality policy	3
2	Department Vision, Mission and Program Educational Objective (PEO)	4
3	Program Outcomes (PO) with Graduate Attributes	5
4	Program Specific Outcomes (PSOs)	6
SCHEME		
5	Scheme of First M.Tech (CSE)	7
SYLLABUS		
6	Syllabus of First Semester M.Tech (CSE)	9-30
	24SCS11	Mathematics for Computational Thinking
	24SCS12	Advanced Algorithms
	24SCS13	Concurrent Programming
	24SCS14	UX/ UI design principles
	24SCS15	Research methodology and IPR
	24SCL16	Advanced algorithms lab
	24SCL17	UX/ UI design principles lab

NEW HORIZON COLLEGE OF ENGINEERING

VISION

To emerge as an institute of eminence in the fields of engineering, technology and management in serving the industry and the nation by empowering students with a high degree of technical, managerial and practical competence.

MISSION

- To strengthen the theoretical, practical and ethical dimensions of the learning process by fostering a culture of research and innovation among faculty members and students
- To encourage long-term interaction between the academia and industry through their involvement in the design of curriculum and its hands-on implementation
- To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities

QUALITY POLICY

To provide services of the highest quality both curricular and co-curricular so that our students can integrate their skills and serve the industry and society equally well at the global level

VALUES

- Academic Freedom
- Integrity
- Inclusiveness
- Innovation
- Professionalism
- Social Responsibility

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION

To emerge as a department of eminence in Computer Science and Engineering in serving the Information Technology Industry and the nation by empowering students with a high degree of technical and practical competence.

MISSION

- To strengthen the theoretical and practical aspects of the learning process by strongly encouraging a culture of research, innovation and hands-on learning in Computer Science and Engineering
- To encourage long-term interaction between the department and the IT industry, through the involvement of the IT industry in the design of the curriculum and its hands-on implementation
- To widen the awareness of students in professional, ethical, social and environmental dimensions by encouraging their participation in co-curricular and extracurricular activities

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Graduate of the program will be able to:

PE01: Develop proficiency as computer scientists with an ability to solve a wide range of computational problems in industry, government, or other work environments.

PE02: Attain the ability to adapt quickly to new environments and technologies, assimilate new information, and work in multi-disciplinary areas with a strong focus on innovation and entrepreneurship.

PE03: Possess the ability to think logically and the capacity to understand technical problems with computational systems.

PE04: Possess the ability to collaborate as team members and team leaders to facilitate cutting- edge technical solutions for computing systems and thereby providing improved functionality.

PEO TO MISSION STATEMENT MAPPING

Mission Statements	PEO1	PEO2	PEO3	PEO4
To strengthen the theoretical and practical aspects of the learning process by strongly encouraging a culture of research, innovation and hands-on learning in Computer Science and Engineering	3	3	3	2
To encourage long-term interaction between the department and the IT industry, through the involvement of the IT industry in the design of the curriculum and its hands-on implementation	3	3	3	2
To widen the awareness of students in professional, ethical, social and environmental dimensions by encouraging their participation in co-curricular and extracurricular activities	2	2	2	3

Correlation: 3 - High, 2 - Medium, 1 - Low

PROGRAM OUTCOMES (POs)

The student will be able to:

PO1: Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex Computer Science and engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems in Computer Science and Engineering reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO3: Design / Development of Solutions: Design solutions for complex engineering problems and design system components or processes of Computer Science and Engineering that meet the specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

PO4: Modern tool usage: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities related to Computer Science and Engineering with an understanding of the limitations.

PO5: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO6: Life-Long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

The student will be able to:

PSO1: Ability to design, develop, implement computer programs and use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations.

PSO2: Work with and communicate effectively with professionals in various fields and pursue lifelong professional development in computing.

MAPPING OF PEOs to POs & PSOs

	PO's						PSO's	
	1	2	3	4	5	6	1	2
PEO1	3	3	2	2	2	1	1	1
PEO2	3	3	3	3	3	2	3	2
PEO3	3	3	3	3	3	3	3	3
PEO4	1	1	1	1	1	2	1	1

Correlation: 3 - High, 2 - Medium, 1 - Low

NEW HORIZON COLLEGE OF ENGINEERING
Scheme of Teaching and Examinations –2024
M.Tech., COMPUTER SCIENCE AND ENGINEERING
Choice Based Credit System (CBCS) and Outcome-Based Education (OBE)
Scheme of Teaching and Examinations for 2024 - 2026 BATCH (2024 Scheme)

I SEMESTER

Sl.No	Course	Course Code	Course Title	Credit Distribution					CONTACT HRS	CIE	SEE	TOTAL
				L	T	P	S	CREDITS				
1	BSC	24SCS11	Mathematics for Computational Thinking	2	1	0	0	3	3	50	50	100
2	PCC	24SCS12	Advanced Algorithms	3	0	0	0	3	3	50	50	100
3	PCC	24SCS13	Concurrent Programming	3	0	0	0	3	3	50	50	100
4	PCC	24SCS14	UX/ UI design principles	2	0	0	1	3	4	50	50	100
5	MCC	24SCS15	Research methodology and IPR	2	0	0	1	3	4	50	50	100
6	PCCL	24SCL16	Advanced algorithms lab	0	0	2	0	2	4	50	50	100
7	PCCL	24SCL17	UX/ UI design principles lab	0	0	2	0	2	4	50	50	100
TOTAL				13	1	4	2	19	25	350	350	700

Note: During the 1st semester, students should enroll 2 online courses (Minimum) and must finish the courses before 4th semester and the evaluation will take place during the 4th semester.

Legends: BSC- Basic Science Courses, PCC: Professional core. IPCC-Integrated Professional Core Courses, MCC-Mandatory Credit Course, AUD/AEC –Audit Course/Ability

Enhancement Course (A pass in AUD/AEC is mandatory for the award of the degree), PCCL-Professional Core Course lab, L-Lecture, P-Practical, T/SDA-Tutorial / Skill Development Activities (Hours are for Interaction between faculty and students)

Integrated Professional Core Course (IPCC): Integrated Professional Core Course (IPCC): Refers to Professional Theory Core Course Integrated with practical of the same course. The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

Audit Courses /Ability Enhancement Courses Suggested by BOS (ONLINE courses):

Audit Courses: These are prerequisite courses suggested by the concerned Board of Studies.

Skill Development Activities: Under Skill development activities in a concerning course, the students should

- Interact with industry (small, medium, and large).
- Involve in research/testing/projects to understand their problems and help creative and innovative methods to solve the problem.
- Involve in case studies and field visits/ fieldwork.
- Accustom to the use of standards/codes etc., to narrow the gap between academia and industry.
- Handle advanced instruments to enhance technical talent.
- Gain confidence in modeling of systems and algorithms for transient and steady-state operations, thermal study, etc.
- Work on different software/s (tools) to simulate, analyze and authenticate the output to interpret and conclude.

All activities should enhance student's abilities to employment and/or self-employment opportunities, management skills, Statistical analysis, fiscal expertise, etc. Students and the course instructor/s to involve either individually or in groups to interact together to enhance the learning and application skills of the study they have undertaken. The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks

First Semester Syllabus

MATHEMATICS FOR COMPUTATIONAL THINKING

Course Code	24SCS11	CIE Marks	50
L:T:P:S	2:1:0:0	SEE Marks	50
Hrs. / Week	3	Total Marks	100
Credits	03	Exam Hours	03

Course outcomes:

At the end of the course, the student will be able to:

24SCS11.1	Understand vector spaces and related topics arising in magnification and rotation of images.
24SCS11.2	Compute orthogonal and orthonormal basis vectors required to analyze image and signal processing problems and apply the technique singular valued decomposition for the data compression and solving consistent linear systems
24SCS11.3	Apply the graph theory concepts in solving problems related to computer science.
24SCS11.4	To apply the concept of sampling theory in computational processes.
24SCS11.5	Illustrate the fundamental concepts of queuing model, queuing system and queuing theory arising in various fields engineering.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
24SCS11.1	3	3	-	-	-	-	-	-
24SCS11.2	3	3	-	-	-	-	-	-
24SCS11.3	3	3	-	-	-	-	-	-
24SCS11.4	3	3	-	-	-	-	-	-
24SCS11.5	3	3	-	-	-	-	-	-

MODULE-1 VECTOR SPACES **24SCS11.1** **9 Hours**

Vector spaces; subspaces Linearly independent and dependent vectors Basis and dimension; Coordinate vectors- Illustrative examples.

Case Study Case study on vector spaces.
Text Book Text Book 3: 4.1, 4.2, 4.3, 4.4, 4.5

MODULE-2 ORTHOGONALITY AND LEAST SQUARES **24SCS11.2** **9 Hours**

Orthogonality: Inner product, orthogonal sets, orthogonal projections, orthogonal bases. Eigenvalues and Eigenvectors, orthogonal diagonalization, Singular valuedecomposition

Text Book Text Book 1: 2.13, 2.14, 2.16

MODULE-3 GRAPH THEORY **24SCS11.3** **9 Hours**

Basic Concepts of Graphs, Sub graphs, Matrix representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphism, Paths and Circuits, Eulerian and Hamiltonian Graphs, Eccentricity, radius, diameter, (Theorems without Proofs). Algorithms-Prims Algorithm, Kruskal's Algorithm.

Text Book Text Book 4: 1.1, 1.2, 1.3, 1.6, 4.1,4.2,

MODULE-4 SAMPLING THEORY **24SCS11.4** **9 Hours**

Testing of hypothesis by t-test, χ^2 test, F-test, Analysis of Variance (ANOVA): one way classification.

Case Study Case studies on ANOVA
Text Book Text Book 1: 27.1, 27.2, 27.3, 27.4, 27.5, 27.14, 27.17, 27.19.

MODULE-5 QUEING THEORY **24SCS11.5** **9 Hours**

Symbolic representation of Queuing model, Poisson queue system, Little law, types of stochastic process, birth-death process.

Case Study Case Studies on birth-death process
Text Book Text book 5: 9.1, 9.2, 9.3, 9.4, 9.5, 9.6.

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	5	-
L2	Understand	5	5	-

L3	Apply	10	5	10
L4	Analyze	2.5	-	-
L5	Evaluate	2.5	-	-
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	5
L5	Evaluate	5
L6	Create	-

Suggested Learning Resources:

Text Books:

- 1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.
- 2) B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, Fourth Edition, 2017, ISBN: 9780070634190.
- 3) David C Lay, Linear Algebra and its applications, Addison-Wesley Publishers, Fourth Edition, 2012, ISBN: 9780321385178.
- 4) J. A. Bondy and U. S. R. Murty, –Graph Theory and Applications||, Macmillan Press, 1982, ISBN: 978-1-84996-690-0.
- 5) T.Veeranjan, Probability, Statistics and Random Process, Tata McGraw Hill Education Private Limited, 3rd Edition, 2008, ISSN : 978-0-07-066925-3

Reference Books:

- 1) Gilbert Strong, “Linear Algebra and its Applications”, Cengage Learning, 4th Edition, 2006, ISBN: 97809802327.
- 2) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, Reprint 2016, ISBN: 9788126554232
- 3) R.E, Walpole, R.H.Myres, S.L.Myres and Keying Ye, “Probability and Statistics for Engineers and Scientists”, 9th Edition, Pearson, 2012. ISBN : 978-0-321-62911-1
- 4) N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., Ninth Edition, 2014, ISBN: 9788131808320.

Web links and Video Lectures (e-Resources):

- 1) <https://youtu.be/Qwu8uY-7-2M?si=RgxCcvzsoCZOSU7G>
- 2) https://youtu.be/jQJorvFGE1k?si=iiQN_8fPIhqqrFWp
- 3) <https://youtu.be/F79wYnoFYxQ?si=QQmHNpZTX895aJ58>
- 4) https://youtu.be/VQGnTZQCXvs?si=IFs_jcnP25veRldP
- 5) <https://youtu.be/HS6aGeq3Fds?si=KdBXAEI2j8uq-DQE>
- 6) <https://youtu.be/o2Bzp967gZs?si=Xl-yesqWfyX1CjzL>
- 7) <https://youtu.be/EapYu79wA3M?si=vnCE6N5BNIakskW2>
- 8) <https://youtu.be/gXbThCXjZFM?si=j7rPRVRLQVTjTEDY>
- 9) https://youtu.be/RWDKNOoU_KI?si=iBiMbXBWnQ4xEkxI
- 10) <https://youtu.be/9UbC7p18PDw?si=XqMMjJO-aaKLxdrm>
- 11) <https://youtu.be/5M7bOXrn54A?si=5P1sWdkzgeg2URXy>
- 12) https://youtu.be/36cAE1Ovpq4?si=JoRRGkMzMFwSxfE_
- 13) https://youtu.be/vFz2FG65HBc?si=D_PVoS7unAw92WFB
- 14) <https://youtu.be/Qugzp3ldZEY?si=AETF-MGmkzikoEEK>
- 15) <https://youtu.be/4H9dMn919cs?si=umtJm1hhqwd6GN9Q>
- 16) https://youtu.be/VtksT_vacAc?si=GUvVbACgeHXzCSsg
- 17) <https://youtu.be/Wo75G99F9fM?si=l1C9DeVYfidhopj>

Activity-Based Learning (Suggested Activities in Class)/Practical Based Learning:

- Contents related activities (Activity-based discussions)
 - For active participation of students, instruct the students to prepare Algorithms/Flowcharts/Programming Codes
 - Organizing Group wise discussions on related topics
 - Seminars

ADVANCED ALGORITHMS									
Course Code	24SCS12						CIE Marks	50	
L:T:P:S	3:0:0:0						SEE Marks	50	
Hrs / Week	3						Total Marks	100	
Credits	3						Exam Hours	03	
Course outcomes:									
At the end of the course, the student will be able to:									
24SCS12.1	Describe the workings of both iterative and recursive algorithms, highlighting their characteristics and differences in problem-solving approaches.								
24SCS12.2	Comprehend graph search algorithms and their impact on spatial and temporal complexities in problem-solving contexts.								
24SCS12.3	Apply number theoretic algorithms and evaluate their efficiency and effectiveness in tackling computational problems.								
24SCS12.4	Evaluate the implementation and functionality of diverse string-matching algorithms, understanding their strengths, weaknesses, and performance metrics.								
24SCS12.5	Formulate approaches aimed at optimizing algorithms, considering factors like time complexity, space utilization, and overall efficiency.								
24SCS12.6	Implement high-performing programming solutions tailored to real-world scenarios, focusing on optimization and effectiveness.								
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:									
	P01	P02	P03	P04	P05	P06	PS01	PS02	
24SCS12.1	3	2	3	3	2	1	3	-	
24SCS12.2	3	2	3	3	2	1	3	-	
24SCS12.3	3	2	3	3	2	1	3	-	
24SCS12.4	3	2	3	3	2	1	3	-	
24SCS12.5	3	2	3	3	2	1	3	-	
24SCS12.6	3	2	3	3	2	1	3	-	
MODULE-1	Review of Analysis Techniques and Amortized Analysis:						24SCS12.1	8 Hours	
Growth of Functions, Asymptotic notations, Standard notations and common functions, Recurrences and Solution of Recurrence equations-The substitution method, The recurrence – tree method, The master method; Aggregate, Accounting and Potential Methods. Case Study.									
Text Book: T1: Chapter 2, 3, 4, 16									
MODULE-2	Graph Algorithms and Polynomials and the FFT						24SCS12.2	8 Hours	
Bellman - Ford Algorithm, Single source shortest paths in a DAG, Johnson's Algorithm for sparse graphs, Flow networks and Ford-Fulkerson method, Maximum bipartite matching. Representation of polynomials, The DFT and FFT, Efficient implementation of FFT, Case Study.									
TextBook: T1: Chapter 22, 23, 24, 25 , 30									
MODULE-3	Number - Theoretic Algorithms						24SCS12.3	8 Hours	
Elementary notions, GCD,Modular Arithmetic, Solving modular linear equations, The Chinese remainder theorem, Powers of an element, RSACrypto system, Primality testing, Integer factorization. Case based scenario.									
Text Book: T1: Chapter 31.									
MODULE-4	String-Matching Algorithms						24SCS12.4	8 Hours	
Naïve string Matching, Rabin - Karp algorithm, String matching with finite automata, Knuth- Morris-Pratt algorithm, Boyer – Moore algorithms. Case based scenario									
Text Book: T1: Chapter 32, T3: Chapter 20									
MODULE-5	Probabilistic and Randomized Algorithms						24SCS12.5 & 24SCS12.6	8 Hours	
Probabilistic algorithms, Randomizing deterministic algorithms, Monte Carlo and Las Vegas algorithms, Probabilistic numeric algorithms, Case study									
Text Book: T1: chapter 5, T3:Chapter 24									

CIE Assessment Pattern (50 Marks)

RBT Levels		Marks Distribution			AAT3(Case Study Presentation)
		Test (s)	AAT1(Assignment)	AAT2(Quiz)	
		25	7.5	7.5	
L1	Remember	5	-	-	10
L2	Understand	5	2.5	-	
L3	Apply	5	3	2.5	
L4	Analyze	5	2	3	5
L5	Evaluate	5	-	2	5
L6	Create	-	-	-	

SEE Assessment Pattern (50 Marks - Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	--
L2	Understand	10
L3	Apply	20
L4	Analyze	10
L5	Evaluate	10
L6	Create	--

Suggested Learning Resources:**Text Books:**

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein: Introduction to Algorithms, Fourth Edition, Prentice-Hall of India, ISBN: 9780262046305, 2022.
2. Jeff Erickson: Algorithms, Jeff Erickson., 2019, ISBN: 1792644833, 9781792644832, 2019.
3. Kenneth A. Berman, Jerome L. Paul: Algorithms, Cengage Learning, ISBN: 8131505219, 9788131505212, 2008.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: Fundamentals of Computer Algorithms, 2nd Edition, Silicon press, ISBN-13: 978-0-929306-41-4, ISBN: 0-929306-41-4, 2007.

CONCURRENT PROGRAMMING									
Course Code	24SCS13					CIE Marks	50		
L:T:P:S	3:0:0:0					SEE Marks	50		
Hrs / Week	3					Total Marks	100		
Credits	3					Exam Hours	03		
Course outcomes:									
At the end of the course, the student will be able to:									
24SCS13.1	Comprehend fundamental concepts prevalent in dynamic programming languages.								
24SCS13.2	Analyze the architectural principles behind concurrent programming enabling scalability through asynchronous code.								
24SCS13.3	Implement event-driven programming constructs and methodologies effectively.								
24SCS13.4	Investigate concurrent programming in the context of basic web applications.								
24SCS13.5	Evaluate deployment paradigms for concurrent applications.								
24SCS13.6	Develop the necessary database prerequisites for concurrent application development.								
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:									
	P01	P02	P03	P04	P05	P06	PS01	PS02	
24SCS13.1	3	-	3	3	2	-	3	-	
24SCS13.2	-	3	3	3	2	3	3	-	
24SCS13.3	-	-	3	3	2	3	3	-	
24SCS13.4	-	-	3	3	2	3	3	-	
24SCS13.5	-	-	3	3	2	3	3	-	
24SCS13.6	-	-	3	3	2	3	3	-	
MODULE-1 Introduction to JavaScript and HTML forms 24SCS13.1 8 Hours									
Variables, Operators, Control Structures and Loop statements, Switch statement, Arrays, Functions, String functions; HTML Forms - getElementById, Email function, Radio Button, Dropdown Lists, Checkboxes and Validating forms, Event Handling, Form Validation, AJAX for Form Submission, Form Accessibility, Advanced Input Types (added)									
Skill Development Activities	<p>1: Programming Logic and Functions Problem Statement: Develop a program in JavaScript to generate the Fibonacci sequence up to a specified number 'n'. Implement the solution using a function and demonstrate how the sequence is produced for a given input. Instructions:</p> <ol style="list-style-type: none"> Write a JavaScript function, generateFibonacci(n), that takes an integer 'n' as input. Inside the function, create logic to generate the Fibonacci sequence up to 'n' terms. Print or display the generated sequence as output. Test your function by displaying the Fibonacci sequence up to the 10th term. <p>2: HTML Form Validation and JavaScript Interaction Problem Statement: Create an HTML form to collect user details and implement JavaScript-based validation for the form inputs, including email and password confirmation. Instructions:</p> <ol style="list-style-type: none"> Design an HTML form that collects user information: name, email, password, and password confirmation. Implement JavaScript functions to validate the form inputs: <ul style="list-style-type: none"> Ensure the email input follows the correct email format. Validate that the password matches the confirmed password. Display appropriate error messages if the validation fails. 								

		c) Apply the getElementById method to access form elements for validation. d) Test your form by attempting to submit with incorrect or incomplete inputs to observe the validation in action.	
MODULE-2	Basics of Node.js & Asynchronous Node.js	24SCS13.2	8 Hours
Definition, Concepts, Usage of node.js, Core modules, printing in color, Import npm modules, Debugging and Error messages. Asynchronous Node.js: Asynchronous basics, Call Stack, Callback, Queue, Event loop, Http requests, Error handling, Callback function, Callback abstraction and Callback chaining			
Skill Development Activities	<p>3: Asynchronous HTTP Server with Node.js Problem Statement: Develop a Node.js program that creates an asynchronous HTTP server and handles delayed responses. Instructions:</p> <ol style="list-style-type: none"> Write a Node.js script that utilizes the http core module to create an HTTP server listening on port 3000. Implement asynchronous handling of HTTP requests using a 2-second delay before responding. Upon receiving a request, the server should respond with a message after the delay. Explain the asynchronous nature of Node.js by describing how the event loop, callback queue, and callback function are involved in processing delayed responses. Test the server by accessing "http://localhost:3000/" in a browser or using tools like Postman. <p>4: npm Module Usage for Console Styling in Node.js Problem Statement: Create a Node.js program demonstrating the usage of a npm module for colorful console printing. Instructions:</p> <ol style="list-style-type: none"> Install the 'chalk' npm module using the command npm install chalk. Write a Node.js script that imports the 'chalk' module and showcases its usage for console output styling. Print multiple messages to the console, each with different colors, text styles, and background colors using 'chalk'. Explain the significance of using 'chalk' or similar npm modules for console output enhancement in Node.js applications. Discuss the advantages and potential use cases of utilizing npm modules for styling console output. 		
MODULE-3	Event Driven Programming	24SCS13.3	8 Hours
Introduction, Example and Node Applications working paradigm, Event Emitter – Class, Methods and Events, Buffers – create, read and write, convert buffers to JSON format, Streams – read, write, piping and chaining, Globalobjects - filename, dirname, setTimeout(cbms), clearTimeout(t), console and process object.			
Skill Development Activities	<p>5: Event Emitters and Buffered File Handling Objective: Develop a Node.js program that utilizes Event Emitters for file handling, working with Buffers, and converting data to JSON format. Instructions:</p> <ol style="list-style-type: none"> Implement an Event Emitter class named 'FileProcessor' with methods for reading, writing, and handling file events. Utilize the 'fs' core module to handle file operations (reading and writing) using Buffers. Create event handlers for 'read', 'write', and 'error' events within the 'FileProcessor' class. Demonstrate reading data from a text file, processing it as a Buffer, and converting it to JSON format. Use event emitters to emit events upon successful file read or write operations. 		

	<p>f) Display the contents of the file in JSON format.</p> <p>Program 6: Working with Streams and Global Objects in Node.js Objective: Develop a Node.js program demonstrating the usage of Streams, Global Objects, and the Console & Process objects. Instructions: Create a Node.js script that showcases the use of streams for reading and writing data from one file to another using piping and chaining techniques.</p> <ol style="list-style-type: none"> Access and display information about the global objects 'filename' and 'dirname' within the script. Utilize the 'console' object to output formatted messages to the console, highlighting details about the current process. Implement a function that utilizes setTimeout to display a message after a specified delay and clear the timeout using clearTimeout. Explain how streams enable efficient handling of large datasets and their advantages over traditional file handling techniques. Discuss the role and significance of global objects, console methods, and process-related functionalities in Node.js applications.
--	--

MODULE-4	Web Servers and API from browser	24SCS13.4	8 Hours
-----------------	---	------------------	----------------

Introduction, Web Application architecture, creating a web server using Node, serving up HTML and JSON, Static assets, CSS, JS images, Dynamic Pages with Templating, Accessing the Query String, Default Function Parameters, Browser HTTP Requests with Fetch, Creating a Search Form.

Skill Development Activities	<p>Program 7: Creating a Basic Web Server with Node.js Objective: Develop a simple Node.js application to create a web server serving static assets (HTML, CSS, JS, images) and dynamic content using templating, handling query strings, and implementing default function parameters. Instructions:</p> <ol style="list-style-type: none"> Create a Node.js script that initializes an HTTP server using the 'http' core module. Serve static assets (HTML, CSS, JS, images) by setting up routes for different file types and sending appropriate responses. Implement a templating engine (like EJS or Handlebars) to render dynamic pages using Node.js. Demonstrate accessing and parsing query strings from URL requests to fetch user inputs. Utilize default function parameters in the server-side code for handling missing or undefined parameters. Use the Fetch API in a basic HTML file to make HTTP requests to your Node.js server and retrieve data. <p>Program 8: Implementing a Search Form with Node.js and Fetch API Objective: Develop a Node.js application that includes a search form and handles HTTP requests initiated by the Fetch API from a web browser. Instructions:</p> <ol style="list-style-type: none"> Design a simple HTML file containing a search form that takes user input. Write a Node.js script that sets up a server and handles GET requests to a specific endpoint for search queries. Implement a route on the server to process search queries received from the browser using the Fetch API. Use the query parameters passed in the Fetch request to perform a basic search operation (e.g., searching through an array or predefined data). Return the search results back to the client-side (browser) as JSON data in the Fetch response. Display the search results on the web page using JavaScript to handle the response data.
------------------------------	--

MODULE-5	Application Deployment and Databases	24SCS13.5 & 24SCS13.6	8 Hours
-----------------	---	--------------------------------------	----------------

Introduction to any one Online development platform (like GitHub, Heroku), Version control, Exploring, Integrating, Setting up SSH keys, Pushing code. MongoDB and NoSQL introduction - Installation, Connecting and Inserting, Querying, Update and Delete documents.

Skill Development Activities

Program 9: GitHub Integration & Version Control

Objective: Set up a GitHub repository, integrate it with a local project, and demonstrate version control operations.

Instructions:

- a) Create a new repository on GitHub.
- b) Initialize a local project directory with Git, set up version control, and connect it to the GitHub repository.
- c) Write a simple program or use an existing project to demonstrate version control operations:
 - a. Create multiple code versions by adding, modifying, and deleting files.
 - b. Commit these changes with descriptive commit messages.
 - c. Branch out, merge branches, and resolve merge conflicts if necessary.
- d) Explore the use of SSH keys for secure communication between the local system and GitHub.
- e) Push the local repository's code to the GitHub remote repository.

Program 2: MongoDB Operations - Installation & CRUD Operations

Objective: Set up MongoDB, establish a connection, and perform CRUD operations on a database.

Instructions:

- a) Install MongoDB locally on your machine or use a cloud-based service.
- b) Write a Node.js script to establish a connection to the MongoDB server using the 'mongodb' Node.js driver.
- c) Implement functions for inserting, querying, updating, and deleting documents in a MongoDB collection:
 - a. Insert new documents into a collection.
 - b. Retrieve documents based on specific criteria using query operations.
 - c. Update existing documents by modifying their fields.
 - d. Delete documents from the collection based on certain conditions.
- d) Demonstrate these CRUD operations on a sample database and collection.

CIE Assessment Pattern (50 Marks - Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessments based on SDA	MCQ's
		25	15	10
L1	Remember	5	-	-
L2	Understand	5	-	5
L3	Apply	5	5	5
L4	Analyze	10	5	-
L5	Evaluate	-	5	-
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks - Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	10
L3	Apply	20
L4	Analyze	10
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:**Text Books:**

1. Learning Node.js Development, Andrew Mead, Packt Publisher, 2018, ISBN: 978-1- 78839-554-0
2. A PDF Reference for The Complete Node.js Dev Course-tutorial, Taught by Andrew Mead.
3. Node.js, Tutorial Point Simply easy learning, Online contents.

Reference Books:

1. Beginning Node.js by Basarat Syed, Apress, 1st ed. Edition, ISBN: 978-1484201886.
2. Node.js Web Development: Create real-time server-side applications with this practical step-by-step guide, David Herron, 3rd Revised edition, Packt Publishing, ISBN: 978- 1785881503

UX / UI DESIGN PRINCIPLES									
Course Code	24SCS14						CIE Marks	50	
L:T:P:S	2:0:0:1						SEE Marks	50	
Hrs / Week	4						Total Marks	100	
Credits	3						Exam Hours	03	
Course outcomes:									
At the end of the course, the student will be able to:									
24SCS14.1	Understand the foundational principles underlying user interface design characteristics.								
24SCS14.2	Explain the user interface design process, citing pertinent case studies for illustration.								
24SCS14.3	Demonstrate the framework of user experience, creating designs that transcend multiple platforms.								
24SCS14.4	Analyze the critical elements of user experience pivotal to successful business strategies.								
24SCS14.5	Evaluate the requirements and structural components integral to designing user experience elements.								
24SCS14.6	Construct the framework and surface presentation of user experience elements, formulating the skeleton and visual plane.								
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:									
	P01	P02	P03	P04	P05	P06	PS01	PS02	
24SCS14.1	3	-	-	-	-	3	3	-	
24SCS14.2	3	3	3	3	-	3	3	-	
24SCS14.3	-	3	3	3	-	3	3	-	
24SCS14.4	-	3	3	3	-	3	3	-	
24SCS14.5	-	3	3	3	-	3	3	-	
24SCS14.6	-	3	3	3	-	3	3	-	
MODULE-1 USER INTERFACE INTRODUCTION & CHARACTERISTICS 24SCS14.1 8 Hours									
Definition, Importance and Benefits of good design, Characteristics of Graphical Systems: GUI, Advantage and disadvantages of graphical systems, Characteristics of GUI. Characteristics of Web User Interface: GUI vs. Web page design, Merging of graphical Business systems and the web, Principles of user interface design.									
Skill Development Activities	<p>Activity-1: Comparative Analysis and Design Principles</p> <p>Objective: Enhance understanding of different interface designs and principles through comparative analysis.</p> <p>Instructions:</p> <p>Research and Presentation: It is a group activity. Each group is assigned with one type of graphical system (GUI) and one aspect of web user interfaces (Web page design). Instructed them to do a research and create presentations:</p> <ul style="list-style-type: none"> Describe the characteristics, advantages, and disadvantages of their assigned system. Discuss principles of user interface design relevant to their systems. <p>Comparative Analysis: After presentations, a group discussion will be conducted to compare GUIs and Web page designs:</p> <ul style="list-style-type: none"> Analyze similarities and differences between GUIs and web interfaces. Identify principles that overlap or differ in the two design approaches. <p>Case Study Review: Consider any case studies showcasing successful integration or challenges when merging graphical business systems with web interfaces.</p> <p>Practical Application: Task participants must create a comparative analysis report highlighting key design principles and merging techniques between GUIs and web interfaces.</p> <p>Outcome: Improved comprehension of design characteristics, benefits, and principles through comparative analysis and practical application.</p>								

MODULE-2	USER INTERFACE DESIGN PROCESS	24SCS14.2	8 Hours
Obstacles and pitfalls in development path, Five commandments, Common Usability problems, Practical and objective measures of usability; Clients: Important human characteristics in design, Human considerations in design, user's psychological and physical characteristics, methods for understanding users.			
Skill Development Activities	<p>Activity-2: User-Centric Design</p> <p>Objective: Enhance understanding of user characteristics, usability problems, and methods for user-centered design.</p> <p>Instructions:</p> <p>User Characteristics Analysis:</p> <ul style="list-style-type: none"> • Introduce participants to various human characteristics influencing design (psychological, physical). • Discuss on how these characteristics impact user experience and design decisions. • Could be a group activity to research and present on specific user characteristics (e.g., cognitive abilities, motor skills). <p>Usability Problems Identification:</p> <ul style="list-style-type: none"> • Consider case studies or examples showcasing common usability problems in design. • Analyze these problems, identifying the root causes and their impact on user experience. • Encourage discussions on practical measures to mitigate or solve these problems. <p>Usability Testing and Measures:</p> <ul style="list-style-type: none"> • Conduct a usability testing session with a simple prototype or existing interface. • Observe users interacting with the interface and note usability issues. • Discuss how to objectively measure usability, considering metrics like task completion time, error rates, etc. <p>Client's Perspective and User Understanding:</p> <ul style="list-style-type: none"> • Introduce the importance of understanding clients' needs and user requirements in design. • Perform role-playing sessions where participants represent designers and clients, focusing on effective communication. • Explore methods (interviews, surveys, personas) for understanding users and gathering requirements. <p>Design Recommendations and Prototyping:</p> <ul style="list-style-type: none"> • Based on insights gained, task participants to propose design recommendations to address common usability problems. • Create low-fidelity prototypes reflecting improvements based on user-centric design principles. • Perform discussions on iterating designs based on feedback and iterative usability testing. <p>Outcome: Improved comprehension of user-centric design principles, identification of usability problems, practical usability testing experience, and effective methods for understanding user needs. This activity fosters a user-centered mindset among participants, emphasizing the importance of human characteristics, usability, and client considerations in design.</p>		
MODULE-3	UX AND 24SCS231	24SCS14.3	8 Hours
<p>Introduction:Product development cycle, characteristics of good user experience, The role of a beginner UX designer, responsibility of an entry level UX designer.</p> <p>Design thinking: A UX design framework, Designing cross platform experience, UX research, research methods, primary research, secondary research, bias in UX research.</p>			

Skill Development Activities	<p>Activity: Entry-Level UX Design Workshop Objective: Develop foundational skills for beginner UX designers, emphasizing design thinking and research methodologies. Instructions: Introduction to UX Design and Roles:</p> <ul style="list-style-type: none"> • Provide an overview of the product development cycle and the essential characteristics of good user experience. • Discuss the responsibilities and role of an entry-level UX designer in a team. • Share case studies or examples highlighting the impact of a beginner UX designer's role in successful products. <p>Design Thinking Framework and Cross-Platform Experience:</p> <ul style="list-style-type: none"> • Introduce design thinking as a problem-solving framework in UX design. • Perform a group activity on a hypothetical cross-platform experience design challenge. • Complete the stages of empathizing, defining, ideating, prototyping, and testing for their designs. <p>UX Research Methods:</p> <ul style="list-style-type: none"> • Brainstorm on UX research methodologies covering primary and secondary research techniques. • Provide examples and case studies demonstrating bias in UX research and how it can affect design outcomes. • Discussion on mitigating bias and ensuring validity in research. <p>Practical Research Exercise:</p> <ul style="list-style-type: none"> • Perform a group activity on specific UX research method (e.g., user interviews, surveys, competitor analysis). • Task each group with conducting a short research activity related to the hypothetical cross-platform design challenge. • Present their findings, discussing the relevance of their research in the design process. <p>Reflection and Design Presentation:</p> <ul style="list-style-type: none"> • Have each group reflect on their design thinking process, research findings, and insights gained. • Present their design concepts, explaining how research influenced their design decisions. • Feedback and discussions among participants on different approaches and lessons learned. <p>Outcome: Improved understanding of the UX design process, application of design thinking in cross-platform experience, familiarity with various UX research methods, and awareness of the responsibilities and impact of an entry-level UX designer. This activity aims to provide hands-on experience and foundational knowledge crucial for beginners entering the field of UX design.</p>		
MODULE-4	USER EXPERIENCE AND ITS ELEMENTS	24SCS14.4	8 Hours
Introducing User Experience, From Product design to User experience design, Designing for experience, User experience and the web, Good user experience is good business. Elements: The five planes, Building from bottom to top, A basic duality, Elements of User experience, Strategy Plane – Defining the strategy, Product Objectives, User needs.			
Skill Development Activities	<p>Activity: User Experience Elements and Strategy Objective: Enhance understanding of the five planes of user experience and strategize product objectives based on user needs. Instructions: Introduction to User Experience Elements:</p>		

	<ul style="list-style-type: none"> • Provide an overview of the five planes of user experience: strategy, scope, structure, skeleton, and surface. • Explain how these planes build upon each other to create a holistic user experience. • Discuss the importance of understanding each plane for designing successful products. <p>Group Activity - Exploring User Experience Elements:</p> <ul style="list-style-type: none"> • Divide participants into groups, assigning each group one plane of the user experience to focus on. • Task each group with exploring and presenting characteristics, components, and examples related to their assigned plane. • Discuss on how each plane contributes to overall user experience design. <p>Defining Strategy and Product Objectives:</p> <ul style="list-style-type: none"> • Introduce the strategy plane and its role in defining product objectives aligned with user needs. • Conduct an interactive session on identifying and understanding user needs and expectations. • Craft the product objectives that resonate with identified user needs. <p>Case Study Analysis and Strategy Development:</p> <ul style="list-style-type: none"> • Provide case studies showcasing successful products or services and their strategic planning processes. • Break participants into smaller groups to analyze these case studies and extract strategic insights. • Formulate a strategy plan for a hypothetical product, aligning it with user needs. <p>Presentation and Strategy Refinement:</p> <ul style="list-style-type: none"> • Have groups present their formulated strategy plans to the larger audience. • Perform feedback and discussions on different strategic approaches and their alignment with user needs. • Facilitate a session to refine and improve the strategies based on group discussions and feedback. <p>Outcome: Enhanced comprehension of the five planes of user experience, understanding the role of strategy in product design, and the ability to align product objectives with user needs. This activity aims to provide participants with practical knowledge and skills essential for developing strategic thinking in user experience design.</p>		
MODULE-5	USER EXPERIENCE DESIGN FRAMEWORK	24SCS14.5 & 24SCS14.6	8 Hours
<p>Scope Plane – Defining the scope Functionality and content, Defining requirements, Functional specification. Structure Plane – Defining the structure, Interaction Design, Information architecture. Skeleton Plane – Defining the Skeleton, Convention and Metaphor, Wireframes Surface Plane – Defining the surface, Making sense of the senses, Contrast and Uniformity, Design composite and Styleguides.</p>			
Skill Development Activities	<p>Activity: Journey Across the User Experience Planes Objective: Enhance understanding and proficiency across the scope, structure, skeleton, and surface planes of user experience design. Instructions: Introduction to User Experience Planes:</p> <ul style="list-style-type: none"> • Provide an overview of the four planes - Scope, Structure, Skeleton, and Surface - emphasizing their significance in user experience design. • Discuss how each plane contributes to the overall user experience and the sequential nature of their development. <p>Practical Exercises on Each Plane:</p> <ul style="list-style-type: none"> • Conduct tutorials on each plane, focusing on practical exercises and activities: 		

	<ul style="list-style-type: none"> • Scope Plane: Define scope, functionality, requirements, and create functional specifications for a hypothetical product. • Structure Plane: Explore interaction design principles, build information architecture, and discuss defining structures. • Skeleton Plane: Engage in exercises on convention, metaphor, and wireframing techniques to develop a basic skeleton. • Surface Plane: Discuss making sense of senses, contrast, uniformity, and delve into creating design composites and style guides. <p>Cross-Plane Design Challenges:</p> <ul style="list-style-type: none"> • Formulate cross-plane design challenges, combining elements from each plane. • Assign mixed-discipline groups, tasking them to collaborate and create a comprehensive design solution. • Emphasize the importance of integrating learning from each plane into their solutions.
--	---

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessments based on SDA	MCQ's
		25	15	10
L1	Remember	5	-	-
L2	Understand	5	-	5
L3	Apply	5	5	5
L4	Analyze	10	5	-
L5	Evaluate	-	5	-
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	10
L3	Apply	20
L4	Analyze	10
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:

Text Books:

1. The Elements of User Experience: User-Centered Design for the Web and Beyond, Jesse James Garrett, Second Edition, 2011, ISBN: 13: 978-0-321-68368-7.
2. A Project Guide to UX Design: For user experience designers in the field or in the making (2nd. ed.). Russ Unger and Carolyn Chandler. New Riders Publishing, USA, 2012.
3. Wilbert O. Galitz, "The Essential Guide to User Interface Design", John Wiley & Sons, 2001.
4. Ben Shneiderman, "Design the User Interface", Pearson Education, 1998

Reference Books:

1. The Elements of User Experience: User-Centered Design for the Web and Beyond, Second Edition Jesse James Garrett, Pearson Education. 2011.
2. The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, Third Edition Wilbert O. Galitz, Wiley Publishing, 2007.
3. The UX Book Process and Guidelines for Ensuring a Quality User Experience, Rex Hartson and Pardha S. Pyla, Elsevier, 2012
4. Alan Cooper, "The Essential of User Interface Design", Wiley – Dream Tech Ltd., 2002.
5. Wilbert O. Galitz, The Essential Guide to User Interface Design, John Wiley & Sons, Second Edition 2002.

RESEARCH METHODOLOGY AND IPR										
Course Code	24SCS15					CIE Marks	50			
L:T:P:S	2:0:0:1					SEE Marks	50			
Hrs / Week	4					Total Marks	100			
Credits	3					Exam Hours	03			
Course outcomes:										
At the end of the course, the student will be able to:										
24SCS15.1	Outline the research objectives aimed at articulating and refining a specific research problem.									
24SCS15.2	Provide a condensed overview of the research literature, drawing from credible journals and other reputable resources.									
24SCS15.3	Employ appropriate methodologies, tools, or techniques in devising the research design.									
24SCS15.4	Conduct an analysis of multiple parametric hypothesis tests to substantiate the research discoveries and document the outcomes.									
24SCS15.5	Interpret diverse manifestations of intellectual property and explore their significance within business contexts.									
24SCS15.6	Develop strategies and identify resources pertinent to patent-related endeavors.									
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:										
	PO1	PO2	PO3	PO4	PO5	PO6	PS01	PS02		
24SCS15.1	3	3	3	-	-	-	3	-		
24SCS15.2	3	3	3	1	2	-	3	-		
24SCS15.3	3	3	3	1	2	-	3	-		
24SCS15.4	3	3	-	-	-	-	3	-		
24SCS15.5	3	-	-	-	-	-	3	-		
24SCS15.6	3	3	3	1	-2	-	3	-		
MODULE-1 RESEARCH METHODOLOGY AN INTRODUCTION 24SCS15.1 8 Hours										
Introduction: Meaning of Research, Objectives, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India.										
Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, Illustrations.										
Self-study / Case Study / Applications	<p>1. Evaluate the importance of a well-defined research problem in the context of research endeavors. Discuss the potential challenges researchers might face in the process of selecting and defining a research problem, providing strategies to mitigate these challenges.</p> <p>2. Critically examine the technique(s) used in defining a research problem. Compare and contrast the effectiveness of different techniques, citing examples where appropriate. Discuss how the choice of technique can impact the trajectory and outcomes of a research study.</p>									
MODULE-2 LITERATURE REVIEW WRITING 24SCS15.2 8 Hours										
Reviewing the literature: Place of the literature review in research, Bringing clarity and focus to the research problem, Searching the existing literature, Reviewing the selected literature, Developing a theoretical/conceptual framework, Writing about the literature re- viewed.										
Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.										
Self-study / Case Study / Applications	Conduct a comprehensive literature review on the advancements and applications of quantum computing in comparison to classical computing architectures. Explore the theoretical foundations, technological developments, potential advantages, and limitations of quantum computing over traditional computing paradigms. Discuss key research papers, case studies, and significant findings in this field to provide a									

	comprehensive overview of the current landscape and future prospects of advanced computing technologies.		
MODULE-3	DESIGN OF SAMPLING	24SCS15.13	8 Hours
<p>Introduction: Sample Design, Sampling and Non- sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs.</p> <p>Measurement and Scaling: Qualitative and Quantitative Data, Classifications of Measurement Scales, Goodness of Measurement Scales, Sources of Error in Measurement Tools, Scaling, Scale Classification Bases, Scaling Techniques, Multidimensional Scaling, Deciding the Scale.</p> <p>Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.</p>			
Self-study / Case Study / Applications	Evaluate a healthcare study's measurement scale selection, discussing the reliability and validity of Likert scales in measuring patient satisfaction, addressing potential sources of measurement error and justifying the choice of a specific scaling technique for multidimensional assessment.		
MODULE-4	TESTING OF HYPOTHESES	24SCS15.4	8 Hours
<p>Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Testing of Hypothesis, Test Statistics and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Proportion, Variance, for Difference of Two Mean, for Difference of Two Proportions, for Difference of Two Variances, P-Value approach, Power of Test, Limitations of the Tests of Hypothesis, Chi-square Test: Test of Difference of more than two proportions, Test of independence of attributes, Test of goodness of fit, Cautions in Using Chi Square Tests.</p> <p>Interpretation and Report Writing: Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Presentation, and Writing Research Reports.</p>			
Self-study / Case Study / Applications	<p>Hypothesis Testing for Mean: A manufacturing company claims that the average lifespan of its product is 50 months. A sample of 30 products resulted in a mean lifespan of 48 months with a standard deviation of 5 months. At a 5% significance level, test the company's claim.</p> <p>Hypothesis Testing for Proportion: A researcher claims that the proportion of people preferring Product A over Product B is 0.6. In a survey of 200 individuals, 120 prefer Product A. Test the claim at a 1% significance level.</p> <p>Hypothesis Testing for Difference of Two Means: Compare the average scores of two teaching methods given to two different groups of students. Group A's mean score is 75 with a standard deviation of 10, and Group B's mean score is 80 with a standard deviation of 12. For a significance level of 0.05, test if there's a significant difference between the teaching methods.</p> <p>Chi-square Test for Difference of More than Two Proportions: A survey examines the preference for four different ice cream flavors among people of different age groups. In a sample of 500 respondents, test whether the preference for flavors is the same across age groups (significance level of 0.05).</p>		
MODULE-5	IP & PATENTS ACT	24SCS15.5 & 24SCS15.6	8 Hours
<p>Intellectual Property: The Concept, Intellectual Property System in India, Development of TRIPS Complied Regime in India, 1970, Trade Mark Act, 1999, The Designs Act, 2000, The Geographical Indications of Goods (Registration and Protection) Act 1999, Copyright Act, 1957, The Protection of Plant Varieties and Farmers' Rights Act, 2001, The Semiconductor Integrated Circuits Layout Design Act, 2000, Trade Secrets, Utility Models, IPR and Biodiversity.</p> <p>Patents Act: Patent Cooperation Treaty (PCT), Advantages of PCT Filing, Basic Principles, Duration of Protection, Trade Related Aspects of Intellectual Property Rights (TRIPS) Agreement, Patentable Subject</p>			

Matter, Rights Conferred, Exceptions, Term of protection, Conditionson Patent Applicants, Process Patents.

Self-study / Case Study / Applications

1. List a few innovating patentable ideas.
2. Discuss the role of patents in fostering innovation and economic growth within the pharmaceutical industry. Analyze the balance between patent protection and public access to essential medicines, considering the ethical and societal implications. Provide examples and arguments supporting both sides of this debate, and propose strategies that strike a balance between incentivizing innovation and ensuring affordable access to life-saving medications.

CIE Assessment Pattern (50 Marks - Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessments	MCQ's
		25	15	10
L1	Remember	5	-	-
L2	Understand	5	-	5
L3	Apply	5	5	5
L4	Analyze	10	5	-
L5	Evaluate	-	5	-
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks - Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	10
L3	Apply	20
L4	Analyze	10
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:

Text Books:

1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg, New Age International, 4th Edition, 2018.
2. Research Methodology a step-by-step guide for beginners, Ranjit Kumar, AGE Publications, 3rd Edition, 2011.
3. Study Material (For the topic Intellectual Property under module 5), Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September2013.

Reference Books:

1. Research Methods: the concise knowledge base Trochim Atomic Dog Publishing 2005.
2. Conducting Research Literature Reviews: From the Internet to Paper, Fink A Sage Publications, 2009.

ADVANCED ALGORITHMS LAB								
Course Code	24SCSL16					CIE Marks	50	
L:T:P:S	0:0:2:0					SEE Marks	50	
Hrs / Week	4					Total Marks	100	
Credits	02					Exam Hours	03	
Course outcomes:								
At the end of the course, the student will be able to:								
24SCSL16.1	Understand the intricacies search problems through application of various algorithmic methods.							
24SCSL16.2	Apply optimized algorithms to find the shortest path using positive and negative weights effectively.							
24SCSL16.3	Analyse the graph algorithm for the Ford-Fulker son method, encryption and decryption- RSA							
24SCSL16.4	Evaluate various algorithmic design techniques for Knuth-Morris-Pratt (KMP) ,Rabin Karp Algorithm-hashing and other string matching algorithms.							
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:								
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
24SCSL16.1	3	2	3	3	2	1	3	-
24SCSL16.2	3	2	3	3	2	1	3	-
24SCSL16.3	3	2	3	3	2	1	3	-
24SCSL16.4	3	2	3	3	2	1	3	-
Exp. No. / Pgm. No.								
List of Experiments / Programs							Hours	COs
Prerequisite Experiments / Programs / Demo								
<ul style="list-style-type: none"> • Demo of C++/JAVA/Python Installation with Simple Programs 							2	NA
PART-A								
1	Design a program to implement the maximum value among an array's n elements and evaluate the best and worst-case scenarios for the given elements.						2	24SCSL16.1
2	Develop a program for performing linear search and binary search . Evaluate the best and worst-case scenarios for the given elements.						2	24SCSL16.1
3	Design and develop a program to implement the Bellman-Ford algorithm for finding the shortest path in a weighted graph: a) Provide a detailed plan on how to represent the graph data structure. b) Explain the steps involved in implementing the Bellman-Ford algorithm, including initialization, edge relaxation, and cycle detection. c) Describe the methodology to handle graphs with negative edge weights and analyze the presence of negative cycles.						2	24SCSL16.2
4	Design a program to implement Dijkstra's algorithm for determining the shortest path in a weighted graph with non-negative edge weights? a) Explain the graph representation suitable for implementing Dijkstra's algorithm. b) Elaborate on the steps involved in the algorithm, including initialization, prioritization, and relaxation of edges. c) Highlight the conditions under which Dijkstra's algorithm might not function optimally						2	24SCSL16.2
5	Design a program to implement Ford-Fulkerson algorithm greedy approach for calculating the maximum possible flow in a network or a graph.						2	24SCSL16.3
6	Design a program that utilizes the Sieve of Eratosthenes algorithm to generate prime numbers within a specified range. a) Detail the steps involved in Sieve of Eratosthenes and its mathematical principles for sieving out primes. b) Implement the algorithm within the program to generate prime numbers efficiently.						2	24SCSL16.3

	c) Analyse the algorithm's time complexity and discuss how it performs concerning larger ranges of numbers. Enhance the program to optimize memory usage for extremely large ranges and evaluate its impact on performance.		
PART-B			
7	Design, develop, and implement a robust program that demonstrates the RSA (Rivest Shamir-Adleman) algorithm's functionalities using small prime numbers for encryption and decryption. a) Validate the RSA algorithm's implementation accuracy through extensive testing with different input sizes. b) Handle edge cases gracefully, considering scenarios involving very small prime numbers or specific input conditions. c) Measure the computational efficiency and execution time of the RSA algorithm using small prime values.	2	24SCSL16.3
8	Develop a program to perform string matching using the brute force (naïve) algorithm, aiding in pattern detection within given text strings. a) Describe the algorithm's methodology, emphasizing comparisons and shifts during the search process. b) Evaluate the algorithm's time complexity and efficiency for different text and pattern lengths. c) Discuss scenarios where the naïve approach excels or experiences limitations based on input characteristics.	2	24SCSL16.4
9	Design and develop a program incorporating the Knuth-Morris-Pratt (KMP) algorithm to match a given pattern within a text. a) Explain the KMP algorithm's intricacies, such as pre-processing and efficient pattern matching techniques. b) Verify the correctness and accuracy of the program through various test cases involving different text and pattern lengths.	2	24SCSL16.4
10	Develop a program implementing the Rabin-Karp algorithm for efficient pattern matching. a) Discuss the algorithm's hashing techniques and sliding window approach for pattern search. b) Evaluate and analyze the performance of the Rabin-Karp algorithm concerning different text and pattern sizes.	2	24SCSL16.4
11	Implement the Finite Automata-based string-matching algorithm within the program. a) Explain the construction of the Finite Automata and its role in pattern matching. b) Measure and analyze the algorithm's performance, considering variations in text and pattern lengths.	2	24SCSL16.4
12	Design and implement a Monte Carlo-based algorithm for testing the primality of integers . a) Explain the probabilistic nature of the algorithm and its approach to determining primality. b) Validate the correctness and accuracy of the algorithm with various integer inputs	2	24SCSL16.4

PART-C

Beyond Syllabus Virtual Lab Content

(To be done during Lab but not to be included for CIE or SEE)

- <https://ds2-iiith.vlabs.ac.in/List%20of%20experiments.html>

CIE Assessment Pattern (50 Marks - Lab)

RBT Levels		Weekly Assessment	Test (s)
		30	20
L1	Remember	-	--
L2	Understand	5	05
L3	Apply	10	05

L4	Analyze	10	05
L5	Evaluate	5	05
L6	Create	--	--

SEE Assessment Pattern (50 Marks - Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	10
L3	Apply	20
L4	Analyze	20
L5	Evaluate	-
L6	Create	-

UX/UI Design Principles Lab									
Course Code	24SCSL17						CIE Marks	50	
L:T:P:S	0:0:2:0						EE Marks	50	
Hrs / Week	4						Total Marks	100	
Credits	02						Exam Hours	03	
Course outcomes:									
At the end of the course, the student will be able to:									
24SCSL17.1	Understand the core principles of user interface design characteristics.								
24SCSL17.2	Explore the user interface design thinking process through the analysis of pertinent case studies								
24SCSL17.3	Create prototypes for user experience frameworks								
24SCSL17.4	Deploy web applications using UI/UX principles								
Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:									
	P01	P02	P03	P04	P05	P06	PS01	PS02	
24SCSL17.1	3	3	3	3	2	-	3	-	
24SCSL17.2	3	3	2	3	2	-	3	-	
24SCSL17.3	3	2	3	3	2	-	3	-	
24SCSL17.4	3	2	3	2	2	-	3	-	
Exp. No. / Pgm. No.	List of Experiments / Programs						Hours	COs	
Prerequisite Experiments / Programs / Demo									
	Basic understanding of design principles and Proficiency in using design software tools, as well as a creative mindset and an interest in user-centered design concepts.						2	NA	
PART-A									
1.	Need for Navigation Design and implementing Navigation Design: In the context of Navigation interface design, describe a specific scenario where a lack of Navigation-user design led to a suboptimal user experience. How could we incorporate the principles of UX design have improved the situation?						2	24SCSL17.1	
2.	Need for Design and UX Design: In the context of a user interface design, describe a specific scenario where a lack of user-centered design led to a suboptimal user experience. How could we incorporate the principles of UX design have improved the situation?						2	24SCSL17.1	
3.	Importance of Design Thinking: Conduct a mini design thinking activity within your laboratory group. Select a real-world problem or challenge and lead the participants through the stages of design thinking, including empathizing, defining, ideating, prototyping, and testing. Share the outcomes and lessons learned from this exercise.						2	24SCSL17.2	
4.	UPI Case Study and Design Thinking - Explore the user-centered design approach through a case study of the Unified Payments Interface (UPI) in the context of India's digital payments landscape.						2	24SCSL17.2	
5.	Sharing and Exporting UI/UX Design – Understand and analysis of the importance of a Sharing and Exporting design in UI/UX design.						2	24SCSL17.2	
6.	Custom and Operation Control - Explore the impact of Custom and Operation Control working and tools used.						2	24SCSL17.2	
PART-B									
7.	Ui/UX Prototype - Develop a working prototype using prototyping tools						2	24SCSL17.3	

8.	Designing Sections and Adding Contents - Populate the sections of the website prototype with content and apply basic styling.	2	24SCSL17.3
----	---	---	------------

PART-C
Beyond Syllabus Virtual Lab Content
(To be done during Lab but not to be included for CIE or SEE)

2. <https://ds2-iiith.vlabs.ac.in/List%20of%20experiments.html>

CIE Assessment Pattern (50 Marks - Lab)

RBT Levels		Weekly Assessment	Test (s)
		30	20
L1	Remember	-	--
L2	Understand	5	05
L3	Apply	10	05
L4	Analyze	10	05
L5	Evaluate	5	05
L6	Create	--	--

SEE Assessment Pattern (50 Marks - Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	10
L3	Apply	20
L4	Analyze	20
L5	Evaluate	-
L6	Create	-