



# 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<br>University<br>Exam | Two Term<br>Exam | Teachers<br>Assessment* | END SEM<br>University<br>Exam | Teachers<br>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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| BTCS301N    | DCC      | Discrete Structures | 60                            | 20               | 20                      | 0                             | 0                       | 3 | 0 | 0 | 3       |

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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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## Shri Vaishnav Institute of Information Technology

Choice Based Credit System (CBCS) in the light of NEP-2020  
B.Tech(CSE/IT), B.Tech+MBA(CSE/IT) and B.Tech+M.Tech(CSE/IT)  
SEMESTER-V(2023-2027)

| COURSE CODE | CATEGORY | COURSE NAME   | TEACHING & EVALUATION SCHEME  |                  |                         |                               |                         | L | T | P | CREDITS |
|-------------|----------|---------------|-------------------------------|------------------|-------------------------|-------------------------------|-------------------------|---|---|---|---------|
|             |          |               | THEORY                        |                  |                         | PRACTICAL                     |                         |   |   |   |         |
|             |          |               | END SEM<br>University<br>Exam | Two Term<br>Exam | Teachers<br>Assessment* | END SEM<br>University<br>Exam | Teachers<br>Assessment* |   |   |   |         |
| BTCS501N    | DCC      | Third Subject | 60                            | 20               | 20                      | -                             | -                       | 3 | 1 | 0 | 4       |

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## Shri Vaishnav Institute of Information Technology

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<br>University<br>Exam | Two Term<br>Exam | Teachers<br>Assessment* | END SEM<br>University<br>Exam | Teachers<br>Assessment* |   |   |   |         |
| BTCS401N    | DCC      | Data Base<br>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**

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B. Tech (CSE/ IT) - All Programs

SEMESTER- IV (2025-29)

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| BTCS401N    | DCC      | Data Base<br>Management Systems | 60                            | 20               | 20                      | 30                            | 20                      | 3 | 0 | 2 | 4       |

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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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B. Tech (CSE/ IT) - All Programs

SEMESTER- IV (2025-29)

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|             |          |                                 | THEORY                        |                  |                         | PRACTICAL                     |                         |   |   |   |         |
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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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| BTCS302N    | DCC      | Analysis & Design of Algorithms | 60                            | 20               | 20                      | 30                            | 20                      | 3 | 0 | 2 | 4       |

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### 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, 0/1 Knapsack, multistage graph, Traveling Salesperson Problem, All Pairs Shortest Paths.

#### UNIT IV

**7 HOURS**

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B. Tech (CSE/ IT) - All Programs

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|             |          |                                 | 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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**Backtracking:** General Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycles, Sum of Subsets.

**Branch and Bound:** General Method, 0/1 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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## Shri Vaishnav Institute of Information Technology

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

B. Tech (CSE/ IT) - All Programs

SEMESTER- IV (2025-29)

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|             |          |                                 | THEORY                        |                  |                         | PRACTICAL                     |                         |   |   |   |         |
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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-Warshall algorithm.
9. Write a program for traveling salesman problem.
10. Write a program for Hamiltonian cycle problem.

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# Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

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

B. Tech CSE (AIML - Microsoft)

SEMESTER IV (2025-2029)

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|-------------|----------|-----------------------|-------------------------------|------------------|-------------------------|-------------------------------|-------------------------|---|---|---|---------|
|             |          |                       | THEORY                        |                  |                         | PRACTICAL                     |                         |   |   |   |         |
|             |          |                       | END SEM<br>University<br>Exam | Two Term<br>Exam | Teachers<br>Assessment* | END SEM<br>University<br>Exam | Teachers<br>Assessment* |   |   |   |         |
| BTAIML410   | DSE      | Azure AI Fundamentals | 60                            | 20               | 20                      | 30                            | 20                      | 3 | 0 | 2 | 4       |

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### COURSE OBJECTIVES:

The student will have ability to:

1. Fundamentals of AI, workloads, Responsible AI, and Azure AI Foundry basics.
2. Generative AI, LLMs, agents, and their use in Azure AI Foundry
3. Natural Language Processing and text-based AI applications.
4. Speech AI concepts and Azure Speech services.
5. Computer Vision and information extraction using Azure AI services.

### COURSE OUTCOMES:

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

1. Understanding AI fundamentals, workloads, and Responsible AI principles.
2. Understanding generative AI, LLMs, and AI agents.
3. Understanding NLP concepts and text-based AI solutions.
4. Understanding speech AI and Azure Speech services.
5. Understanding computer vision and information extraction applications.

### SYLLABUS

#### UNIT I

9 HOURS

**Introduction to AI in Azure:** What is Artificial Intelligence? History, Trends and Applications of Artificial Intelligence, Artificial Intelligence workloads, Principles of responsible AI. Get started with AI in Azure: Microsoft Azure, Microsoft Foundry, Microsoft Foundry endpoints. **Introduction to Generative AI and Agents:** What is generative AI? What is LLMs, Generative AI models, AI Agents, Types of AI Agents, Get started with generative AI and agents in Azure: Microsoft Foundry Models, using a generative AI model, Creating agents.

#### UNIT II

7 HOURS

**Introduction to Natural Language Processing:** Natural Language Processing (NLP), Text pre-processing: Data Cleaning, Tokenization, Normalization, Word Reduction, Stemming, Stop-word removal, Vectorization, Named Entity Recognition. PoS Tagging (HMM model and Viterbi Algorithm). Text Representation and Feature Extraction.

#### UNIT III

9 HOURS

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## Shri Vaishnav Institute of Information Technology

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

B. Tech CSE (AIML - Microsoft)

SEMESTER IV (2025-2029)

| COURSE CODE | CATEGORY | COURSE NAME           | TEACHING & EVALUATION SCHEME  |                  |                         |                               |                         | L | T | P | CREDITS |
|-------------|----------|-----------------------|-------------------------------|------------------|-------------------------|-------------------------------|-------------------------|---|---|---|---------|
|             |          |                       | THEORY                        |                  |                         | PRACTICAL                     |                         |   |   |   |         |
|             |          |                       | END SEM<br>University<br>Exam | Two Term<br>Exam | Teachers<br>Assessment* | END SEM<br>University<br>Exam | Teachers<br>Assessment* |   |   |   |         |
| BTAIML410   | DSE      | Azure AI Fundamentals | 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.

**Text Analysis and Language Models:** Get started with text analysis in Azure: Understand text analysis in Foundry, using general-purpose AI models, Using Azure Language in Foundry Tools, Choosing the right method, General-Purpose AI Models vs Azure Language in Foundry Tools. Creating client applications for text analysis: Azure Language SDK, OpenAI Python Library, Using the OpenAI API with general purpose AI models, Using the Azure Language SDK, A closer look at Azure Language SDK methods, Using Azure Language in an agent.

### UNIT IV

**10 HOURS**

**Introduction to AI Speech Concepts:** Speech Signals, waveform, sampling, feature extraction, Speech-enabled solutions (Speech recognition, Speech synthesis), Speech to Text: Transcription, customization. neural voices, SSML, Speech recognition (Azure Speech in Microsoft Foundry Tools: Speech-to-Text), Implementing speech synthesis (Azure Speech in Microsoft Foundry Tools: Text-to-Speech). Creating a speech-capable agent: Azure Speech in Foundry Tools: Voice Live. Conversational AI, Speech Translation.

### UNIT V

**10 HOURS**

**Generative AI, AI Agents, and Azure AI Foundry:** Introduction to computer vision concepts, Computer vision tasks and techniques, Computer vision models: Convolutional neural network (CNN) & Vision transformer (ViT), Image and video generation: Diffusion models, VAE, GANs.

Get started with computer vision in Azure: Multimodal models for image analysis (Image-to-text inferencing), Image and video generation models (Image-generation, Video-generation)

Introduction to information extraction concepts: What is information extraction? Converting digital content into useful data, Optical Character Recognition (OCR), Field extraction and mapping. Get started with information extraction in Azure: Extracting information from documents, Azure Content Understanding in Foundry Tools, Extracting information from audio and video.

### REFERENCE:

- Microsoft Azure AI Documentation**  
<https://learn.microsoft.com/en-us/azure/ai-services/>
- Azure Machine Learning Documentation**  
<https://learn.microsoft.com/en-us/azure/machine-learning/>

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|             |          |                       | END SEM<br>University<br>Exam | Two Term<br>Exam | Teachers<br>Assessment* | END SEM<br>University<br>Exam | Teachers<br>Assessment* |   |   |   |         |
| BTAIML410   | DSE      | Azure AI Fundamentals | 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.

- Responsible AI Resources**  
<https://www.microsoft.com/en-us/ai/responsible-ai>
- Azure AI Foundry Documentation**  
<https://learn.microsoft.com/en-us/azure/ai-studio/>
- Neural Networks and Deep Learning**  
Michael Nielsen, *Online Book*  
<http://neuralnetworksanddeeplearning.com/>
- Azure Machine Learning Python SDK Documentation**  
<https://learn.microsoft.com/en-us/python/api/overview/azure/ml/>

### LIST OF PRACTICALS

- Get started in Microsoft Foundry
- Get started with generative AI and agents in Microsoft Foundry
- Get started with text analysis in Microsoft Foundry
- Get started with speech in Microsoft Foundry
- Get started with computer vision in Microsoft Foundry
- Get started with information extraction in Microsoft Foundry

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SEMESTER- IV (2025-29)

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|-------------|----------|---------------------------------------|-------------------------------|------------------|-------------------------|-------------------------------|-------------------------|---|---|---|---------|
|             |          |                                       | THEORY                        |                  |                         | PRACTICAL                     |                         |   |   |   |         |
|             |          |                                       | END SEM<br>University<br>Exam | Two Term<br>Exam | Teachers<br>Assessment* | END SEM<br>University<br>Exam | Teachers<br>Assessment* |   |   |   |         |
| BTDSE423M   | DSE      | Information Storage<br>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**

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|             |          |                                       | THEORY                        |                  |                         | PRACTICAL                     |                         |   |   |   |         |
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| BTDSE423M   | DSE      | Information Storage<br>and Management | 60                            | 20               | 20                      | 30                            | 20                      | 3 | 0 | 2 | 4       |

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**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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|-------------|----------|----------------------------------------|-------------------------------|------------------|-------------------------|-------------------------------|-------------------------|---|---|---|---------|
|             |          |                                        | THEORY                        |                  |                         | PRACTICAL                     |                         |   |   |   |         |
|             |          |                                        | END SEM<br>University<br>Exam | Two Term<br>Exam | Teachers<br>Assessment* | END SEM<br>University<br>Exam | Teachers<br>Assessment* |   |   |   |         |
| BTDSE421M   | DSE      | Computer<br>Graphics and<br>Multimedia | 60                            | 20               | 20                      | 30                            | 20                      | 3 | 0 | 2 | 4       |

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### 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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|             |          |                                        | THEORY                        |                  |                         | PRACTICAL                     |                         |   |   |   |         |
|             |          |                                        | END SEM<br>University<br>Exam | Two Term<br>Exam | Teachers<br>Assessment* | END SEM<br>University<br>Exam | Teachers<br>Assessment* |   |   |   |         |
| BTDSE421M   | DSE      | Computer<br>Graphics and<br>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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|             |          |                                        | THEORY                        |                  |                         | PRACTICAL                     |                         |   |   |   |         |
|             |          |                                        | END SEM<br>University<br>Exam | Two Term<br>Exam | Teachers<br>Assessment* | END SEM<br>University<br>Exam | Teachers<br>Assessment* |   |   |   |         |
| BTDSE421M   | DSE      | Computer<br>Graphics and<br>Multimedia | 60                            | 20               | 20                      | 30                            | 20                      | 3 | 0 | 2 | 4       |

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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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|             |          |                    | THEORY                        |                  |                         | PRACTICAL                     |                         |   |   |   |         |
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| BTIT411     | SEC      | Java Full Stack II | 0                             | 0                | 0                       | 30                            | 20                      | 0 | 0 | 2 | 1       |

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### COURSE OBJECTIVES:

The student will have ability:

1. To develop interactive and responsive user interfaces using modern Frontend technologies.
2. To understand the server-side web processing model using Servlets and MVC architecture.
3. To master the Spring Boot framework for rapid, production-grade application development.
4. To implement efficient Object-Relational Mapping (ORM) using Spring Data JPA.
5. To design, document, and secure Restful Micro services for scalable enterprise solutions.

### COURSE OUTCOMES:

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

1. Build responsive web pages using HTML5, CSS3, and JavaScript (ES6+) for modern browsers.
2. Design and deploy server-side components using Java Servlets and session management techniques.
3. Create and manage standalone, production-ready Restful APIs using the Spring Boot ecosystem.
4. Implement seamless data persistence layers by integrating Spring Boot with RDBMS via Spring Data JPA.
5. Architect and secure distributed systems using Micro services principles and JWT-based authentication.

### SYLLABUS

#### UNIT I

**6 HOURS**

**Frontend Development & UI Design:** Client-Server architecture and the HTTP/HTTPS protocols. **Structure & Style:** HTML5 semantic elements and CSS3 layout techniques (Flex box and Grid). **Dynamic Logic:** JavaScript ES6+ essentials: Arrow functions, Template literals, Promises, and A sync/Await. **Interaction:** DOM Manipulation and using the fetch () API to consume backend services.

#### UNIT II

**6 HOURS**

**Server-Side Web Logic:** Introduction to Apache Tomcat and web application structure. **Servlet:** Servlet Lifecycle, handling GET/POST requests, and the Request Dispatcher. **State Management:** Managing user sessions using Cookies and the Http Session API. **MVC Architecture:** Decoupling logic using the Model-View-Controller design pattern.

#### UNIT III

**6 HOURS**

**Spring Boot Framework:** Inversion of Control (IOC) and Dependency Injection (DI) explained. **Spring Boot Basics:** Auto-configuration, Starters, and the application. Properties file. **Restful APIs:** Developing endpoints using @Rest Controller, @Request mapping, and @Path Variable. **Validation:** Handling JSON data and using @Valid to request body validation.

#### UNIT IV

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|             |          |                    | THEORY                        |                  |                         | PRACTICAL                     |                         |   |   |   |         |
|             |          |                    | END SEM<br>University<br>Exam | Two Term<br>Exam | Teachers<br>Assessment* | END SEM<br>University<br>Exam | Teachers<br>Assessment* |   |   |   |         |
| BTIT411     | SEC      | Java Full Stack II | 0                             | 0                | 0                       | 30                            | 20                      | 0 | 0 | 2 | 1       |

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**ORM and Spring Data JPA:** Introduction to Hibernate and Object-Relational Mapping (ORM). **Spring Data JPA:** Repository abstraction, CRUD interfaces, and derived query methods. **Database Integration:** Connecting Spring Boot to MySQL/ Posture SQL; handling One-to-Many and Many-to-Many relationships. **Pagination:** Implementation of Paging and Sorting for large datasets.

### UNIT V

**6 HOURS**

**Micro services and Security:** Evolution from Monolith to Micro services; Service Discovery using Eureka. **API Gateway:** Routing requests and cross-cutting concerns (logging/security). **Security:** Introduction to Spring Security and JWT (JSON Web Tokens) for stateless authentication. **Testing:** Writing unit tests for controllers and services using Unit and Mockito.

### TEXTBOOKS:

1. C. Walls, *Spring in Action*, 6th ed. Shelter Island, NY, USA: Manning Publications, 2022.
2. F. Gutierrez, *Introducing Spring Framework: A Modern Approach to Data-Driven Operations*. Berkeley, CA, USA: Apress, 2020.
3. K. Sharan and A. Späth, *Beginning Spring Boot 3: Build Cloud-Native Applications, Micro services and Carbon-Aware Systems*. Berkeley, CA, USA: Apress, 2023.

### REFERENCES:

1. Mozilla Developer Network, "Client-Server Architecture and HTTP/HTTPS Protocols," *MDN Web Docs*, 2024. [Online]. Available: <https://developer.mozilla.org/en-US/docs/Web/HTTP>
2. Mozilla Developer Network, "HTML5 Semantic Elements," *MDN Web Docs*, 2024. [Online]. Available: <https://developer.mozilla.org/en-US/docs/Web/HTML/Element>
3. Mozilla Developer Network, "CSS Flexible Box Layout and Grid," *MDN Web Docs*, 2024. [Online]. Available: [https://developer.mozilla.org/en-US/docs/Web/CSS/CSS\\_Grid\\_Layout](https://developer.mozilla.org/en-US/docs/Web/CSS/CSS_Grid_Layout)
4. Mozilla Developer Network, "JavaScript ES6+ Features: Arrow Functions, Template Literals, Promises, and Async/Await," *MDN Web Docs*, 2024. [Online]. Available: <https://developer.mozilla.org/en-US/docs/Web/JavaScript>
5. Mozilla Developer Network, "DOM Manipulation and Fetch API," *MDN Web Docs*, 2024. [Online]. Available: [https://developer.mozilla.org/en-US/docs/Web/API/Fetch\\_API](https://developer.mozilla.org/en-US/docs/Web/API/Fetch_API)
6. Apache Software Foundation, "Introduction to Apache Tomcat," *Apache Tomcat Documentation*, 2024. [Online]. Available: <https://tomcat.apache.org/tomcat-10.1-doc/index.html>
7. Oracle, "Java Servlet Technology," *Oracle Docs*, 2024. [Online]. Available: <https://docs.oracle.com/javaee/7/tutorial/servlets.htm>
8. [Baeldung, "Spring Boot Basics: IOC, DI, Auto-Configuration, and Starters," *Baeldung Tutorials*, 2024.

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# 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 (AIML - Microsoft)

SEMESTER - IV (2025-2029)

| COURSE CODE | CATEGORY | COURSE NAME        | TEACHING & EVALUATION SCHEME  |                  |                         |                               |                         | L | T | P | CREDITS |
|-------------|----------|--------------------|-------------------------------|------------------|-------------------------|-------------------------------|-------------------------|---|---|---|---------|
|             |          |                    | THEORY                        |                  |                         | PRACTICAL                     |                         |   |   |   |         |
|             |          |                    | END SEM<br>University<br>Exam | Two Term<br>Exam | Teachers<br>Assessment* | END SEM<br>University<br>Exam | Teachers<br>Assessment* |   |   |   |         |
| BTIT411     | SEC      | Java Full Stack II | 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.

[Online]. Available: <https://www.baeldung.com/spring-boot>

9. [Baeldung, "Building RESTful APIs with Spring Boot," *Baeldung Tutorials*, 2024. [Online]. Available: <https://www.baeldung.com/rest-with-spring-series>
10. Baeldung, "Spring Data JPA: Repository Abstraction and CRUD Operations," *Baeldung Tutorials*, 2024. [Online]. Available: <https://www.baeldung.com/spring-data-jpa>
11. Baeldung, "Pagination and Sorting with Spring Data JPA," *Baeldung Tutorials*, 2024. [Online]. Available: <https://www.baeldung.com/spring-data-jpa-pagination-sorting>
12. Baeldung, "Microservices with Spring Boot and Spring Cloud," *Baeldung Tutorials*, 2024. [Online]. Available: <https://www.baeldung.com/spring-cloud>
13. Baeldung, "Spring Security and JWT Authentication," *Baeldung Tutorials*, 2024. [Online]. Available: <https://www.baeldung.com/spring-security-oauth-jwt>
14. Baeldung, "Testing in Spring Boot with JUnit and Mockito," *Baeldung Tutorials*, 2024. [Online]. Available: <https://www.baeldung.com/spring-boot-testing>

### LIST OF PRACTICALS

1. Frontend: Build a responsive "Placement News" portal using HTML5 and CSS Grid.
2. JS Integration: Create a dynamic search bar that filters a list of companies using JavaScript.
3. Servlets: Implement a Login/Logout system with session-based access control.
4. Spring Boot REST: Create an API for "Internship Postings" that allows GET and POST requests.
5. JPA Integration: Connect the Internship API to a MySQL database using Spring Data JPA.
6. Advanced Querying: Implement a search feature that finds internships by "Role" or "City" using JPA Query methods.
7. Security Lab: Secure a Spring Boot endpoint so it only accepts requests with a valid Authorization header.

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