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-VI (2023-27)

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*				
BTCS601N	DCC	Compiler Design	60	20	20	30	20	2	1	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 introduce the major concept areas of language translation and compiler design
2. To enrich the knowledge in various phases of compiler and its use
3. To provide understanding of steps of programming necessary for constructing a compiler

COURSE OUTCOMES:
Upon completion of the subject, students will be able to:
1. Ability to apply the knowledge of lex tool & yacc tool to develop a scanner & parser
2. Ability to design and develop software system for backend of the compiler
3. Ability to comprehend and adapt to new tools and technologies in compiler design

SYLLABUS
UNIT I — 8 HOURS
Introduction: Compiler**,** Compilers analysis of the source program**,** Phases of a compiler**,** Cousins of the Compiler, Grouping of Phases and Compiler construction tools, Lexical Analysis, Role of Lexical Analyzer, Input Buffering and Specification of Tokens.

UNIT II — 10 HOURS
Syntax Analysis: Role of the parser, Writing Grammars, Context-Free Grammars, Top-Down parsing, Recursive Descent Parsing, Predictive Parsing, Bottom-up parsing, Shift Reduce Parsing, Operator Precedent Parsing, LR Parsers, SLR Parser – Canonical LR Parser – LALR Parser.

UNIT III — 9 HOURS
Intermediate Code Generation: Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate languages**,** Declarations, Assignment Statements, Boolean Expressions, Case Statements, Three Address code, Back patching, Procedure calls.

UNIT IV — 10 HOURS
Code Optimization and Run Time Environments: Introduction, Principal Sources of Optimization, Optimization of basic Blocks, DAG representation of Basic Blocks - Introduction to Global Data Flow Analysis, Runtime Environments, Source Language issues, Storage Organization, Storage Allocation strategies, Access to non-local names, Parameter Passing, Error detection and recovery.

UNIT V — 9 HOURS
Code Generation: Issues in the design of code generator, The target machine, Runtime Storage management, Basic Blocks and Flow Graphs, Next-use Information, A simple Code generator, Peephole Optimization.

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BTCS601N	DCC	Compiler Design	60	20	20	30	20	2	1	2	4

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TEXTBOOKS:
1. Alfred V. Aho, Jeffrey D. Ullman, *Compilers: Principles, Techniques and Tools*, Pearson Education Asia, 2012
2. Jean Paul Tremblay, Paul G Serenson, *The Theory and Practice of Compiler Writing*, BS Publications, 2005

REFERENCE:
1. Allen I. Holub, *Compiler Design in C*, Prentice Hall of India, 2003
2. C. N. Fischer and R. J. LeBlanc, *Crafting a compiler with C*, Benjamin Cummings, 2003
3. Henk Alblas and Albert Nymeyer, *Practice and Principles of Compiler Building with C*, PHI, 2001
4. Kenneth C. Louden, *Compiler Construction: Principles and Practice*, Thompson Learning, 2003
5. D. M. Dhamdhere, *Compiler Construction Principles and Practice*, 2nd Ed., Macmillan India Ltd., New Delhi, 2008

LIST OF PRACTICALS
1. To study the Lex Tool.
2. To study the Yacc Tool.
3. Write a program to implement Lexical Analyzer to recognize few patterns of C.
4. Write a program to implement the Recursive Descent Parser.
5. Write a program to implement the Computation of FIRST and FOLLOW of variables of grammar.
6. Write a program to compute the leading and trailing symbols of grammar.
7. Write a program to implement Operator Precedence Parser.
8. Write a program to implement SLR parser.
9. Write a program to check the data types.
10. Write a program to implement the generation of three address code.
11. Write a program to implement the computation of postfix notation.
12. Write a program to implement the computation of Quadruple.

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BTCS602N	DCC	Object Oriented Analysis and Design	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 concept of Object-Oriented Software Development Process
2. To get acquainted with UML Diagrams
3. To understand Object Oriented Analysis Processes

COURSE OUTCOMES:
Upon completion of the subject, students will be able to:
1. Understand Object Oriented Software Development Process
2. Gain exposure to Object Oriented Methodologies & UML Diagrams
3. To apply Object Oriented Analysis Processes for projects

SYLLABUS
UNIT I — 10 HOURS
Introduction: Object Orientated Technology, Development and OO Modeling History. Modeling Concepts: Modeling design Technique, Three Models, Class Model, State Model and Interaction model.

UNIT II — 9 HOURS
Class Modeling: Object and class concepts, link and association, Generalization and Inheritance, Advanced class modeling- aggregation, Abstract class meta data, constraints. State Modeling: Event, state, Transition and conditions, state diagram, state diagram behavior, concurrency, Relation of Class and State models. Interaction Modeling: Use case Models, sequence models, activity models

UNIT III — 8 HOURS
Analysis and Design: Development Life cycle, Development stages, Domain Analysis-Domain class model, domain state model, domain interaction model, Iterating and analysis. Application Interaction model, Application class model, Application state Model, Adding operation.

UNIT IV — 7 HOURS
System Design: Estimating Performance, Making a reuse plan, breaking system into sub systems identifying concurrency, allocation of subsystems, management of data storage, Handling Global resources, choosing a software control strategy, Handling boundary condition, common Architectural style.

UNIT V — 8 HOURS
Class design: Overview of class design, designing algorithms recursing downward, refactoring, design optimization, Adjustment of Inheritance, Rectification of Behavior.

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BTCS602N	DCC	Object Oriented Analysis and Design	60	20	20	30	20	3	0	2	4

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TEXTBOOKS:

1. Michael Blaha and J. Rumbugh, *Object oriented Modeling and design with UML*, Pearson Education

REFERENCE:

1. Satzinger, Jackson and Burd, *Object oriented Analysis and design with the Unified Process*, CENGAGE Learning.
2. O. Docherty, *Object Oriented Analysis and Design Understanding, System Development with UML2.0*, Wiley India.

LIST OF PRACTICALS

1. How to write a Problem Statement
2. Perform the system analysis: Requirement analysis, SRS.
3. Perform the function oriented diagram: DFD and Structured chart.
4. Perform the user's view analysis: Use case diagram.
5. Draw the structural view diagram: Class diagram, object diagram.
6. Draw the behavioral view diagram: Sequence diagram, Collaboration diagram.
7. Draw the behavioral view diagram: State-chart diagram, Activity diagram.
8. Draw the implementation view diagram: Component diagram.
9. Draw the environmental view diagram: Deployment diagram.

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BTMLCC631	DCC	Application of Machine Learning Solution on Vertex AI	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:

1. To Understand the Unified Nature of Vertex AI for the ML Lifecycle.
2. To Identify Appropriate Vertex AI Tools for Different ML Tasks.
3. To Comprehend the Process of Data Management and Preparation for Vertex AI.
4. To Grasp the Concepts of Model Deployment and Serving Strategies on Vertex AI.
5. To Recognize the Importance of MLOps Practices Supported by Vertex AI.

COURSE OUTCOMES:

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

1. Efficiently manage and prepare datasets for machine learning using Vertex AI Datasets, integrating with various Google Cloud data sources like BigQuery and Cloud Storage.
2. Train and evaluate custom machine learning models using Vertex AI Custom Training, or leverage Vertex AI AutoML for scenarios requiring faster development and less code.
3. Deploy trained machine learning models to Vertex AI Endpoints for online predictions or set up batch prediction jobs, configuring appropriate scaling and monitoring.
4. Configure and interpret model monitoring on Vertex AI, detecting issues like data drift and concept drift, and utilizing Vertex Explainable AI to understand model predictions.
5. Orchestrate and automate machine learning workflows using Vertex AI Pipelines, demonstrating an understanding of MLOps best practices for reproducible and scalable ML solutions.

UNIT I

Employing Machine Learning Operations:-Introduction to MLOps-Why and when to employ MLOps, Machine learning (ML) practitioners' pain points, The concept of devOps in ML, ML lifecycle, Automating the ML process.

Vertex AI and MLOps on Vertex AI:-What is vertex ai and why does a unified platform matter?, Introduction to mlops on vertex ai, How does vertex ai help with the mlops workflow, part 1?, How does vertex ai help with the mlops workflow, part 2?

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BTMLCC631	DCC	Application of Machine Learning Solution on Vertex AI	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 II

Welcome to Recommendation Systems on Google Cloud:-Recommendation Systems Overview, Introduction, Types of Recommendation Systems, Content-Based or Collaborative, Recommendation System Pitfalls.
Content-Based Recommendation Systems, Content-Based Recommendation Systems, Similarity Measures, Building a User Vector, Making Recommendations Using a User Vector, Making Recommendations for Many Users.

UNIT III

Collaborative Filtering Recommendations Systems:-Types of User Feedback Data, Embedding Users and Items, Factorization Approaches, The ALS Algorithm, Preparing Input Data for ALS, Creating Sparse Tensors For Efficient WALS Input, Instantiating a WALS Estimator: From Input to Estimator, Instantiating a WAL Estimator: Decoding TFRecords, Instantiating a WALS Estimator: Recovering Keys. Instantiating a WALS Estimator: Training and Prediction,

UNIT IV

Neural Networks for Recommendation Systems:-Hybrid Recommendation Systems, ML on GCP: Hybrid Recommendations with the MovieLens Dataset, Context-Aware Recommendation Systems, Context-Aware Algorithms, Contextual Postfiltering, Modeling Using Context-Aware Algorithms, YouTube Recommendation System Case Study: Overview, YouTube Recommendation System Case Study: Candidate Generation, YouTube Recommendation System Case Study: Ranking

UNIT V

Reinforcement Learning:-Introduction to module, Introduction to Reinforcement Learning, The reinforcement learning framework and workflow, Model-based and model-free reinforcement learning, Value-based reinforcement learning, Policy-based reinforcement learning, Contextual bandits, Applications of reinforcement learning.

REFERENCE:

MLOps (Machine Learning Operations) Fundamentals

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTMLCC631	DCC	**Application of Machine Learning Solution on Vertex AI**	**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.

List of Experiments:-

1. Lab introduction Vertex AI: Training and Deploying a TensorFlow Model in Vertex AI
2. Lab intro: Create a Content-Based Recommendation System, Using Neural Networks for Content-Based Recommendation Systems
3. Lab Intro: Collaborative Filtering with Google Analytics Data Issues with Collaborative Filtering Cold Starts
4. Lab Intro: Building a Neural Network Hybrid Recommendation System
5. Lab Intro: Designing a Hybrid Recommendation System
6. Lab Intro: Designing a Hybrid Collaborative Filtering Recommendation System
7. Lab Intro: Designing a Hybrid Knowledge-based Recommendation System

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BTMLCC632	DSE	Fundamentals of Computer Vision & Machine Learning	60	20	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:
1. To Understand the Core Concepts of Image Processing and Representation.
2. To Grasp the Foundational Principles of Traditional Machine Learning Algorithms.
3. To Comprehend the Architecture and Working of Convolutional Neural Networks (CNNs).
4. To Recognize the Importance of Data Preprocessing and Feature Extraction for ML/CV Tasks.
5. To Understand the Evaluation Metrics and Strategies for ML/CV Models

COURSE OUTCOMES:
After completion of this course the students will be able to

1. Apply fundamental image processing techniques to manipulate and enhance digital images, such as resizing, cropping, filtering, and adjusting brightness/contrast.
2. Implement and train basic machine learning models (e.g., logistic regression, decision trees) on structured datasets, interpreting their performance using appropriate evaluation metrics.
3. Build and train simple Convolutional Neural Networks (CNNs) for image classification tasks, demonstrating an understanding of how to configure layers and activation functions.
4. Preprocess and prepare image and tabular data for machine learning models, including handling missing values, scaling features, and splitting datasets for training and testing.
5. Evaluate the performance of computer vision and machine learning models using relevant metrics, and identify potential issues like overfitting or underfitting.

UNIT-I
Introduction to Computer Vision and Pre-built ML Models for Image Classification:- What Is Computer Vision, Different Type of Computer Vision Problems, Computer Vision Use Cases, Vision API - Pre-built ML Models
Vertex AI and AutoML Vision on Vertex AI:- Introduction to AutoML Vision on Vertex AI.
Custom Training with Linear, Neural Network and Deep Neural Network models:- Introduction Introduction to Linear Models, Reading the Data, Implementing Linear Models for Image Classification, Neural Networks and Deep Neural Networks for Image Classification, Deep Neural Networks with Dropout and Batch Normalization.
Convolutional Neural Networks:-Introduction, Convolutional Neural Networks, Understanding Convolutions CNN Model Parameters, Working with Pooling Layers, Implementing CNNs on Vertex AI with pre-built TF container using Vertex Workbench.

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BTMLCC632	DSE	Fundamentals of Computer Vision & Machine Learning	60	20	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.

Dealing with Image Data:- Introduction, Preprocessing the Image Data, Model Parameters and the Data Scarcity Problem, Data Augmentation, Transfer Learning.Sequence Models for Time Series and Natural Language Processing

UNIT-II

Natural Language Processing on Google Cloud:- Course introduction

NLP on Google Cloud:- Introduction, What is NLP?, NLP history, NLP architecture, NLP APIs, NLP solutions.

NLP with Vertex AI:- Introduction, NLP options, Vertex AI, NLP with AutoML, NLP with custom training, NLP end-to-end workflow.**Text representation:-**Introduction, Tokenization, One-hot encoding and bag-of-words, Word embeddings Word2vec, Transfer learning and reusable embeddings.

UNIT-III

NLP models:- Introduction, ANN, TensorFlow, DNN, RNN, LSTM, GRU.

Advanced NLP models:-Introduction, Encoder-decoder architecture, Attention mechanism, Transformer, BERT, Large language models.

Machine Learning in the Enterprise:- Course introduction.

Understanding the ML Enterprise Workflow:- Introduction, Overview of an ML enterprise workflow.

Data in the Enterprise, Introduction, Feature Store, Data Catalog, Dataplex, Analytics Hub, Data preprocessing options, Dataprep.

UNIT-IV

Science of Machine Learning and Custom Training:- Introduction, The art and science of machine learning Make training faster, When to use custom training, Training requirements and dependencies (part 1) Training requirements and dependencies (part 2), Training custom ML models using Vertex AI.

Vertex Vizier Hyperparameter Tuning:- Introduction, Vertex AI Vizier hyperparameter tuning, Vertex AI: Hyperparameter-Tuning.

UNIT-V

Prediction and Model Monitoring Using Vertex AI:- Introduction, Predictions using Vertex AI, Model management using Vertex AI.

Vertex AI Pipelines:-Introduction, Prediction using Vertex AI pipelines.

Best Practices for ML Development:- Introduction, Best practices for model deployment and serving

Best practices for model monitoring, Vertex AI pipeline best practices, Best practices for artifact organization.

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BTMLCC632	DSE	Fundamentals of Computer Vision & Machine Learning	60	20	20			2	0	2	3

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REFERENCE:

Computer Vision Fundamentals with Google Cloud
Sequence Models for Time Series and Natural Language Processing
Machine Learning in the Enterprise

List of Experiments:-

1. Lab Introduction - Identifying Damaged Car Parts with Vertex AI for AutoML Vision users
2. Lab introduction: Exploring the Dialogflow API
3. Lab Exploring the Dialogflow API
4. Lab introduction: Reusable Embeddings
5. Lab Text classification using reusable embeddings
6. Lab introduction: Text Classification with Keras
7. Lab Keras for Text Classification using Vertex AI
8. Lab intro: Exploring and Creating an Ecommerce Analytics Pipeline with Dataprep
9. Lab Exploring and Creating an Ecommerce Analytics Pipeline with Cloud Dataprep v1.5
10. Lab intro: Vertex AI: Hyperparameter Tuning
11. Lab Vertex AI: Hyperparameter Tuning
12. Lab intro: Monitoring Vertex AI Models
13. Lab Monitoring Vertex AI Models
14. Lab intro: Vertex AI Pipelines

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BTCS708N	DCC	Introduction to Data science	60	20	20	30	20	3	0	2	4

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COURSE OBJECTIVES:
The student will have ability to:
1. The objective of this course is to impart the necessary knowledge of the mathematical foundations needed for data science and develop the programming skills required to build data science applications.

COURSE OUTCOMES:
Upon completion of the subject, students will be able to:
1. Demonstrate understanding of the mathematical foundations needed for data science.
2. Collect, explore, clean, munge and manipulate data.
3. Implement models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees, neural networks and clustering.
4. Build data science applications using Python based toolkits.

SYLLABUS
UNIT I — 6 HOURS
Introduction to Data Science: Concept of Data Science, Traits of Big data, Web Scraping, Analysisvs Reporting.

UNIT II — 9 HOURS
Introduction to Programming Tools for Data Science: Toolkits using Python: Matplotlib, NumPy,Scikit-learn, NLTK, Visualizing Data: Bar Charts, Line Charts, Scatterplots, Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.

UNIT III — 6 HOURS
Mathematical Foundations: Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation, Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem, Hypothesis and Inference: Statistical Hypothesis Testing, Confidence Intervals, Phacking, Bayesian Inference.

UNIT IV — 8 HOURS
Machine Learning: Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression-model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random

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BTCS708N	DCC	Introduction to Data science	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.

forest, Classification Errors, Analysis of Time Series- Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks-Learning And Generalization, Overview of Deep Learning.

UNIT V **5 HOURS**

Case Studies of Data Science Application: Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment Analysis.

TEXTBOOKS:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media.
2. Aurélien Geron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media.
3. Jain V.K., “Data Sciences”, Khanna Publishing House, Delhi.
4. Jain V.K., “Big Data and Hadoop”, Khanna Publishing House, Delhi.
5. Jeeva Jose, “Machine Learning”, Khanna Publishing House, Delhi.
6. Chopra Rajiv, “Machine Learning”, Khanna Publishing House, Delhi.
7. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press http://www.deeplearningbook.org
8. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann Publishers.

LIST OF PRACTICALS:

1. Write a programme in Python to predict the class of the flower based on available attributes.
2. Write a programme in Python to predict if a loan will get approved or not
3. Write a programme in Python to predict the traffic on a new mode of transport
4. Write a programme in Python to predict the class of the user.
5. Write a programme in Python to identify the tweets which are hate tweets and which are not.
6. Write a programme in Python to predict the age of the actors.
7. Mini project to predict the time taken to solve a problem given the current status of the user

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BTCS607N	PW	Minor Project	0	0	0	60	40	0	0	4	2

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:

This course is the masters by coursework Minor Project.
A Minor Project is a substantial work of supervised research or development, requiring the equivalent of about four to six months full-time work from start to finish. A Project involves identifying a task or problem, searching and reviewing relevant literature, a proposed, implemented, and critically analyzed solution to the task or problem, and a written report describing the problem, the relevant literature, the solution, and its relation to other work in the area.

Note: This course includes a work integrated learning experience in which your knowledge and skills will be applied and assessed in a real or simulated workplace context and where feedback from industry and/ or community is integral to your experience.

COURSE OUTCOMES

This course contributes to the following program learning outcomes:

- **Enabling Knowledge:**

You will gain skills as you apply knowledge with creativity and initiative to new situations. In doing so, you will:

- Demonstrate mastery of a body of knowledge that includes recent developments in Information Technology

Recognize and use research principles and methods applicable to Information Technology.

You will learn to accurately and objectively examine, and critically investigate Information Technology (IT) concepts, evidence, theories or situations, in particular to:

- Analyze and model complex requirements and constraints for the purpose of designing and implementing software artifacts and ITsystems
- Evaluate and compare designs of software artifacts and IT systems on the basis of organizational and user requirements.

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-VI (2023-27)

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*				
BTCS607N	PW	Minor Project	0	0	0	60	40	0	0	4	2

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.

- **Problem Solving:**

Your capability to analyze complex problems and provide suitable solutions will be extended as you learn to: design and implement software solutions that accommodate specified requirements and constraints, based on analysis or modeling or requirements specification.

- **Communication:**

You will learn to communicate effectively with a variety of audiences through a range of modes and media, in particular to: interpret abstract theoretical propositions, choose methodologies, justify conclusions and defend professional decisions to both IT and non-IT personnel via technical reports of professional standard and technical presentations.

- **Responsibility:**

You will be required to accept responsibility for your own learning and make informed decisions about judging and adopting appropriate behavior in professional and social situations. This includes accepting the responsibility for independent life-long learning and a high level of accountability. Specifically, you will learn to: effectively apply relevant standards, ethical considerations, and an understanding of legal and privacy issues to designing software applications and IT systems.

- **Research and Scholarship:**

You will have technical and communication skills to design, evaluate, implement, analyze and theorize about developments that contribute to professional practice or scholarship; specifically you will have cognitive skills:

- To demonstrate mastery of theoretical knowledge and to reflect critically on theory and professional practice or scholarship
- To plan and execute a substantial research-based project, capstone experience and/or piece of scholarship.

Course Learning Outcomes

Upon successful completion of this course you should be able to:

- Identify a task or problem relevant to /or IT

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- Search and review of the relevant literature
- Propose a solution to the task or problem
- Develop a software and/or algorithmic solution to the task or problem
- Implement solutions to meet high quality requirements developed by the supervisor
- Carry out research under supervision
- Present the research in a written form like that used for published papers
- Present the research in an oral seminar.

Overview of Learning Activities

A Minor project is a substantial work of supervised research or software development. You will choose an academic staff member as your supervisor to work on a research project. To successfully complete the course, you must demonstrate research skills: ability to undertake research under supervision, ability to analyze, develop, and present the research in a written form like that used for published papers, and ability to present the research in an oral seminar.

In this course, you are expected to carry out research activities including implementing a complete solution to the problems identified by the supervisor, critical analysis of results, and completing a written Project. The major deadline for this course is the delivery of the Minor Project by the end of the semester.

Overview of Assessment

You must satisfactorily complete each of the following assessment tasks for this course:

- Research project comprising an implemented and critically analyzed solution to the task or problem.
- Written report (final Project) describing the problem, the relevant literature, the solution, and its relation to other work in the area
- Seminar on your research (of 20 minutes) soon after your Project is submitted.

The Minor Project is assessed on its merits as a research publication. Each Project is examined by two academics, usually from within the Institute.

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BTCS607N	**PW**	**Minor Project**	**0**	**0**	**0**	**60**	**40**	**0**	**0**	**4**	**2**

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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