Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Shri Vaishnav Institute of Information Technology

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

B. Tech (CSE/ IT) - All Programs

SEMESTER- III/IV (2025-29)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS301N	DCC	Discrete Structures	60	20	20	0	0	3	0	0	3

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. Provide the fundamentals of formal techniques for solving the problems in computational domain and algorithm development.
2. Apply appropriate mathematical and statistical concepts and operations to interpret data and to solve problems
3. Formulate and evaluate possible solutions to problems, and select and defend the chosen solutions
4. Construct graphs and charts, interpret them, and draw appropriate conclusions.

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Apply set theory, relations, and functions to solve computational problems.
2. Analyse logical statements and proofs using propositional and predicate logic, truth tables, and inference rules to determine validity and correctness of arguments.
3. Evaluate and construct graph-theoretic and algebraic structures to model and solve real-world problems in computer science.

SYLLABUS

UNIT I — 10 HOURS

Set Theory-

Definition of Sets, Venn Diagrams, complements, Cartesian products, power sets, counting principle, cardinality and countability (Countable and Uncountable sets), pigeonhole principle. Relation: Definition, types of relation, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation. Function: Definition and types of function, composition of functions, recursively defined functions.

UNIT II — 9 HOURS

Propositional logic

Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradiction, normal forms (conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification. Notion of proof: proof by implication, converse, inverse, contra positive, negation, and contradiction, proof by using truth table.

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UNIT III — 9 HOURS

Graph Theory

Terminology Graph Representation Graph isomorphism; Connectedness; Various graph properties; Euler & Hamiltonian graph; shortest paths algorithms. Trees: Terminology; Tree traversals; prefix codes; Spanning trees; Minimum spanning trees.

UNIT IV — 9 HOURS

Algebraic Structure

Binary composition and its properties definition of algebraic structure; Groupoid, Semi group, Monoid Groups, A belian Group, properties of groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (definition and standard results).

UNIT V — 9 HOURS

Posets, Hasse Diagram and Lattices

Introduction, ordered set, well-ordered set, Hasse diagram of partially, Lattices, properties of Lattices, bounded and complemented lattices. Generating functions, Solution by method of generating functions. Recurrence Relation and Generating Function: Introduction to Recurrence Relation, Linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions.

TEXTBOOKS:

1. J. P. Tremblay and R. Manohar, *Discrete Mathematical Structures with Applications to Computer Science*, 1st ed. New York, NY, USA: McGraw-Hill, 2017.

REFERENCE:

1. K. H. Rosen, *Discrete Mathematics and Its Applications*, 8th ed. New York, NY, USA: McGraw-Hill, 2021.
2. B. Biswal, *Discrete Mathematics and Graph Theory*, 4th ed. New Delhi, India: PHI Learning, 2015.
3. S. Lipschutz and M. Lipson, *Discrete Mathematics*, 4th ed. New Delhi, India: Tata McGraw-Hill, 2021.
4. C. L. Liu and D. P. Mohapatra, *Elements of Discrete Mathematics*, 4th ed. New Delhi, India: Tata McGraw-Hill, 2017.

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SEMESTER- IV (2025-29)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS401N	DCC	Data Base Management Systems	60	20	20	30	20	3	0	2	4

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:

1. To differentiate among the various database systems according to their function.
2. To understand the process to develop database model and database design.
3. To understand managing a database using Structured Query Language.
4. To expand an understanding of necessary DBMS concepts such as: Database Transactions, Database Security, Integrity, Concurrency.
5. To understand and build a straightforward database system and show competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Construct conceptual data models by identifying the entities and relationships.
2. Evaluate the normality of a logical data model and correct any anomalies.
3. Develop physical data models for relational database management systems.
4. Implement relational databases using RDBMS
5. Work as a valuable member of a database design and implementation team.

SYLLABUS

UNIT I — 10 HOURS

Introduction: Concept & Overview of DBMS, Three Schema Architecture of DBMS, Database Approach v/s Traditional File Accessing Approach, Advantages of Database Systems, Data Models, Schema and Instances, Data Independence, Data Base Language and Interfaces, Functions of DBA and Designer, Database Users.

Entity-Relationship Model: Basic concepts, Design Issues, Mapping Constraints, Keys, Entity- Relationship Diagram, Weak Entity Sets and Extended E-R features. ER Diagram to Relational Table conversion.

UNIT II — 9 HOURS

Relational Model: Structure of Relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Joins and its type. Integrity Constraints. Referential Integrity, Intension and Extension.

UNIT III — 8 HOURS

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
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SQL and PL/SQL: SQL commands, Set operations, Aggregate Functions, Null Values, Domain Constraints, Assertions, Views, Nested Sub Queries, Stored Procedures and Triggers, Database Security, Application development using PLSQL.

Relational Database Design: Functional Dependency, Database Anomalies, Normalization and its forms, Multi-Valued Dependencies, 4NF, Join Dependency, 5NF.

UNIT IV — 9 HOURS

Transaction and Concurrency Control: Physical Data Structures, Query Optimization, Transaction Model properties, State Serializability, Concurrency control protocols, Multiple Granularities, Granularity of Data Item. Multi version schemes, Database Recovery Methods, Recovery in Multi-Database System and Database Backup and Recovery from Catastrophic Failure

UNIT V — 9 HOURS

File Organization and Index Structure: File & Record Concept, placing file records on Disk, Types of Records, Types of Single-Level Index, Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree. Mongo DB, NoSQL types, Features and tools.

TEXTBOOKS:

1. H. F. Korth and A. Silberschatz, *Database System Concepts*, 7th ed. New York, NY, USA: McGraw-Hill Education, 2019.

REFERENCE:

1. R. Ramakrishnan and J. Gehrke, *Database Management Systems*, 3rd ed. New York, NY, USA: McGraw-Hill Education, 2003.
2. A. Kahate, *Introduction to Database Management Systems*. New Delhi, India: Pearson Education India, 2006.
3. C. J. Date, *An Introduction to Database Systems*, 8th ed. Boston, MA, USA: Pearson Education, 2004.
4. I. Bayross, *SQL, PL/SQL: The Programming Language of Oracle*, 4th rev. ed. New Delhi, India: BPB Publications, 2010.
5. R. Elmasri and S. B. Navathe, *Fundamentals of Database Systems*, 7th ed. Harlow, U.K.: Pearson Education, 2016.
6. S. Kedar, *Database Management System*. Pune, India: Technical Publications, 2009.

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BTCS401N	DCC	Data Base Management Systems	60	20	20	30	20	3	0	2	4

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7. R. Chopra, *Database Management System (DBMS): A Practical Approach*. New Delhi, India: S. Chand Publishing, 2017.

LIST OF PRACTICALS

1. Design a Database and create required tables. For e.g. Bank, College Database.
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for table and record handling like implementing INSERT statement, using SELECT and INSERT together, DELETE, UPDATE, TRUNCATE statements and DROP, ALTER statements.
4. Write the queries for Retrieving Data from a Database Using the WHERE clause, using Logical Operators in the WHERE clause, Using IN, BETWEEN, LIKE, ORDER BY, GROUP BY and HAVING Clause, Using Aggregate Functions and Combining Tables Using JOINS.
5. Write the query for implementing the following functions: MAX (), MIN (), AVG (), COUNT ().
6. Write the query to implement the concept of Integrity constraints.
7. Write the query to create the views.
8. Perform the queries for triggers.
9. Perform the following operation for demonstrating the insertion, updating and deletion using the referential integrity constraints.
10. Write the query for creating the users and their role. Using GRANT and REVOKE operations.
11. Develop a small application for a patient admitted in a hospital which has capability of inserting, deleting, updating, the patient record. The application should also be able to search the patients' record by its id.

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SEMESTER- IV (2025-29)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS302N	DCC	Analysis & Design of Algorithms	60	20	20	30	20	3	0	2	4

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:

1. To learn algorithm analysis techniques.
2. To critically analyse the efficiency of alternative algorithmic solutions for the same problem
3. To understand the limitation of algorithm power.
4. To understand different algorithm design techniques.

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Design algorithms for a given problem using standard algorithm design techniques.
2. Explain different standard algorithm design techniques, namely, divide & conquer, greedy, dynamic programming, backtracking and branch & bound.
3. Analyze and compare the efficiency of various algorithms of a given problem.
4. Identify the types of problem, formulate, analyze and compare the efficiency of algorithms.

SYLLABUS

UNIT I — 10 HOURS

Algorithms Designing: Algorithms, Analyzing Algorithms, Asymptotic Notations, Heap Sort, Sorting and Searching Algorithms and their Analysis in terms of Space and Time Complexity.

Divide and Conquer: General Method, Binary Search, Merge Sort, Quick Sort, Selection Sort, Strassen's Matrix Multiplication Algorithms.

UNIT II — 9 HOURS

Greedy Method: General Method, fractional, Knapsack Problem, Job Sequencing with Deadlines, Minimum-Cost Spanning Tree - Prim's and Kruskal's algorithm, Single Source Shortest Paths.

UNIT III — 8 HOURS

Dynamic Programming: General Method, Optimal Binary Search Trees, O/1 Knapsack, multistage graph, Traveling Salesperson Problem, All Pairs Shortest Paths.

UNIT IV — 7 HOURS

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
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BTCS302N	DCC	Analysis & Design of Algorithms	60	20	20	30	20	3	0	2	4

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.

Backtracking: General Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycles, Sum of Subsets.
Branch and Bound: General Method, O/1 Knapsack Problem, Traveling Salesperson Problem.

UNIT V 8 HOURS

NP Hard and NP Complete Problems: Basic Concepts, Cook's Theorem, NP Hard Graph and NP Scheduling Problems, Some Simplified NP Hard Problems.

TEXTBOOKS:

1. E. Horowitz, S. Sahni, and S. Rajasekaran, *Fundamentals of Computer Algorithms*, 2nd ed. New Delhi, India: Universities Press (India) Pvt. Ltd., 2008.

REFERENCE:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, *Introduction to Algorithms*, 4th ed. Cambridge, MA, USA: MIT Press, 2022.
2. D. E. Knuth, *The Art of Computer Programming, Vol. 1: Fundamental Algorithms*, 3rd ed. Boston, MA, USA: Addison-Wesley, 1997.
3. S. E. Goodman and S. T. Hedetniemi, *Introduction to the Design and Analysis of Algorithms*. New York, NY, USA: McGraw-Hill, 1977.
4. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani, *Algorithms*. New Delhi, India: Tata McGraw-Hill, 2006.
5. Massachusetts Institute of Technology, "Design and Analysis of Algorithms (6.046J/18.410J)," *MIT OpenCourseWare*, 2005. [Online]. Available: https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2005/
6. Stanford University, T. Roughgarden, "Algorithms: Design and Analysis, Part I & II," *Stanford Online/YouTube*, 2011. [Online]. Available: https://www.youtube.com/playlist?list=PLoROMvodv4rO1NB9TD4iUZ3qghGEGtqNX

LIST OF PRACTICALS

1. Write a program for Iterative and Recursive Binary Search.
2. Write a program for Merge Sort.
3. Write a program for Quick Sort.

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SEMESTER- IV (2025-29)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
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BTCS302N	DCC	Analysis & Design of Algorithms	60	20	20	30	20	3	0	2	4

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4. Write a program for Strassen's Matrix Multiplication
5. Write a program for minimum spanning trees using Kruskal's algorithm.
6. Write a program for minimum spanning trees using Prim's algorithm.
7. Write a program for single sources shortest path algorithm.
8. Write a program for Floyd-Warshal algorithm.
9. Write a program for traveling salesman problem.
10. Write a program for Hamiltonian cycle problem.

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

B. Tech CSE / IT / CSE (ES/MA/BDCE)

SEMESTER-IV (2025-2029)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
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BTDSE420	DSE	Introduction to Machine Learning	60	20	20	30	20	3	0	2	4

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COURSE OBJECTIVES:

The student will have ability:

1. To introduce the landscape of Machine Learning through real-world applications and engineering use cases.
2. To provide mathematical and algorithmic grounding in supervised and unsupervised learning.
3. To enable students to design and evaluate regression and classification systems.
4. To explore ensemble methods for improving model robustness in complex industrial environments.
5. To master the discovery of hidden patterns and relationships in transactional data through Association Mining.

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Identify and categorize machine learning use cases across various engineering domains.
2. Design and implement robust supervised learning models (Regression/Classification) for predictive analysis.
3. Apply ensemble techniques to solve high-variance engineering data problems.
4. Implement unsupervised clustering techniques for data segmentation and pattern recognition.
5. Extract meaningful "if-then" relationships from large datasets using Association Rule Mining metrics like Support, Confidence, and Lift.

SYLLABUS

UNIT I — 9 HOURS

Introduction, Applications, and Use Cases: - What is Machine Learning? The ML Pipeline: Data Acquisition to Deployment. **Application Domains:** Healthcare (Diagnostics), Finance (Fraud Detection), Transportation (Autonomous Routes), and E-commerce. **Engineering Use Cases:** Predictive Maintenance, Smart Agriculture (Crop selection), and Cyber Security (Threat detection). Types of Learning: Supervised, Unsupervised, Semi-supervised, and Reinforcement Learning.

UNIT II — 9 HOURS

Supervised Learning - Linear Models: - Mathematical Foundations: Linear Algebra and Probability recap. Linear Regression: Cost functions, Gradient Descent, and Multivariate analysis. Logistic Regression: Sigmoid function and Decision boundaries. **Evaluation Metrics:** Confusion Matrix, Precision, Recall, and F1-Score.

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BTDSE420	DSE	Introduction to Machine Learning	60	20	20	30	20	3	0	2	4

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UNIT III 9 HOURS

Advanced Classification and Ensemble Methods: - Decision Trees (ID3, CART), Support Vector Machines (SVM): Linear and Kernel tricks. **Ensemble Learning:** The power of "Wisdom of the Crowd"—Bagging (Random Forests) and Boosting (Ada Boost, XG Boost). Model Selection: Bias-Variance Tradeoff and Cross-Validation.

UNIT IV 9 HOURS

Unsupervised Learning – Clustering: - Introduction to Unsupervised Learning. Clustering Algorithms: K-Means, Hierarchical Clustering (Agglomerative), and Density-based spatial clustering (DBSCAN). Dimensionality Reduction: Principal Component Analysis (PCA) and t-SNE for visualization.

UNIT V 9 HOURS

Association Rule Mining: - Foundations of Association Rules: Market Basket Analysis. **Key Metrics:** Support, Confidence, and Lift. Algorithms for Frequent Item set Mining: **Apriority Algorithm** (Join and Prune), **FP-Growth** (Frequent Pattern Tree), and **Éclat**. Applications in recommendation engines and retail inventory management.

TEXTBOOKS:

1. T. M. Mitchell, Machine Learning. New York, NY, USA: McGraw-Hill, 1997.
2. E. Alpaydin, *Introduction to Machine Learning*, 4th ed. Cambridge, MA, USA: MIT Press, 2020.

REFERENCE:

1. J. Han, M. Kamber, and J. Pei, *Data Mining: Concepts and Techniques*, 3rd ed. Waltham, MA, USA: Morgan Kaufmann, 2011. (Best for Association Mining).
2. S. J. Russell and P. Norvig, *Artificial Intelligence: A Modern Approach*, 4th ed. Upper Saddle River, NJ, USA: Pearson, 2020.
3. A. Geron, *Hands-On Machine Learning with Scikit-Learn, Keras, and Tensor Flow*, 3rd ed. Sebastopol, CA, USA: O'Reilly Media, 2022.
4. T. M. Mitchell, "Machine Learning (10-601) Lecture Series," *Carnegie Mellon University, YouTube*, 2015. [Online]. Available: https://www.youtube.com/watch?v=m4NlfvrRCdg&list=PLl-BBnDxtUt1hLXmIwu27P22bTi6VwMkN
5. Stanford University, A. Ng, "Machine Learning," *Stanford Online, YouTube*, 2008. [Online]. Available:

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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.

https://www.youtube.com/watch?v=jGwO_UgTS7I&list=PLoROMvodv4rMiGQp3WXShtMGgzqpfVfbU

6. Massachusetts Institute of Technology, "Machine Learning (6.867)," *MIT OpenCourseWare, YouTube*, 2020. [Online]. Available: https://www.youtube.com/watch?v=_PwhiWxHK8o&list=PLnvKubj2-I2LhIibS8TOGC42xsD3-liux

LIST OF PRACTICALS

1. Case Study Analysis: Map three real-world problems from your "Smart City Indore" initiative to ML tasks.
2. Linear Regression: Predict energy consumption in a manufacturing plant based on historical data.
3. Logistic Regression: Classify emails as "Sajag" (Safe) or "Malicious" (Phishing).
4. Decision Trees: Predict soil suitability for different crops in the MP region.
5. Ensemble Lab: Compare a single Decision Tree vs. a Random Forest for predicting student internship placements.
6. Clustering: Segment local farmers into groups based on sensor data (Moisture, Nitrogen, pH).
7. PCA Lab: Reduce a 10-feature agricultural dataset to 2 features and visualize clusters.
8. Apriori Implementation: Use the Apriori algorithm to find frequently bought product pairs from a retail dataset.
9. FP-Growth Lab: Compare the execution time of Apriori vs. FP-Growth on a large transactional dataset.
10. Recommendation System: Build a simple "Customers who bought this also liked" feature using association rules.
11. Capstone Project

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BTDSE423M	DSE	Information Storage and Management	60	20	20	30	20	3	0	2	4

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COURSE OBJECTIVES:

The student will have ability to:

1. An ability to understand various storage architecture & technologies.
2. An ability to understand various technologies used to provide backup & recovery.
3. An ability to understand various techniques used to provide security.
4. Ability to identify information storage system requirements.
5. An ability to develop policy for information storage system.
6. An ability to develop policy for backup& recovery.

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Describe & apply storage technologies.
2. Identify storage technologies that provide cost effective IT solutions for medium to large scale businesses & data centers.
3. Manage Virtual Server & Storage between Remote locations.
4. Design analysis and managing clusters of resources

SYLLABUS

UNIT I — 10 HOURS

Introduction: Digital data and its types, Information storage, Key characteristics of data center, Evolution of computing platforms. Introduction to storage technology: Data Proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information life Cycle Management, Data categorization.

UNIT II — 9 HOURS

Storage System Architecture: Intelligent disk subsystems overview, Contrast of integrands modular array, Component Architecture of Intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.

UNIT III — 8 HOURS

Introduction to network storage: JBOD, DAS, NAS, SAN & CAS evolution and comparison, Applications, Elements, Connectivity, standards, management, security and limitations of DAS, NAS, CAS & SAN.

UNIT IV — 9 HOURS

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
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BTDSE423M	DSE	Information Storage and Management	60	20	20	30	20	3	0	2	4

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.

Hybrid storage solutions and virtualization: memory, network, server, storage & appliances. Datacenters concepts & requirements, Backup and disaster recovery. Industry Management standards, standard framework applications, Key management metrics

UNIT V 9 HOURS

Information storage on clouds: concept of cloud, cloud computing, storage on cloud, Cloud benefits, Cloud computing evolution. Application & services on cloud, cloud service providers, cloud deployment models, Essential characteristics of cloud computing.

TEXTBOOKS:

1. G. Somasundaram and A. Shrivastava, Eds., *ISM: Storing, Managing, and Protecting Digital Information*. New Delhi, India: Wiley India, 2011.
2. Saurabh, *Cloud Computing: Insight into New Era Infrastructure*. New Delhi, India: Wiley India, 2012.

REFERENCE:

1. U. Troppens, W. Mueller-Friedt, R. Erkens, R. Wolafka, and N. Haustein, *Storage Networks Explained: Basics and Application of Fibre Channel, SAN, NAS, iSCSI, InfiniBand, and FCoE*. Hoboken, NJ, USA: Wiley, 2011.
2. B. Sosinsky, *Cloud Computing Bible*. Hoboken, NJ, USA: Wiley India, 2011.

LIST OF PRACTICALS

1. Understand working of different storage devices.
2. Perform different steps for data backup and recovery.
2. Analyze various techniques to provide security to data.
3. Understand different policies for information storage and management.
4. Demonstrate how to manage Virtual Server and Storage between remote locations.
5. Understand physical structure and components of hard disc.
6. Analyze how information storage on cloud is performed.

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

B. Tech (CSE/ IT) - All Programs

SEMESTER- IV (2025-29)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTDSE421M	DSE	Computer Graphics and Multimedia	60	20	20	30	20	3	0	2	4

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. Understood basic concepts of computer graphics.
2. Extract the various computer graphics hardware and display technologies.
3. Evaluate various algorithms for scan conversion and filling of basic objects and their comparative analysis.
4. Acquire knowledge about drawing basic shapes such as lines, circle, ellipse, polygon.
5. Remembering knowledge about two- and three-dimensional transformations.
6. Analyze the line and polygon clipping algorithms of the basic shapes.
7. Understood the various Multimedia Operation and file formats

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Apply basic concepts of computer graphics.
2. Able to perform processing of basic shapes by various processing algorithms /techniques.
3. Design two and three-dimensional graphics.
4. Analyze all the types of clipping algorithms for line and polygon.
5. Apply the acquire knowledge about Visible Surface Detection methods, Illumination Models and Surface Rendering.
6. Able to perform various types of color model implication.
7. Acquire knowledge to apply advanced techniques such as fractals, introduction to open GL and Multimedia Systems.

SYLLABUS

UNIT I — 9 HOURS

Introduction to Computer Graphics, Applications of computer graphics, Display devices, Random and Raster scan systems, CRT color monitors, Beam Penetration CRT, The Shadow - Mask CRT, DVST, Graphics input devices, Graphics software and standards.

UNIT II — 10 HOURS

Points and Lines, DDA line drawing algorithm, Bresenham's drawing algorithm, Mid-point Circle drawing algorithm, Mid-point circle drawing algorithm, Mid-point Ellipse drawing algorithm, Parametric Cubic Curves: -

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BTDSE421M	DSE	Computer Graphics and Multimedia	60	20	20	30	20	3	0	2	4

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Bezier and B-Spline curves, Filled Area Primitives: -Scan line polygon fill algorithm, Pattern fill algorithm Inside-Outside Tests, Boundary fill algorithms, Flood fill algorithms

UNIT III **10 HOURS**

2D transformation: Translation, Rotation, Scaling, Shearing, Reflection. Inverse Transformation, Homogenous coordinate system, Matrices Transformation, Composite Transformation.

3D transformations: translation, rotation, scaling. Parallel & Perspective Projection, Types of Parallel & Perspective Projection.Composite transformations Projections, Back Surface detection method Depth Buffer method Scan line method BSP tree method, Area Subdivision method.

UNIT IV **8 HOURS**

Windowing & Clipping: World Coordinate System, Screen Coordinate System, Viewing Transformation, Line Clipping, Cohen Sutherland, Midpoint Line clipping algorithms, Polygon Clipping: Sutherland –Hodgeman, Weiler-Atherton algorithms.

Basic Illumination Model, Diffuse reflection, Specular reflection, Phong Shading Gourand shading, ray tracing, color models like RGB, YIQ, CMY, HSV.

UNIT V **9 HOURS**

Multimedia System: An Introduction, Multimedia hardware, Multimedia System Architecture. Data & File Format standards. i.e RTF, TIFF, MIDI, JPEG, DIB, MPEG, Audio: digital audio, MIDI, processing sound, sampling, compression. Video: Avi, 3GP, MOV, MPEG, compression standards, compression through spatial and temporal redundancy. Multimedia Authoring.

TEXTBOOKS:

1. J. F. Hughes, A. Van Dam, M. McGuire, D. F. Sklar, J. D. Foley, S. K. Feiner, and K. Akeley, *Computer Graphics: Principles and Practice*, 3rd ed. Boston, MA, USA: Addison-Wesley Professional, 2013.

REFERENCE:

1. J. D. Foley, A. Van Dam, S. K. Feiner, and J. F. Hughes, *Computer Graphics: Principles and Practice*, 2nd ed. New Delhi, India: Pearson Education, 2003.

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

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BTDSE421M	DSE	Computer Graphics and Multimedia	60	20	20	30	20	3	0	2	4

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.

2. D. Hearn and M. P. Baker, *Computer Graphics*, 3rd ed. New Delhi, India: Prentice Hall of India, 2007.
3. D. F. Rogers, *Procedural Elements for Computer Graphics*, 2nd ed. New Delhi, India: Tata McGraw-Hill, 1985.
4. J. Jeffcoate, *Multimedia in Practice: Technology and Applications*. New Delhi, India: PHI Learning, 1998.
5. D. Hillman, *Multimedia Technology and Applications*. Albany, NY, USA: Delmar Cengage Learning, 1998.

LIST OF PRACTICALS

1. Implement DDA Line Drawing algorithm .
2. Implement Bresenham's line drawing algorithm.
3. Implement Mid-Point circle drawing algorithm.
4. Implement Mid-Point ellipse drawing algorithm.
5. Implement cubic Bezier curve.
6. Implement a menu-driven program for 2D transformations.
7. Implement Line clipping algorithm using Cohen-Sutherland
8. Implement Polygon Clipping using Sutherland Hodgeman.
9. Implement Scan line fill algorithm.
10. Study of Multimedia and Program for Flash

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

B.Tech. CSE with Specialization in AI Powered Mobile Application - Apple Authorized Training Center

SEMESTER-IV (2025-29)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTMA510	SEC	Flutter Programming	0	0	0	30	20	0	0	2	1

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 the fundamentals of the Dart programming language, including its syntax, data types, and basic constructs.
2. To develop problem-solving skills using control structures, functions, and modular programming in Dart.
3. To provide knowledge of data handling techniques using collections such as lists, sets, and maps along with exception handling.
4. To impart understanding of object-oriented programming concepts such as classes, inheritance, polymorphism, and encapsulation in Dart.
5. To enable learners to build efficient applications using advanced features like asynchronous programming, streams, generics, and file handling

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Describe and explain the fundamental concepts of the Dart programming language, including syntax, data types, and control structures.
2. Apply Dart programming constructs to develop simple programs using functions, loops, and collections.
3. Analyze and implement object-oriented programming concepts such as classes, inheritance, and polymorphism in Dart.
4. Evaluate different programming approaches and handle exceptions effectively in Dart applications.
5. Design and develop efficient Dart applications using advanced features like asynchronous programming, streams, and generics.

SYLLABUS

UNIT I — 6 HOURS

Introduction & Dart Programming: Introduction to mobile app development, Native vs cross-platform frameworks, Introduction to Flutter, Features and advantages of Flutter, Introduction to Dart, Dart basics: variables, data types, operators, Control statements (if, loops), Functions and OOP concepts.

UNIT II — 6 HOURS

Flutter Fundamentals & UI Design: Flutter architecture and project structure, Widgets: Stateless & Stateful, Widget tree and lifecycle, Layouts: Row, Column, Container, Stack, Designing UI with Material Design, Themes, fonts, and assets, Responsive design.

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

B.Tech. CSE with Specialization in AI Powered Mobile Application - Apple Authorized Training Center

SEMESTER-IV (2025-29)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
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BTMA510	SEC	Flutter Programming	0	0	0	30	20	0	0	2	1

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.

UNIT III — 6 HOURS

Navigation & State Management: Navigation and routing, Forms and user input handling, State management basics (setState), Advanced state management: Provider, BLoC (Business Logic Component), Handling dynamic UI updates

UNIT IV — 6 HOURS

Data Handling & Backend Integration: Working with JSON data, REST API integration (HTTP requests), Local storage: Shared Preferences, SQLite, Introduction to Firebase, Authentication and database basics.

UNIT V — 6 HOURS

Advanced Dart Concepts: Animations and transitions, Custom widgets, Packages and plugins, Testing and debugging, Performance optimization, Building APK/IPA files, App publishing (Google Play Store)

TEXTBOOKS:

1. E. Windmill, *Flutter in Action*. Shelter Island, NY, USA: Manning Publications, 2020, ISBN: 978-1617296147.
2. M. Katz, K. D. Moore, and V. Ngo, *Flutter Apprentice: Learn to Build Cross-Platform Apps*, 3rd ed. Raleigh, NC, USA: Razeware LLC, 2022, ISBN: 978-1950325740.
3. A. Miola, *Flutter Complete Reference: Create Beautiful, Fast and Native Apps for Any Device*. Birmingham, U.K.: Packt Publishing, 2021.

REFERENCE:

1. Kodeco Team, K. D. Moore, V. Ngo, S. Patterson, and A. U. Fallas, *Flutter Apprentice: Learn to Build Cross-Platform Apps*, 4th ed. Raleigh, NC, USA: Kodeco Inc., 2026, ISBN: 978-1950325924.
2. S. Alessandria, *Flutter Cookbook: Over 100 Proven Techniques and Solutions for App Development with Flutter and Dart*. Birmingham, U.K.: Packt Publishing, 2021.
3. C. Coyle, *Dart and Flutter in Action: Build Modern, Cross-Platform Apps Step-by-Step with Dart and Flutter*. Seattle, WA, USA: Amazon Digital Services LLC, 2025

LIST OF PRACTICALS

1. Create a simple “Hello World” app using Flutter.
2. Design a basic UI using widgets (Text, Image, Icon).
3. Create a layout using Row, Column, and Container.
4. Build a login screen with username and password fields.

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BTMA510	**SEC**	**Flutter Programming**	**0**	**0**	**0**	**30**	**20**	**0**	**0**	**2**	**1**

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.

5. Implement navigation between two screens.
6. Create a form with validation (TextFormField).
7. Develop a counter app using set State ().
8. Create a dynamic list using ListView. Builder.
9. Design a responsive UI for different screen sizes.
10 Fetch and display data from a REST API.
11. Parse JSON data and show it in a list.
12. Store and retrieve data using Shared Preferences.
13. Create a simple SQLite database app (CRUD operations).
14. Integrate Firebase for authentication (login/signup).
15. Develop a mini project (e.g., To-Do List / Notes App / Weather App).