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-Data Science-IBM)

SEMESTER-IV(2024-2028)

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*				
ML307	BS	Environmental Management and Sustainability	60	20	20	0	0	4	0	0	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.	To create awareness towards various environmental problems.
2.	To create awareness among students towards issues of sustainable development.
3.	To expose students towards environment friendly practices of organizations.
4.	To sensitize students to act responsibly towards environment

COURSE OUTCOMES:	
Upon completion of the subject, students will be able to:	
1.	The course will give students an overview of various environmental concerns and practical challenges in environmental management and sustainability.
2.	Emphasis is given to make students practice environment friendly behavior in day-to-day activities.

SYLLABUS

UNIT I	**10 HOURS**

Introduction to Environment Pollution and Control:

1. Pollution and its types (Air, Water, and Soil): Causes, Effects and Control measures
2. Municipal Solid Waste: Definition, Composition, Effects
3. Electronic Waste: Definition, Composition, Effects
4. Plastic Pollution: Causes, Effects and Control Measures

UNIT II	**8 HOURS**

Climate Change and Environmental Challenges:

1. Global Warming and Green House Effect
2. Depletion of the Ozone Layer
3. Acid Rain
4. Nuclear Hazards

UNIT III	**9 HOURS**

Environmental Management and Sustainable Development:

1. Environmental Management and Sustainable Development: An overview
2. Sustainable Development Goals (17 SDGs)
3. Significance of Sustainable Development

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4. Environment Friendly Practices At Workplace and Home (Three Rs' of Waste Management, Water Conservation, Energy Conservation)

UNIT IV **8 HOURS**

Environmental Acts:

1. The Water (Prevention and Control of Pollution) Act, 1974: Objectives, Definition of Pollution under this act, Powers and Functions of Boards
2. The Air (Prevention and Control of Pollution) Act, 1981:Objectives, Definition of Pollution under this act, Powers and Functions of Boards
3. The Environment (Protection) Act, 1986: Objectives, Definition of important terms used in this Act, Details about the act.
4. Environmental Impact Assessment: Concept and Benefits.

UNIT V **7 HOURS**

Role of Individuals, Corporate and Society:

1. Environmental Values
2. Positive and Adverse Impact of Technological Developments on Society and Environment
3. Role of an individual/ Corporate/ Society in environmental conservation
4. Case Studies: The Bhopal Gas Tragedy, New Delhi's Air Pollution, Arsenic Pollution in Ground Water (West Bengal), Narmada Valley Project, Cauvery Water Dispute, Fukushima Daiichi Disaster (Japan), Ozone Hole over Antarctica, Ganga Pollution, Deterioration of TajMahal. Uttarakhand flash floods.

TEXTBOOKS:

1. Rogers, P.P., Jalal, K.F., Boyd, I.A. *An Introduction to Sustainable Development*, Earthscan.
2. Kalam, A.P.J., *Target 3 Billon: Innovative Solutions Towards Sustainable Development*, Penguin Books

REFERENCE:

1. Kaushik A. and Kaushik, *Perspectives in Environmental Studies*, New Delhi: New Age International Publishers.
2. Dhameja, S.K., *Environmental Studies*, S.K. Kataria and Sons, New Delhi
3. Bharucha E., *Environmental Studies for Undergraduate Courses*, New

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4.	Delhi: University Grants Commission.
5.	Wright R.T., *Environmental Science: towards a sustainable future*, New Delhi: PHL Learning Private Ltd.
6.	Rajagopalan R., *Environmental Studies*, New York: Oxford University Press.

COURSE OBJECTIVES:

The student will have ability to:

1.	To differentiate among the various database system 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 a 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.

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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.

UNIT III	**8 HOURS**
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	**7 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	**8 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. Henry F. Korth and Silberschatz Abraham, *Database System Concepts*, Mc.GrawHill, 6th Ed., 2015.
2. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems*, McGraw- Hill Education, 2003.

REFERENCE:

1. Kahate, Atul, *Introduction to Database Management Systems*, Pearson Education India, 2006.
2. C J Date, *An Introduction to Database System*, Pearson Educations, 8th Edition, 2004.
3. Ivan Bayross, *SQL, PL/SQL - The Programming Language of Oracle*, BPB Publications 4th Revised Edition, 2010.
4. Elmasri, Navathe, *Fundamentals of Database Systems*, Pearson Educations 7th Edition, 2016.
5. Seema Kedar, *Database Management System*, Technical Publications, 2009.
6. Rajiv Chopra, *Database Management System (DBMS) A Practical Approach*, Kindle Edition, S Chand (December 1, 2010), 2017.

LIST OF PRACTICALS

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

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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 constrains.
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, and the patient record. The application should also be able to search the patient's record by its id.

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			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 to:	
1.	To learn the algorithm analysis techniques.
2.	To critically analyze 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.	Define the basic concepts of algorithms and analyze the performance of algorithms.
2.	Explain different standard algorithm design techniques, namely, divide & conquer, greedy, dynamic programming, backtracking and branch & bound.
3.	Demonstrate standard algorithms for fundamental problems in Computer Science.
4.	Design algorithms for a given problem using standard algorithm design techniques.
5.	Analyze and compare the efficiency of various algorithms of a given problem.
6.	Identify the limitations of algorithms in problem solving.
7.	To 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**
Backtracking: General Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycles, sum of Subsets.	

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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

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.

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.	Ellis Horowitz and Sartaj Sahni, *Fundamental of Computer Algorithms*, 2nd Edition, Galgotia Publication, 2001.
2.	Thomas H Cormen, Charles E Leiserson and Ronald L Rivest, *Introduction to Algorithms*, 3rd Ed., MIT Press. 2009.
REFERENCE:	
1.	Donal E Knuth, *Fundamentals of Algorithms: The Art of Computer Programming*, Vol l, 3rd Ed., Pearson Education, 1997.
2.	Goodman, S.E. & Hedetnieni, *Introduction to Design and Analysis of Algorithm*, Tata McGraw Hill, 1977.
3.	S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani, *Algorithms*, Tata McGraw Hill, 2006.
4.	J.E Hopcroft, J.D Ullman, *Design and analysis of algorithms*, TMH Publication.
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.
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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BTIBMB502N	DSC	Fundamental of Predictive Analytics	60	20	20	30	20	2	0	2	3

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COURSE OBJECTIVES:	
The student will have ability to:	
1.	To provide an overview of an exciting field of Predictive Analytics.
2.	To introduce the tools required For the Predictive Analytics.
3.	Review and explore data to look at data distributions and to identify data problems, including missing values.
4.	To enable students to have skills that will help them to solve complex real-world problems for decision support.

COURSE OUTCOMES:	
Upon successful completion of the course the student will be able to:	
1.	Understand and critically apply the concepts and methods of Business analytics
2.	To understand and apply IBM SPSS Modeler in Data Mining, what kinds of data can be mined, what kinds of patterns can be mined?
3.	Applying and analyzing how to use functions, deal with missing values, use advanced field operations, handle sequence data and improve efficiency.
4.	To evaluate the Model on the basis of different Predictive Methods.
5.	Building and create advanced analytical model that leverage historical data to uncover real-time insights to predict future events.

SYLLABUS

UNIT I	**6 HOURS**

ANALYTICS OVERVIEW

Definition of business Analytics with real time examples, How Predictive analytics: Transforming data into future insights, Analytics trends: Past, Present & Future, Towards a Predictive enterprise.

UNIT II	**12 HOURS**

IBM SPSS MODELER & DATA MINING

What is a Data Mining application? Strategy for data mining: CRISP-DM, Identify nodes and streams, The framework of a Data – mining project, Brief the unit of analysis, Explain the type of dialog box.

UNIT III	**8 HOURS**

UNIT OF ANALYSIS

Concepts of Unit of analysis (Distinct, Aggregate, SetToFlag), Integrate data, CLEM Expression, Role of Relationship between two fields, Identifying the modeling objective.

UNIT IV	**16 HOURS**

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BTIBMB502N	**DSC**	**Fundamental of Predictive Analytics**	**60**	**20**	**20**	**30**	**20**	**2**	**0**	**2**	**3**

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ADVANCED DATA PREPARATION WITH IBM SPSS MODELER Functions to enrich data, Method to transform data, Cross record functions, Sampling, Partitioning and sampling data, Improving Efficiency.	
UNIT V	**10 HOURS**
PROJECT Predicting using IBM SPSS Modeler & IBM Watson with real Case studies.	
TEXTBOOKS:	
1.	IBM Courseware
References:	
1.	Predictive Analytics Mesmerizing & fascinating by ERIC SIEGEL
LIST OF PRACTICALS	
1.	Import Data and Check Data Quality using Data Audit Node
2.	Balance an Imbalanced Dataset using Balance Node.
3.	Remove Blank or Unwanted Records using Select Node
4.	Handle Missing Values using Fill Node
5.	Convert Categorical Values into Flags using Set Flag Node.
6.	Analyze Telecom Customer Data (Data Mining).
7.	Merge Two Telecom Datasets using Merge Node.
8.	Build a Logistic Regression Model for Classification.
9.	Upload Data to Data Refinery and Clean the Data.
10.	Create Charts and Graphs to Understand the Data (Data Visualization)

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BTIBM507N	SEC	Programming with Python	0	0	0	0	50	0	0	2	1

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COURSE OBJECTIVES:	
The student will have ability to:	
1.	To develop proficiency in creating based applications using the Python Programming Language.
2.	To be able to understand the various data structures available in Python programming language and apply them in solving computational problems.
3.	To be able to do testing and debugging of code written in Python.
4.	To be able to draw various kinds of plots using PyLab.
5.	To be able to use generators for generating series like fibonacci

COURSE OUTCOMES:	
Upon completion of the subject, students will be able to:	
1.	Ability to create robust applications using the Python programming language.
2.	Ability to test and debug applications written using the Python programming language
3.	Ability to create applications for solving computational problems using the Python Programming Language.

SYLLABUS

UNIT I	**10 HOURS**

Introduction to Python: The basic elements of Python, Branching programs, Strings and Input, Iteration. Functions, Scoping and Abstraction: Functions and Scoping, Specifications, Recursion, Global variables, Modules, Files.

UNIT II	**9 HOURS**

Testing and Debugging: Testing, Debugging. Structured Types, Mutability and Higher order Functions: Tuples, Lists and Mutability, Functions as Objects, Strings, Tuples and Lists, Dictionaries.

UNIT III	**8 HOURS**

Exceptions and assertions: Handling exceptions, Exceptions as a control flow mechanism, Assertions. Classes and Object oriented Programming: Abstract Data Types and Classes, Inheritance, Encapsulation and information hiding.

UNIT IV	**10 HOURS**

Numpy and Pandas: Python list vs NumPy arrays, Creating a NumPy Array, Basic ndarray, Shape of NumPy array, Size of NumPy array,Random numbers in ndarray, The Shape and Reshaping of NumPy Array, Dimensions of NumPy array, Reshaping a NumPy array, Flattening a NumPy array, Transpose of a NumPy array, Indexing and Slicing of NumPy Array.

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BTIBM507N	SEC	Programming with Python	0	0	0	0	50	0	0	2	1

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Pandas Series, Pandas DataFrames, Common Operations in Pandas, How to Deal With Missing Data in Pandas, How To Merge DataFrames in Pandas, How To Join DataFrames in Pandas, How to Concatenate DataFrames in Pandas. Data Input and Output in Pandas, How to Save Pandas DataFrames. Data visualization

UNIT V **8 HOURS**

Matplotlib: Matplotlib Introduction, Line Chart, Scatter Plot , Bar Graph, Histogram, Subplots , Pie Chart , Pyplot, Matplotlib with Pandas and Numpy. Specify Color, Markings and Lline Styles, Adjust Thickness, Label Tilte, and Legend

TEXTBOOKS:

1.	JohnVGuttag.“IntroductiontoComputationandProgrammingUsingPython”,Prentice Hall of India.
2.	Allen Downey, Jeffrey Elkner and Chris Meyers "How to think like a Computer Scientist, Learning with Python", Green Tea Press.
3.	Mark Lutz "Learning Python "O' Reilly Media; 5 edition.
4.	David Beazley "Python Cookbook, Third edition "O' Reilly Media.

REFERENCE:

1.	Python Essential Reference, 4thEdition Addison-Wesley Professional.
2.	Mark Lutz "Programming Python: Powerful Object-Oriented Programming.
3.	"David Beazley "Python Cookbook" Third edition, O'Reilly Media.

LIST OF PRACTICALS

1.	Write a Python Program to Print Hello world.
2.	Write a program to demonstrate different number data types in Python.
3.	Write a program to perform different Arithmetic Operations on numbers in Python.
4.	Write a Program to Swap Two Variables.
5.	Write a Program to Convert Celsius to Fahrenheit.
6.	Write a Program to Find the Largest Among Three Numbers.
7.	Write a Program to Check Prime Number.
8.	Write a Program to Find the Factorial of a Number.
9.	Write a Program to Print the Fibonacci sequence.
10.	Write a program to create, append, and remove lists in python.
11.	Write a program to demonstrate working with tuples in python.
12.	Write a program to demonstrate working with set in python.
13.	Write a program to demonstrate working with dictionaries in python.
14.	Write a program to find reverse of given number using function.

ShriVaishnavVidyapeethVishwavidyalaya, Indore

ShriVaishnav Institute of Information Technology

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

B.Tech. (CSE-Data Science-IBM)

SEMESTER-IV(2024-2028)

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*				
BTIBM507N	**SEC**	**Programming with Python**	**0**	**0**	**0**	**0**	**50**	**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.

15.	Write a python Program to call data member and function using classes and objects.
16.	Write a program to read 3 subject marks and display pass or failed using class and object.
17.	Write a program in Python to handle user defined exception for given problem.
18.	Write a program using a Numpy module to create an array and check the following: a. Type of array b. Axes of array c. Shape of array d. Type of elements in array
19.	Write a python program to concatenate the dataframes with two different objects
20.	Write a Python program to Demonstrate how to Draw a Scatter Plot, Bar Graph and Pie Chart using Matplotlib.