Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Shri Vaishnav Institute of Information Technology

Choice Based Credit System (CBCS) in the light of NEP-2020

Diploma CSE/AI/DS/Cyber Security

SEMESTER-IV (2026-2029)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS401	DCC	Database Management Systems	Max	60	20	20	30	20	3	1	2	5
			Min	24	16		14	9				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:	
The student will have ability to:	
1.	To provide a strong foundation in database concepts, data modeling, and relational systems, enabling students to design and manage structured data efficiently.
2.	To develop skills in SQL programming and understanding of transaction management for real-world applications.
3.	To understand normalization techniques for designing efficient and consistent database schemas.
4.	To develop analytical skills for database design, querying, and data integrity management.
5.	To apply database concepts in practical applications and mini projects for real-world problem solving.
COURSE ALIGNMENT WITH UNSDG:	
The Course aims to fulfill the United Nations Sustainable Development Goals, **SDG 4 (Quality Education)** and **SDG 9 (Industry, Innovation and Infrastructure)**.	
COURSE OUTCOMES:	
After completion of the course, the student will be able to:	
CO1	Explain DBMS architecture and data models for structured data management
CO2	Design relational databases using ER modeling and normalization techniques.
CO3	Develop and execute SQL queries for data manipulation and retrieval.
CO4	Understand transaction management, concurrency, and recovery mechanisms in DBMS
TEACHING PEDAGOGY:	
T1	Classroom teaching (white board), Power Point Presentations, Interactive lectures, Inquiry-based teaching
T2	ABL activities, Assignments, Flip Class/ Seminars, Quizzes, Oral Viva-voce examination
ASSESSMENT TOOLS:	
ATL1	Quiz
ATL2	Activity Based Learning

Chairperson	Chairperson	Controller of Examination	Registrar
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			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS401	DCC	Database Management Systems	Max	60	20	20	30	20	3	1	2	5
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Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

ATL3	Midterm Exams
ATL4	Flip Class
ATL5	Seminar Presentation
ATL6	Assignments
ATL7	Poster
ATL8	Oral Viva-voce examination
ATL9	Industrial Visit Report

PREREQUISITES:

- Basic Computer Knowledge
- Fundamentals of Programming Concepts
- Logical and Analytical Thinking Skills

SYLLABUS:

Module	Descriptors / Topics	Hours	Assessment Tools
I	**Introduction to Database Systems:** Introduction to data, database, database management system (DBMS), characteristics and advantages of DBMS, limitations of file processing systems, file system versus DBMS, three-level DBMS architecture, schema and instances. Overview of data models including hierarchical, network, relational, and object-oriented models. Introduction to ER model concepts, entities, attributes, relationships, cardinality constraints, ER diagrams, and applications of DBMS in real-world systems.	9	ATL1, ATL3, ATL6
II	**Relational Data Model:** Concepts of relations, tuples, attributes, domains, and relational schema. Types of keys include primary key, foreign key, candidate key, alternate key, and super key. Relational algebra operations such as selection, projection, union, intersection, set difference, Cartesian product, and joins. Integrity constraints including domain integrity, entity integrity, and referential integrity. Applications of relational databases in information	9	ATL1, ATL3, ATL6

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			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS401	DCC	Database Management Systems	Max	60	20	20	30	20	3	1	2	5
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Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

	systems.		
III	**SQL Programming:** Introduction to Structured Query Language (SQL). Data Definition Language (DDL) commands: CREATE, ALTER, DROP, and TRUNCATE. Data Manipulation Language (DML) commands: INSERT, UPDATE, DELETE. Data Query Language (DQL) uses SELECT queries, filtering, sorting, grouping, joining, nested queries, aggregate functions, constraints, views, indexes, and introduction to stored procedures and triggers. Applications for SQL in database development and administration.	9	ATL1, ATL3, ATL6
IV	**Normalization:** Concept of database normalization and functional dependencies. Types of anomalies include insertion, deletion, and update anomalies. Normal forms: First Normal Form (1NF), Second Normal Form (2NF), Third Normal Form (3NF), Boyce-Codd Normal Form (BCNF), and introduction to higher normal forms. Schema decomposition, lossless decomposition, dependency preservation, and normalization applications in efficient database design.	9	ATL1, ATL3, ATL6
V	**Transaction Management:** Concepts of transaction processing, transaction states, and ACID properties. Concurrency control techniques, serializability, locking protocols, deadlocks, deadlock prevention and recovery techniques. Database recovery concepts include log-based recovery, checkpointing, shadow paging, and backup mechanisms. Transaction management applications in maintaining database consistency and reliability.	9	ATL1, ATL3, ATL6
	Total Hours	**45**	

ADDITIONAL RESOURCES

A.	**Value addition to course content/ Skill enhancement content:**
	• Oracle Database Learning Library • MySQL Documentation • PostgreSQL Tutorials
B.	**Remedial classes for slow learners:**

Chairperson	Chairperson	Controller of Examination	Registrar
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SEMESTER-IV (2026-2029)

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			Marks	THEORY			PRACTICAL					
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Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

	As per the SVVV SOP for slow and fast learners.

SUGGESTED READINGS:

Textbooks

1. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, *Database System Concepts*, 7th Edition, McGraw-Hill, 2019.
2. Ramez Elmasri and Shamkant B. Navathe, *Fundamentals of Database Systems*, 7th Edition, Pearson Education, 2016.
3. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems*, 3rd Edition, McGraw-Hill, 2003.

Reference Books:

1. C. J. Date, *An Introduction to Database Systems*, 8th Edition, Pearson Education, 2004.
2. Thomas Connolly and Carolyn Begg, *Database Systems: A Practical Approach to Design, Implementation, and Management*, 6th Edition, Pearson, 2014.
3. Hector Garcia-Molina, Jeffrey D. Ullman, and Jennifer Widom, *Database Systems: The Complete Book*, 2nd Edition, Pearson, 2008.

Suggested e- resources (Websites/e- books)

1.	NPTEL Database Management Systems Course
2.	Oracle Live SQL
3.	W3Schools SQL Tutorial

LIST OF PRACTICAL

S. No.	Practical Title	CO Mapping
1	To create and manage databases using SQL commands.	CO1
2	To perform CRUD operations using INSERT, UPDATE, DELETE, and SELECT statements.	CO1

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SEMESTER-IV (2026-2029)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS401	DCC	Database Management Systems	Max	60	20	20	30	20	3	1	2	5
			Min	24	16		14	9				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

3	To implement integrity constraints such as primary key, foreign key, unique, and check constraints.	CO1
4	To design ER diagrams for real-world applications.	CO2
5	To perform SQL joins and nested queries for multi-table data retrieval.	CO2
6	To create and use views and indexes for data abstraction and performance optimization.	CO2
7	To normalize database schemas up to 3NF/BCNF.	CO2
8	To implement relational algebra queries using SQL statements.	CO2
9	To create stored procedures, functions, and triggers.	CO3
10	To implement transaction control commands and concurrency concepts.	CO4
11	To demonstrate backup and recovery operations in DBMS.	CO4
12	To develop a mini database project for a real-world application.	CO3, CO4

COURSE ARTICULATION MATRIX (MAPPING OF COs WITH POs)

Course Outcomes	Correlation with POs												Correlation with PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	1	3	-	-	-	1	1	-	2	2	1	1
CO2	3	3	2	2	3	2	-	2	2	2	1	3	3	2	3
CO3	3	3	3	3	3	2	1	2	3	2	2	3	3	2	3
CO4	3	3	2	3	3	2	1	2	2	2	1	3	3	2	3

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			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS402	DCC	Software Engineering	Max	60	20	20	30	20	3	0	2	4
			Min	24	16		14	9				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:	
The student will have ability to:	
1.	To introduce systematic approaches and methodologies for software development using various Software Development Life Cycle (SDLC) models.
2.	To develop skills in software requirement analysis, specification preparation, software design, testing, and maintenance activities.
3.	To understand software project management concepts including feasibility analysis, scheduling, risk analysis, and quality management.
4.	To apply UML-based design techniques and software engineering principles in developing reliable software systems.
5.	To enhance problem-solving and teamwork skills for developing high-quality software solutions in real-world applications.
COURSE ALIGNMENT WITH UNSDG:	
The Course aims to fulfill the United Nations Sustainable Development Goals, **SDG 4 (Quality Education)** and **SDG 9 (Industry, Innovation and Infrastructure)**.	
COURSE OUTCOMES:	
After completion of the course, the student will be able to:	
CO1	Explain software development life cycle models and software engineering principles.
CO2	Analyze software requirements and prepare Software Requirement Specification (SRS) documents.
CO3	Apply software design principles and UML diagrams for software modeling and development.
CO4	Perform software testing, quality assurance, maintenance, and configuration management activities.
TEACHING PEDAGOGY:	
T1	Classroom teaching (white board), Power Point Presentations, Interactive lectures, Inquiry-based teaching
T2	ABL activities, Assignments, Flip Class/ Seminars, Quizzes, Oral Viva-voce examination
ASSESSMENT TOOLS:	

Chairperson	Chairperson	Controller of Examination	Registrar
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DTCS402	DCC	Software Engineering	Max	60	20	20	30	20	3	0	2	4
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ATL1	Quiz
ATL2	Activity Based Learning
ATL3	Midterm Exams
ATL4	Flip Class
ATL5	Seminar Presentation
ATL6	Assignments
ATL7	Poster
ATL8	Oral Viva-voce examination
ATL9	Industrial Visit Report

PREREQUISITES:

- Basic Computer Knowledge
- Fundamentals of Programming Concepts
- Logical and Analytical Thinking Skills

SYLLABUS:

Module	Descriptors/Topics	Hours	Assessment Tools
I	**Introduction to Software Engineering:** Introduction to software engineering, software characteristics, software crisis, need for software engineering, and Software Development Life Cycle (SDLC) models including waterfall, incremental, spiral, prototype, and agile models. Project planning, project scheduling, feasibility analysis, cost estimation, and risk management techniques. Applications of software engineering principles in software development projects.	9	ATL1, ATL3, ATL6
II	**Requirement Engineering:** Requirement engineering process including requirement gathering, elicitation techniques, requirement analysis, feasibility study, and requirement validation. Software Requirement Specification (SRS), characteristics of a good SRS document, requirement modeling, functional and non-functional requirements, and applications of requirement	9	ATL1, ATL3, ATL6

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DTCS402	DCC	Software Engineering	Max	60	20	20	30	20	3	0	2	4
			Min	24	16		14	9				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

	engineering in software project development and management.		
III	**Software Design:** Introduction to software design principles including modularity, abstraction, cohesion, coupling, and architectural design concepts. UML diagrams include case diagrams, class diagrams, sequence diagrams, activity diagrams, and state diagrams for software modeling. Design strategies, user interface design principles, and applications of software design in system development.	9	ATL1, ATL3, ATL6
IV	**Software Testing:** Introduction to software testing, objectives and principles of testing, testing levels including unit testing, integration testing, system testing, and acceptance testing. Testing techniques including black-box testing, white-box testing, debugging methods, verification and validation processes, test case generation, and applications of software testing for quality assurance and software reliability.	9	ATL1, ATL3, ATL6
V	**Software Maintenance and Quality Management**: Software maintenance concepts including corrective, adaptive, perfective, and preventive maintenance. Software quality factors, software metrics, software reliability, quality assurance, and quality control techniques. Configuration management, version control systems, change management, software documentation, and applications in software project maintenance and management.	9	ATL1, ATL3, ATL6
	Total Hours	**45**	

ADDITIONAL RESOURCES

A.	**Value addition to course content/ Skill enhancement content:**
	• Atlassian Agile Tutorials • IBM Software Engineering Fundamentals
B.	**Remedial classes for slow learners:**
	As per the SVVV SOP for slow and fast learners.

SUGGESTED READINGS:

Textbooks

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DTCS402	DCC	Software Engineering	Max	60	20	20	30	20	3	0	2	4
			Min	24	16		14	9				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

1.	Roger S. Pressman and Bruce R. Maxim, Software Engineering: A Practitioner's Approach, 8th Edition, McGraw-Hill, 2015.
2.	Ian Sommerville, Software Engineering, 10th Edition, Pearson Education, 2016.
3.	Pankaj Jalote, An Integrated Approach to Software Engineering, 3rd Edition, Narosa Publishing, 2005.

Reference Books:

1. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International, 2008.
2. Rajib Mall, Fundamentals of Software Engineering, 5th Edition, PHI Learning, 2018.
3. Carlo Ghezzi, Mehdi Jazayeri, and Dino Mandrioli, Fundamentals of Software Engineering, 2nd Edition, PHI, 2003.

Suggested e- resources (Websites/e- books)

1. NPTEL Software Engineering Course
2. GeeksforGeeks – Software Engineering Tutorials
3. TutorialsPoint – Software Engineering

LIST OF PRACTICAL

S. No.	Practical Title	CO Mapping
1	To prepare a Software Requirement Specification (SRS) document for a software system.	CO1
2	To design use case diagrams for a software application.	CO1
3	To create class diagrams and activity diagrams using UML tools.	CO1
4	To design sequence diagrams and state transition diagrams.	CO2
5	To prepare functional and non-functional requirements for a project.	CO2
6	To prepare test cases for a software module.	CO4
7	To perform black-box testing techniques on software modules.	CO4

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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS402	DCC	Software Engineering	Max	60	20	20	30	20	3	0	2	4
			Min	24	16		14	9				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

8	To perform white-box testing techniques and calculate cyclomatic complexity.	CO4
9	To perform feasibility study and risk analysis for a software project.	CO3
10	To develop software documentation and project reports.	CO3
11	To implement version control using Git tools.	CO4
12	To develop a mini software project using SDLC methodology.	CO3, CO4

COURSE ARTICULATION MATRIX (MAPPING OF COs WITH POs)

Course Outcomes	Correlation with POs												Correlation with PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	1	2	-	-	-	1	1	-	2	2	1	1
CO2	3	3	2	2	2	1	-	1	2	2	1	2	3	1	2
CO3	3	3	3	3	3	2	1	2	2	2	1	3	3	2	3
CO4	3	3	3	3	3	2	1	2	2	2	1	3	3	2	3

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			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS403	DCC	Design and Analysis of Algorithm	Max	60	20	20	30	20	3	1	2	5
			Min	24	16		14	9				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:	
The student will have ability to:	
1.	To develop the ability to design efficient algorithms using standard algorithmic paradigms and evaluate their performance.
2.	To understand computational complexity concepts and apply algorithmic techniques to solve real-world computational problems.
3.	To analyze the efficiency of algorithms using asymptotic notations and complexity analysis methods.
4.	To apply divide-and-conquer, greedy, dynamic programming, and backtracking techniques for optimization and decision-making problems.
5.	To understand NP-complete problems and develop analytical thinking for selecting suitable algorithmic strategies in computing applications.
COURSE ALIGNMENT WITH UNSDG:	
The Course aims to fulfill the United Nations Sustainable Development Goals, **SDG 4 (Quality Education)** and **SDG 9 (Industry, Innovation and Infrastructure)**.	
COURSE OUTCOMES:	
After completion of the course, the student will be able to:	
CO1	Analyze time and space complexity of algorithms using asymptotic notations.
CO2	Apply algorithm design techniques such as divide-and-conquer, greedy, and dynamic programming methods.
CO3	Solve optimization and decision problems using suitable algorithmic strategies.
CO4	Evaluate and compare algorithm efficiency for different computational approaches.
TEACHING PEDAGOGY:	
T1	Classroom teaching (white board), Power Point Presentations, Interactive lectures, Inquiry-based teaching
T2	ABL activities, Assignments, Flip Class/ Seminars, Quizzes, Oral Viva-voce examination
ASSESSMENT TOOLS:	

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			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS403	DCC	Design and Analysis of Algorithm	Max	60	20	20	30	20	3	1	2	5
			Min	24	16		14	9				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

ATL1	Quiz
ATL2	Activity Based Learning
ATL3	Midterm Exams
ATL4	Flip Class
ATL5	Seminar Presentation
ATL6	Assignments
ATL7	Poster
ATL8	Oral Viva-voce examination
ATL9	Industrial Visit Report

PREREQUISITES:

- Basic Computer Knowledge
- Fundamentals of Programming and Data Structures
- Mathematical and Logical Reasoning Skills

SYLLABUS:

Module	Descriptors/Topics	Hours	Assessment Tools
I	**Introduction to Algorithms:** Introduction to algorithms, characteristics of algorithms, asymptotic notations including Big-O, Ω, and Θ notations, and analysis of time and space complexity. Best case, average case, and worst-case analysis of algorithms along with performance evaluation techniques. Applications of algorithm analysis in problem solving and computing.	9	ATL1, ATL3, ATL6
II	**Divide and Conquer Techniques:** Concept of divide and conquer strategy, binary search, merge sort, quick sort, recurrence relations, and methods for solving recurrences. Complexity analysis of divide and conquer algorithms using asymptotic notations.	9	ATL1 ATL1, ATL3, ATL6

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			Marks	THEORY			PRACTICAL		L	T	P	CREDITS
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS403	DCC	Design and Analysis of Algorithm	Max	60	20	20	30	20	3	1	2	5
			Min	24	16		14	9				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

	Applications of divide and conquer techniques in sorting and searching problems.		
III	**Greedy Algorithms:** Introduction to greedy method, characteristics of greedy algorithms, and applications in optimization problems. Activity selection problem, Huffman coding, minimum spanning tree using Prim's and Kruskal's algorithms, and greedy approach for efficient problem solving. Complexity analysis and applications of greedy techniques in networks and data compression.	9	ATL1, ATL3, ATL6
IV	**Dynamic Programming:** Introduction to dynamic programming, principles of optimal substructure and overlapping subproblems, and comparison with divide and conquer. Applications including 0/1 knapsack problem, longest common subsequence, matrix chain multiplication, and shortest path problems. Complexity analysis and applications of dynamic programming in optimization problems.	9	ATL1, ATL3, ATL6
V	**Backtracking and NP Problems:** Introduction to backtracking technique, state space tree, and problem-solving using recursive approaches. Applications including N-Queen problem, subset sum problem, and concept of traveling salesman problem. Introduction to NP problems, NP-completeness, tractable and intractable problems, and importance in computational complexity theory.	9	ATL1, ATL3, ATL6
	Total Hours	**45**	

ADDITIONAL RESOURCES

A.	**Value addition to course content/ Skill enhancement content:**
	• MIT OpenCourseWare – Introduction to Algorithms • GeeksforGeeks – Algorithms Tutorial • Visualgo Algorithm Visualizations • NPTEL Design and Analysis of Algorithms

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Choice Based Credit System (CBCS) in the light of NEP-2020

Diploma CSE/AI/DS/Cyber Security

SEMESTER-IV (2026-2029)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS403	DCC	Design and Analysis of Algorithm	Max	60	20	20	30	20	3	1	2	5
			Min	24	16		14	9				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

B.	**Remedial classes for slow learners:**
	As per the SVVV SOP for slow and fast learners.

SUGGESTED READINGS:

Textbooks

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, 3rd Edition, MIT Press, 2009.
2. Ellis Horowitz, Sartaj Sahni, and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, 2nd Edition, Universities Press, 2008.
3. Anany Levitin, Introduction to the Design and Analysis of Algorithms, 3rd Edition, Pearson Education, 2012.

Reference Books:

1. Alfred V. Aho, John E. Hopcroft, and Jeffrey D. Ullman, *The Design and Analysis of Computer Algorithms* Pearson Education, 2006.
2. Sara Baase and Allen Van Gelder, *Computer Algorithms: Introduction to Design and Analysis*, 3rd Edition, Pearson Education, 2000.
3. Jon Kleinberg and Éva Tardos, *Algorithm Design*, Pearson Education, 2005.

Suggested e- resources (Websites/e- books)

- NPTEL – Design and Analysis of Algorithms
- MIT OpenCourseWare – Algorithms
- Visualgo Algorithm Simulator
- GeeksforGeeks – Algorithm Tutorials

LIST OF PRACTICAL

S.	Practical Title	CO Mapping

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Choice Based Credit System (CBCS) in the light of NEP-2020

Diploma CSE/AI/DS/Cyber Security

SEMESTER-IV (2026-2029)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS403	DCC	Design and Analysis of Algorithm	Max	60	20	20	30	20	3	1	2	5
			Min	24	16		14	9				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

No.		
1	Implement asymptotic analysis for comparing algorithm efficiency.	CO1
2	Implement binary search and analyze its time complexity.	CO1
3	Implement merge sort and quick sort algorithms with performance comparison.	CO2
4	Solve recurrence relations using substitution and recursion tree methods.	CO2
5	Implement greedy algorithms for activity selection problems.	CO2
6	Implement Huffman coding for data compression.	CO2
7	Implement Prim's and Kruskal's algorithms for minimum spanning tree generation.	CO3
8	Implement dynamic programming solutions for 0/1 knapsack and longest common subsequence problems.	CO3
9	Implement matrix chain multiplication using dynamic programming.	CO3
10	Implement backtracking algorithms for N-Queen and subset sum problems.	CO3
11	Analyze shortest path algorithms and compare algorithmic efficiency.	CO4
12	Develop a mini project demonstrating optimization using algorithmic techniques.	CO4

COURSE ARTICULATION MATRIX (MAPPING OF COs WITH POs)

Course Outcomes	Correlation with POs												Correlation with PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	1	3	-	-	-	1	1	-	3	2	1	1
CO2	3	3	2	2	3	2	-	3	2	2	1	3	3	1	3
CO3	3	3	3	3	3	2	1	2	3	2	2	3	3	2	3
CO4	3	3	3	3	3	2	1	2	2	2	1	3	3	2	3

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Diploma CSE/AI/DS/Cyber Security

SEMESTER-IV (2026-2029)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS403	DCC	Design and Analysis of Algorithm	Max	60	20	20	30	20	3	1	2	5
			Min	24	16		14	9				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

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Choice Based Credit System (CBCS) in the light of NEP-2020

Diploma CSE/Cyber Security/AI/DS

SEMESTER-IV (2025-20228)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS404	DCC	Web Technologies	Max	00	00	00	00	50	0	0	4	2
			Min	00	00		00	23				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:	
The student will have ability to:	
1.	To understand the basic concepts of Internet, WWW, and web architecture
2.	To develop skills in designing web pages using HTML and CSS
3.	To apply styling techniques for creating responsive and attractive web pages
4.	To introduce client-side scripting using JavaScript for dynamic web pages
5.	To understand basic server-side scripting and web hosting concepts
COURSE ALIGNMENT WITH UNSDG:	
The Course aims to fulfill the United Nations Sustainable Development Goals, **SDG 4 (Quality Education)** and **SDG 9 (Industry, Innovation and Infrastructure)**.	
COURSE OUTCOMES:	
After completion of the course, the student will be able to:	

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Choice Based Credit System (CBCS) in the light of NEP-2020

Diploma CSE/Cyber Security/AI/DS

SEMESTER-IV (2025-20228)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS404	DCC	Web Technologies	Max	00	00	00	00	50	0	0	4	2
			Min	00	00		00	23				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

CO1	Explain the working of Internet, WWW, and web technologies
CO2	Design static web pages using HTML and CSS
CO3	Apply CSS concepts to create responsive and user-friendly web layouts
CO4	Develop interactive web pages using JavaScript and DOM manipulation
CO5	Explain the working of Internet, WWW, and web technologies
TEACHING PEDAGOGY:	
T1	Classroom teaching (white board), Power Point Presentations, Interactive lectures, Inquiry-based teaching
T2	ABL activities, Assignments, Flip Class/ Seminars, Quizzes, Oral Viva-voce examination
ASSESSMENT TOOLS:	
ATL 1	Quiz
ATL 2	Activity Based Learning
ATL	Midterm Exams

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Diploma CSE/Cyber Security/AI/DS

SEMESTER-IV (2025-20228)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS404	DCC	Web Technologies	Max	00	00	00	00	50	0	0	4	2
			Min	00	00		00	23				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

3	
ATL 4	Flip Class
ATL 5	Seminar Presentation
ATL 6	Assignments
ATL 7	Poster
ATL 8	Oral Viva-voce examination
ATL 9	Industrial Visit Report
PREREQUISITES:	
Basic knowledge of computer system.	

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SEMESTER-IV (2025-20228)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS404	DCC	Web Technologies	Max	00	00	00	00	50	0	0	4	2
			Min	00	00		00	23				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

SYLLABUS:

Module	Descriptors/Topics	Hours	Assessment Tools
I	**Introduction to Web Technologies:** Internet basics, World Wide Web (WWW), Web browsers, Web servers, Client-server architecture, HTTP/HTTPS protocol, URL structure, Domain names, Introduction to HTML, Basic structure of HTML document	9	ATL1, ATL2, ATL6
II	**HTML and CSS:** HTML elements and attributes, Headings, Paragraphs, Lists, Links, Images, Tables, Forms, Semantic HTML, Introduction to CSS, Types of CSS (inline, internal, external), Selectors, Colors, Backgrounds, Borders, Margins, Padding, Box model	9	ATL4, ATL5, ATL8
III	**Advanced CSS and Responsive Design:** CSS positioning, Flexbox, Grid layout, Media queries, Responsive web design, Bootstrap basics, Navigation bars, Cards, Forms styling, CSS animations and transitions	9	ATL2, ATL6, ATL8
IV	**JavaScript Fundamentals:** Introduction to JavaScript, Variables, Data types, Operators, Control statements, Functions, Arrays, Objects, DOM manipulation, Event handling, Form validation, Basic debugging	9	ATL1,

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SEMESTER-IV (2025-20228)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS404	DCC	Web Technologies	Max	00	00	00	00	50	0	0	4	2
			Min	00	00		00	23				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

	techniques.		ATL3, ATL8
V	**Server-side Basics and Web Hosting:** Introduction to server-side scripting, Basics of PHP or Node.js, Handling forms with server-side scripts, Database connectivity basics, Introduction to MySQL, CRUD operations, Web hosting concepts, FTP, Domain and hosting setup.	9	ATL2, ATL7, ATL9
	Total Hours	**60**	

ADDITIONAL RESOURCES

A.	**Value addition to course content/ Skill enhancement content:**
	Development of logical thinking, coding standards, and industry-oriented programming skills.
B.	**Remedial classes for slow learners:**
	As per the SVVV SOP for slow and fast learners.

SUGGESTED READINGS:

Textbooks:

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

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Choice Based Credit System (CBCS) in the light of NEP-2020

Diploma CSE/Cyber Security/AI/DS

SEMESTER-IV (2025-20228)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS404	DCC	Web Technologies	Max	00	00	00	00	50	0	0	4	2
			Min	00	00		00	23				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

1.	Jon Duckett, HTML and CSS: Design and Build Websites, John Wiley & Sons, 2011, ISBN 978-1118008188.
2.	Jon Duckett, JavaScript and JQuery: Interactive Front-End Web Development, John Wiley & Sons, 2014, ISBN 978-1118531648.
Reference Books:	
1.	Jennifer Niederst Robbins, Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics, O'Reilly Media, 2018, ISBN 978-1491960202.
2.	Anne Boehm and Zak Ruvalcaba, Murach's HTML5 and CSS3, Mike Murach & Associates, 2018, ISBN 978-1943872260.
Suggested e- resources (Websites/e- books)	
https://onlinecourses.swayam2.ac.in/nou25_ma10/preview	
https://www.codecademy.com/catalog/subject/web-development	
LIST OF PRACTICAL	

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SEMESTER-IV (2025-20228)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS404	DCC	Web Technologies	Max	00	00	00	00	50	0	0	4	2
			Min	00	00		00	23				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

	Title	CO Mapping
1.	Design a web page using HTML tables and images with proper formatting	CO2
2.	Develop a student registration form using HTML form elements and input controls	CO2, CO5
3.	Apply CSS (inline, internal, external) to style a web page	CO2
4.	Create a responsive web page using CSS media queries	CO3
5.	Design a webpage layout using Flexbox or Grid system	CO3
6.	Develop a website navigation menu using HTML and CSS	CO2, CO3
7.	Write JavaScript programs using variables, operators, and control statements	CO4
8	Create dynamic web pages using JavaScript DOM manipulation and event handling	CO4
9.	Perform form validation using JavaScript and connect basic form data handling	CO4, CO5
10.	Design a web page using HTML tables and images with proper formatting	CO2, CO3, CO4

COURSE ARTICULATION MATRIX (MAPPING OF COs WITH POs)

Course	Correlation with POs	Correlation with

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Diploma CSE/Cyber Security/AI/DS

SEMESTER-IV (2025-20228)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS404	DCC	Web Technologies	Max	00	00	00	00	50	0	0	4	2
			Min	00	00		00	23				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Outcomes													PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	–	–	2	–	–	–	–	–	–	1	2	1	1
CO2	3	2	3	1	3	–	–	–	–	1	–	1	3	2	2
CO3	3	3	3	1	3	–	–	–	–	1	–	1	2	3	2
CO4	3	3	3	2	3	–	–	–	1	1	–	2	2	3	3
CO5	3	3	2	2	3	–	–	–	1	1	–	2	2	3	3

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Choice Based Credit System (CBCS) in the light of NEP-2020

Diploma CSE

SEMESTER-IV (2026-2029)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS405	DCC	Discrete Mathematics	Max	60	20	20	00	00	3	1	0	4
			Min	24	16		00	00				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:	
The student will have ability to:	
1.	To build strong mathematical foundations required for computer science, cyber security, and computational problem solving.
2.	To develop logical reasoning and analytical skills using discrete mathematical structures and techniques.
3.	To understand sets, relations, functions, and combinatorial methods used in computer science applications.
4.	To apply graph theory, recurrence relations, and Boolean algebra in solving computing and networking problems.
5.	To enhance problem-solving abilities for algorithms, data structures, cryptography, and digital systems using discrete mathematics concepts.
COURSE ALIGNMENT WITH UNSDG:	
The Course aims to fulfill the United Nations Sustainable Development Goals, **SDG 4 (Quality Education)** and **SDG 9 (Industry, Innovation and Infrastructure)**.	
COURSE OUTCOMES:	
After completion of the course, the student will be able to:	
CO1	Apply propositional logic, predicate logic, and proof techniques to solve computational problems.
CO2	Analyze sets, relations, and functions for mathematical and computing applications.
CO3	Solve combinatorial problems and recurrence relations using discrete mathematical techniques.
CO4	Apply graph theory and Boolean algebra concepts in computer science and networking problems.
TEACHING PEDAGOGY:	
T1	Classroom teaching (white board), Power Point Presentations, Interactive lectures, Inquiry-based teaching
T2	ABL activities, Assignments, Flip Class/ Seminars, Quizzes, Oral Viva-voce examination
ASSESSMENT TOOLS:	
ATL1	Quiz/Test

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Diploma CSE

SEMESTER-IV (2026-2029)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS405	DCC	Discrete Mathematics	Max	60	20	20	00	00	3	1	0	4
			Min	24	16		00	00				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

ATL2	Activity-Based Learning Evaluation
ATL3	Midterm Examination
ATL4	Flip Classroom Assessment
ATL5	Seminar Presentation
ATL6	Assignments and Tutorials
ATL7	Poster/Case Study Presentation
ATL8	Oral Viva-Voce Examination
ATL9	Problem Solving/Practical Evaluation

PREREQUISITES:

- Basic Mathematics Knowledge
- Fundamental Computer Knowledge
- Logical and Analytical Thinking Skills

SYLLABUS:

Module	Descriptors/Topics	Hours	Assessment Tools
I	**Logic and Propositions:** Introduction to Discrete Mathematics, statements and propositions, logical operators, truth tables, logical equivalence, tautology, contradiction, and laws of logic. Predicates, quantifiers, rules of inference, proof techniques including direct proof, proof by contradiction, contraposition, and mathematical induction. Applications of logic in computer science, algorithms, and problem solving.	9	ATL1, ATL3, ATL6
II	**Sets, Relations, and Functions:** Fundamentals of sets, subsets, power sets, set operations, Cartesian products, and Venn diagrams. Relations including reflexive, symmetric, transitive, equivalence relations, and partial ordering relations. Functions, types of functions, one-one and onto mappings, inverse and composite functions, and applications in computing and discrete systems.	9	ATL1, ATL3, ATL6
III	**Combinatorics:** Counting principles including addition and multiplication principles, permutations, combinations, circular permutations, and	9	

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Choice Based Credit System (CBCS) in the light of NEP-2020
Diploma CSE
SEMESTER-IV (2026-2029)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME						L	T	P	CREDITS
			Marks	THEORY			PRACTICAL					
				END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTCS405	DCC	Discrete Mathematics	Max	60	20	20	00	00	3	1	0	4
			Min	24	16		00	00				

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

	combinations with repetition. Binomial theorem, pigeonhole principle, inclusion-exclusion principle, recursive counting, and applications of combinatorics in probability, cryptography, algorithms, and computer science.		ATL1, ATL3, ATL6
IV	**Graph Theory:** Introduction to graphs, types of graphs, graph representation, degree of vertices, paths, circuits, connectivity, and trees. Binary trees, spanning trees, minimum spanning trees, graph traversal techniques including Breadth First Search (BFS) and Depth First Search (DFS), shortest path algorithms, and applications of graph theory in networking, routing, and computing systems.	9	ATL1, ATL3, ATL6
V	**Recurrence Relations and Discrete Structures:** Recurrence relations, homogeneous and non-homogeneous recurrence relations, methods of solving recurrence relations, and generating functions. Algebraic structures including semigroups, monoids, groups, lattices, and Boolean algebra with Boolean laws and simplification techniques. Applications of discrete structures in algorithms, digital systems, automata theory, and cyber security.	9	ATL1, ATL3, ATL6
	Total Hours	**45**	

ADDITIONAL RESOURCES

A.	**Value addition to course content/ Skill enhancement content:**
	• NPTEL Discrete Mathematics Course • MIT OpenCourseWare – Mathematics for Computer Science • GeeksforGeeks – Discrete Mathematics Tutorials
B.	**Remedial classes for slow learners:**
	As per the SVVV SOP for slow and fast learners.

SUGGESTED READINGS:

Textbooks

1.	Kenneth H. Rosen, Discrete Mathematics and Its Applications, 7th Edition, McGraw-Hill, 2012.
2.	J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill, 1975.

Chairperson	Chairperson	Controller of Examination	Registrar
Board of Studies, Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore	Faculty of Studies, Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore	Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore	Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

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3.	Richard Johnsonbaugh, Discrete Mathematics, 8th Edition, Pearson Education, 2017.

Reference Books:

1. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall, 1974.
2. C. L. Liu, Elements of Discrete Mathematics, 2nd Edition, McGraw-Hill, 1985.
3. Seymour Lipschutz and Marc Lipson, Discrete Mathematics, Schaum's Outline Series, McGraw-Hill, 2007.

Suggested e- resources (Websites/e- books)

1.	NPTEL Discrete Mathematics
2.	MIT OpenCourseWare – Mathematics for Computer Science
3.	Khan Academy – Logic and Discrete Mathematics

LIST OF TUTORIALS

S. No	Practical Title	CO Mapping
1	To construct truth tables for logical propositions.	CO1
2	To verify logical equivalence and laws of logic.	CO1
3	To solve problems using mathematical induction and proof techniques.	CO1
4	To perform operations on sets and verify set identities.	CO2
5	To analyze properties of relations and equivalence relations.	CO2
6	To implement and analyze functions and mappings.	CO2
7	To solve permutation and combination problems.	CO3
8	To apply pigeonhole principle and inclusion-exclusion principle in problem solving.	CO3
9	To represent and analyze graphs using adjacency matrix and adjacency list.	CO4
10	To perform BFS and DFS graph traversal techniques.	CO4
11	To solve recurrence relations using iterative and recursive methods.	CO3
12	To simplify Boolean expressions using Boolean algebra laws.	CO4

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COURSE ARTICULATION MATRIX (MAPPING OF COs WITH POs)

Course Outcomes	Correlation with POs												Correlation with PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	3	2	1	2	-	-	-	1	1	-	2	2	1	1
CO2	3	3	2	2	2	1	-	1	2	1	-	2	2	1	2
CO3	3	3	3	2	2	1	-	1	2	1	1	2	3	2	2
CO4	3	3	3	3	3	2	1	2	2	2	1	3	3	2	3

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