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(Machine Learning & Cloud Computing in association with Google Cloud)

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 — 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
4. Environment Friendly Practices At Workplace and Home (Three Rs' of Waste Management,

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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
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.

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			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 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.

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.

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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

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

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SEMESTER-IV(2024-2028)

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

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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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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.
Branch and Bound: General Method, O/1 Knapsack Problem, Traveling Salesperson Problem.

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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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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BTMLCC411M	DSE	Google Cloud Big Data & Machine Learning Fundamentals	60	20	20	30	20	2	0	2	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. To Understand the Data-to-AI Lifecycle on Google Cloud.
2. To Identify Key Google Cloud Big Data Products and Their Use Cases.
3. To Recognize Various Machine Learning Options on Google Cloud.
4. To Comprehend the Fundamentals of BigQuery for Data Analysis.
5. To Grasp the Core Steps of a Machine Learning Workflow with Vertex AI.

Course Outcomes (COs):

After completion of this course the students will be able to

1. Select appropriate Google Cloud services for ingesting, storing, and processing large datasets, demonstrating an understanding of their suitability for various big data scenarios (batch vs. streaming)..
2. Perform basic data analysis and run simple SQL queries on large datasets using Google BigQuery..
3. Implement fundamental machine learning tasks on Google Cloud, including leveraging pre-trained APIs for common AI functionalities (e.g., Vision AI, Natural Language AI) or building simple models using AutoML.
4. Describe and outline the steps involved in a typical machine learning workflow on Google Cloud, including data preparation, model training, evaluation, and deployment, primarily utilizing Vertex AI concepts. .
5. Identify and propose suitable Google Cloud Big Data and Machine Learning solutions for real-world business challenges, articulating the benefits and limitations of their chosen approach.

SYLLABUS

UNIT I HOURS

Google Cloud Computing Foundations:Cloud Computing Fundamentals

Cloud Computing, Cloud v/s traditional Architecture , Cloud Computing Service model (IaaS,Paas,SaaS) Google Cloud Architecture, Google cloud Billing, Google cloud API's, Compute Engine, App Engine, Cloud Run Function, Kubernetes Engine, Cloud run.

UNIT II HOURS

Google Cloud Computing Foundations: Infrastructure in Google Cloud

Storage, Structured and unstructured Data Storage, Cloud SQL, Cloud Spanner, NoSQL managed Service, Bigtable as NoSQL, API's, Cloud Endpoints, Apigee API, Pub/Sub, Security and Authentication in cloud, IAM(Identity-Aware-Proxy)

Chairperson	Chairperson	Controller of Examination	Registrar
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UNIT III **HOURS**

Google Cloud Computing Foundations: Networking & Security in Google Cloud

Networking in cloud, Virtual Private Cloud , Routes and firewalls rules in cloud, Multi VPC network,hybrid clouds, Load Balancing , Infrastructure as Code(IaC), Terraform, Cloud Monitoring (Managing Services,infrastructure and applications)

UNIT IV **HOURS**

Google Cloud Computing Foundations: Data, ML, and AI in Google Cloud

Introduction to Big Data managed service in the cloud, Leverage Big Data operation with Dataproc, Build extract, transform and load pipeline using dataflow, BigQuery , Google's Enterprise Data Warehouse .

UNIT V **HOURS**

Google Cloud Computing Foundations: AI in Google Cloud

Machine Learning in Cloud, Building ML models with vertex AI, AutoML, Custom training, Pre-Built API

TEXTBOOKS AND REFERENCE:

https://www.cloudskillsboost.google/course_templates/3

https://www.cloudskillsboost.google/quests/117

https://www.cloudskillsboost.google/course_templates/10

https://www.cloudskillsboost.google/quests/136?

https://www.cloudskillsboost.google/quests/127

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LIST OF PRACTICALS

1) Create a virtual machines, App Engine: Qwik Start -Python, Cloud Run Function: Qwik Start, Kubernetes Engine: Qwik Start
2) Cloud Storage, Cloud SQL for MySQL, Cloud Endpoints, Pub/Sub, User Authentication IAM, Cloud IAM Multiple VPC Network, VPC network controlling access, Application Load Balancer with Cloud Armor, Cloud Monitoring
3) Dataproc: Qwik Start – console, Dataproc: Qwik Start , DataFlow: Qwik start, DataFlow: Qwik Start, Data prep :
4) Qwik Start, Cloud Natural Language API: Qwik Start
5) Speech to Text API: Qwik Start, Video Intelligence: Qwik Start

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BTIT411	SEC	Advanced JAVA	0	0	0	30	20	0	0	2	1

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COURSE OBJECTIVES:

The student will have ability to:

1. Understand HTML Tags.
2. Understand Database connectivity and sql queries in java.
3. Design and develop Web applications using servlet and JSP.
4. Understand how to work with JavaBeans.
5. Designing applications using pre-built frameworks.

COURSE OUTCOMES:

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

1. learn to access database through Java programs, using Java Data Base Connectivity (JDBC)
2. Design new applications using object-oriented methodologies.
3. Create dynamic web pages, using Servlets and JSP.
4. Make a reusable software component, using Java Bean.
5. Design Data base connectivity program for simple problems.

SYLLABUS

UNIT I — 10 HOURS

Designing Graphical User Interfaces in Java, Components and Containers, Basics of Components, Using Containers, Layout Managers, AWT Components, Adding a Menu to Window, Extending GUI Features Using Swing Components, Java Utilities (java.util Package) Event-Driven Programming in Java, Event- Handling Process, Event Handling Mechanism, The Delegation Model of Event Handling, Event Classes, Event Sources, Event Listeners, Adapter Classes as Helper Classes in Event Handling.. Introduction to Cybercrime, Cybercrime and Information Security, Classification of Cybercrimes.

UNIT II — 6 HOURS

Servlets: Basics of Web, MVC in Server-side Programming, Servlet API, Servlet Interface, Generic Servlet, HTTP Servlet, Servlet Life Cycle, Working with Apache Tomcat Server, Steps to create a servlet in Tomcat, Deployment descriptor. Servlet Request: Various Servlet Request methods for form data and HTTP header data.

UNIT III — 8 HOURS

Attack Plan: Session Tracking: Purpose and need of Session Tracing. Approaches to session tracking: Cookies, Hidden Form Field, URL Rewriting, Session tracking with JAVA servlet API.

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BTIT411	SEC	Advanced JAVA	0	0	0	30	20	0	0	2	1

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UNIT IV **6 HOURS**

Database Connectivity and Servlet Collaboration: Database drivers, JDBC, API for Querying with database, API for updating the database. Servlet collaboration: Methods of Request Dispatcher interface: forward, Include. Send redirect..

UNIT V **8 HOURS**

Java Server Pages: Basic of JSP: Life Cycle of JSP, JSP API. Scripting Elements: - Scrip let Tag, expression tag, declaration tag. 9 Implicit Object: out, request, response, config, application, session, page context, page, and Exception. Directives: - page directive, include directive, taglib; Exception Handling, Action Elements, JSTL, Custom tags.2 Media

TEXTBOOKS:

1. Herbert Schildt, “J2EE The Complete Reference Java”, Ninth Edition, McGraw Hill, 2017

REFERENCE:

1. Bert Bates, Kathy Sierra, “Headfirst Java”, 2nd Edition, O’ Reilly, 2005
2. Advanced Java 2 Plateform, How to program, 2nd edition, Harvey.M.Dietel, Prentice Hall.

LIST OF PRACTICALS

1. A html program for creating text box, check box, radio button, list, submit button.
2. A html program for Student registration page.
3. WAP in Servlets to get and display value from an HTML page.
4. A program to execute select query using JDBC.
5. A program to update customer information.
6. A simple servlet that just generates plain text.
7. A program to display cookie id.
8. A program for session tracking.
9. Write a program showing Database connectivity.
10. Write a program showing Simple database Operation (CRUD).
11. WAP in JSP to get and display value from an HTML page.
12. A program for display student result by JSP page.