



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/ CSE (ES/MA/AI/DS/MLCC/ICS/BDCE) /IT

SEMESTER-VII (2023-2027)

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*				
BTCS710	DCC	Deep Learning Foundations	60	20	20	30	20	3	1	2	5

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 understand the fundamental theoretical concepts of neural networks and deep learning.
2. To provide knowledge of various optimization algorithms used in training deep models.
3. To enable the design and implementation of CNNs and RNNs for real-world tasks.
4. To explore unsupervised learning frameworks like Auto encoders and Generative Models.
5. To develop skills in using modern deep learning frameworks for solving complex engineering and data-driven problems.

COURSE OUTCOMES:

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

1. Demonstrate fundamental knowledge of McCulloch-Pitts neurons, Perceptron, and the mathematical foundations of gradient descent.
2. Design and optimize Multi-Layer Perceptron using backpropagation and advanced regularization techniques.
3. Implement Convolutional Neural Networks for image recognition, denoising, and computer vision tasks.
4. Apply Recurrent Neural Networks and LSTMs for sequential data analysis and natural language processing.
5. Evaluate generative models and unsupervised learning architectures for data synthesis and dimensionality reduction.

SYLLABUS

UNIT I

9 HOURS

Foundations of Neural Networks: - History of Deep Learning, McCulloch-Pitts Neuron, Perceptron's and Perceptron Learning Algorithm. Multilayer Perceptron's (MLPs), Representation Power of MLPs, Sigmoid Neurons, Feed Forward Neural Networks, Back propagation.

UNIT II

9 HOURS

Optimization and Linear Algebra for DL: - Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam. Mathematical Foundations: Eigenvalue Decomposition, Singular Value Decomposition (SVD), Principal Component Analysis (PCA).

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UNIT III

9 HOURS

Regularization and Effective Training: - Bias-Variance Tradeoff, L1 & L2 regularization, Early stopping, Dataset augmentation, Parameter sharing, Dropout, Batch Normalization, Instance and Group Normalization. Weight Initialization methods (Xavier/He), Greedy Layer wise pre-training.

UNIT IV

9 HOURS

Convolutional Neural Networks (CNN): - Building blocks of CNN: Convolution, Pooling, and Stride. Architectures: LeNet, AlexNet, VGGNet, GoogLeNet, ResNet (Skip Connections). Applications: Image Denoising, Semantic Segmentation, Object Detection, Transfer Learning.

UNIT V

9 HOURS

Sequence Models and Generative Modeling: - Recurrent Neural Networks (RNN), Backpropagation through time (BPTT), Vanishing/Exploding Gradients. GRU, LSTMs. Attention Mechanism and Encoder-Decoder Models. Introduction to Generative Modeling: Variational Autoencoders (VAE) and Generative Adversarial Networks (GAN).

TEXTBOOKS:

1. I. Good fellow, Y. Bengio, and A. Courville, *Deep Learning*. Cambridge, MA, USA: MIT Press, 2016.
2. E. Charniak, *Introduction to Deep Learning*. Cambridge, MA, USA: MIT Press, 2019.

REFERENCE:

1. F. Chollet, *Deep Learning with Python*. Shelter Island, NY, USA: Manning Publications, 2021.
2. S. Haykin, *Neural Networks and Learning Machines*, 3rd ed. Upper Saddle River, NJ, USA: Pearson, 2009.
3. A. Geron, *Hands-On Machine Learning with Scikit-Learn, Keras, and Tensor Flow*, 3rd ed. Sebastopol, CA, USA: O'Reilly Media, 2022.
4. https://onlinecourses.nptel.ac.in/noc26_cs66/preview
5. https://onlinecourses.nptel.ac.in/noc26_ee53/preview

LIST OF PRACTICALS

1. Implementation of a McCulloch-Pitts Neuron to simulate basic logic gates.
2. Implementation of the Perceptron Learning Algorithm for binary classification.
3. Design a Multi-Layer Perceptron (MLP) for the MNIST handwritten digit dataset using Back propagation.

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- Comparative study of different optimizers (SGD, RMSProp, Adam) on a deep neural network.
- Implementing Dimensionality Reduction using Auto encoders and comparing it with PCA.
- Applying Dropout and Batch Normalization to a deep network to analyze performance and over fitting.
- Image Classification using a standard CNN architecture (e.g., LeNet or AlexNet).
- Implementing Transfer Learning using a pre-trained model (VGG16 or ResNet) for a custom image dataset.
- Time-series prediction (e.g., stock price or weather) using LSTMs.
- Implementation of a basic Generative Adversarial Network (GAN) to generate synthetic images.
- Capstone Project

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BTCS711	DCC	Block Chain and Cryptocurrency	60	20	20	30	20	3	0	2	4

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COURSE OBJECTIVES:

The student will have ability:

1. To introduce the fundamental concepts of blockchain technology and distributed ledger systems
2. To understand the working principles of cryptocurrencies and digital transactions.
3. To study the structure of blocks, hashing, and basic cryptographic techniques
4. To explore real-world applications of blockchain and its security challenges
- 5.

COURSE OUTCOMES:

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

1. To know the structure of Blockchain fundamentals
2. To make the students understand the cryptography usages
3. To give awareness about Blockchain development and its importance
4. To demonstrate the application effect of Blockchain Technology in business
5. To Understand the different applications of Blockchain.

SYLLABUS

UNIT I

9 HOURS

Introduction, Block Chain-Definition, Network view of blockchain, Generic structure of blockchain, Generic elements of blockchain, features of blockchain, how blockchain accumulates blocks, Tier of blockchain, Types of blockchain, structure and mechanism. Crypto currency- definition, features, types, bitcoin& its features.

UNIT II

9 HOURS

Cryptography

Introduction to cryptography, Digital Signatures, Cryptographic Hash Functions, Cryptographic Data Structures, Hash Pointers, Append-Only Ledgers (Blockchains), proof of work vs. proof of stake.

UNIT III

9 HOURS

Cryptocurrency Technologies

Smart Property, Efficient micro-payments, Coupling, Transactions and Payment (Interdependent Transactions), Public Randomness Source, Prediction Markets, Bitcoin Blocks, Hot and Cold Storage, Splitting and Sharing Keys. Understand Digital wallets, Understand Individual Payments, Learn about Developing Countries and DFS: Regulation of Mobile Money, Real-Time Gross Settlement (RTGS) Systems- The Role of Blockchain in RTGS, ABCDs (Artificial Intelligence- Blockchain-Cloud Computing-Data) of Alternative Finance and Digital Finance,

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Benefits of New Payment Stacks.

UNIT IV

9 HOURS

Blockchain deployment

Mining and forking, Upgrading the network, Related BIPs, Segregated Witness (SegWit), Highlights of Major Blockchain Platforms, What is Ethereum? Trustlessness and Immutability of Blockchain Technology, how Blockchain will affect both business and society in the future.

UNIT V

9 HOURS

Application of Blockchain Technology

Abstract Architecture, Ways to dive deeper, Introduction to major block chain platforms, Banking and industry, Financial Transactions, Core banking software case study.

TEXTBOOKS:

1. Bitcoin and Cryptocurrency Technologies, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies, Princeton University Press, 2016.
2. Bitcoin: A Peer-to-Peer Electronic Cash System, Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System, Kindle Edition, 2008.

REFERENCE:

1. How the Bitcoin Protocol Works, Michael Nielsen, How the Bitcoin Protocol Works, 2013.

LIST OF PRACTICALS

1. Study the basic structure of blockchain and simulate how blocks are linked using hash
2. Implement a simple blockchain in Python (creating blocks, hash, and chain linking).
3. Demonstrate working of cryptographic hash functions (e.g., SHA-256) and analyze output changes
4. Implement a basic digital signature system using public and private keys
5. Create and verify a hash pointer-based data structure
6. Simulate Proof of Work (PoW) consensus mechanism
7. Compare Proof of Work vs Proof of Stake (PoS) using a small simulation or case analysis
8. Study and demonstrate the working of a Bitcoin transaction and block structure.
9. Create and manage a digital wallet simulation (key generation, address creation).
10. Simulate micro-payments or transaction flow between multiple users
11. Develop a simple smart contract (using Solidity on Ethereum test network).
12. Demonstrate hot and cold storage concepts for cryptocurrency security.
13. Study and demonstrate mining and block creation process.
14. Analyze a blockchain platform (Ethereum/Hyperledger) and prepare a report.

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15 Case study implementation: Analyze blockchain use in banking or financial transactions

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BTICS701	DSE	Mobile and Cloud Security	60	20	20	30	20	3	0	2	4

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COURSE OBJECTIVES:

The student will have ability:

1. To understand modern trends of cloud and mobile computing security.
2. To acquire knowledge about the methodology followed in developing secure computing applications.

COURSE OUTCOMES:

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

1. Research in the field of mobile and cloud security and privacy.
2. Generalize the Data Centre operations, encryption methods and deployment details.
3. Provide recommendations for using and managing the customer's identity and choose the type of virtualization to be used.
4. Understand the Mobile platform security models and Mobile Commerce Security.
5. Design secured cloud and mobile networks that optimize accessibility whilst minimizing vulnerability to security risks.

SYLLABUS

UNIT I

9 HOURS

Cloud Computing Security Architectural Framework:

Cloud Benefits, Business scenarios, Cloud Computing Evolution, cloud vocabulary, Essential Characteristics of Cloud Computing, Cloud deployment models, Cloud Service Models, Multi-Tenancy, Approaches to create a barrier between the Tenants, cloud computing vendors, Cloud Computing threats, Cloud Reference Model, The Cloud Cube Model, Security for Cloud Computing, How Security Gets Integrated.

UNIT II

9 HOURS

Mobile Security Framework:

Mobile system architecture, Overview of mobile cellular systems, GSM and UMTS Security architecture & Attacks, Vulnerabilities in Cellular Services, Cellular Jamming, Attacks & Mitigation, Security in Cellular VoIP Services, Mobile application security.

UNIT III

9 HOURS

Mobile platform security models and Mobile Commerce Security: Android, iOS Mobile platform security models, Detecting Android malware in Android markets, Reputation and Trust, Intrusion Detection, Vulnerabilities, Analysis of Mobile commerce platform, secure authentication for mobile users, Mobile commerce security

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UNIT IV

9 HOURS

Data Center Operations and security challenges:

Data Center Operations, Security challenge, Implement Five Principal Characteristics of Cloud Computing, Data center Security Recommendations. Encryption and Key Management: Encryption for Confidentiality and Integrity, Encrypting data at rest, Key Management Lifecycle, Cloud Encryption Standards, Recommendations.

UNIT V

9 HOURS

Computing Paradigms:

Virtualization Vulnerabilities, Hypervisor Security-Related Issues, Side Channel Attacks, Data Segregation, ubiquitous, grid, cloud, pervasive, green, ad hoc (mobile, vehicular, flying) networks.

TEXTBOOKS:

1. Tim Mather, Subra Kumaraswamy, Shahed Latif, —Cloud Security and Privacy, An Enterprise Perspective on Risks and Compliance, O'Reilly Media 2009
2. S. Kami Makki, Peter Reiher, Kia Makki, Niki Pissinou, Shamila Makki, “Mobile and Wireless Network Security and Privacy”, Springer, ISBN 978-0-387-71057-0, 09-Aug2007.
3. Anurag Kumar, D. Manjunath, Joy Kuri “Wireless Networking” Morgan Kaufmann Publishers, First edition, 2009.

REFERENCE:

1. Vic (J.R.) Winkler, Securing the Cloud, Cloud Computer Security Techniques and Tactics, Syngress, April 2011.
2. C. Siva Ram Murthy, B.S. Manoj, “Adhoc Wireless Networks Architectures and Protocols”, Prentice Hall, ISBN 9788131706885, 2007
3. Nouredine Boudriga, “Security of Mobile Communications”, ISBN 9780849379413, 2010

LIST OF PRACTICAL

1. Study and implement cloud deployment and service models using public, private, and hybrid environments.
2. Demonstrate multi-tenancy and apply isolation techniques between tenants in a cloud setup.
3. Simulate cloud computing threats and apply mitigation strategies using security tools.

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4. Analyze GSM and UMTS security architecture and demonstrate cellular jamming attacks with countermeasures.
5. Perform mobile application security testing through static and dynamic analysis of Android/iOS apps.
6. Detect Android malware samples using signature-based and behavior-based detection methods.
7. Implement encryption for data at rest and in transit with key management lifecycle demonstration.
8. Apply cloud encryption standards and verify confidentiality and integrity using hashing techniques.
9. Deploy virtualization environments and demonstrate hypervisor-related vulnerabilities and side-channel attacks.
10. Compare security challenges across computing paradigms such as grid, pervasive, and ad hoc networks using simulation tools.

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BTDSE720	DSE	Reinforcement Learning	60	20	20	30	20	3	0	2	4

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COURSE OBJECTIVES:

The student will have ability:

1. To introduce the foundational concepts of the agent-environment interaction and reward-based learning.
2. To provide a deep understanding of Multi-armed Bandits and exploration-exploitation trade-offs.
3. To enable students to model real-world problems as Markov Decision Processes (MDPs).
4. To master tabular and function approximation methods for solving large-scale RL problems.
5. To explore advanced topics like Deep Q-Networks (DQN), Hierarchical RL, and partially observable environments.

COURSE OUTCOMES:

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

1. Formulate sequential decision-making problems using the framework of Markov Decision Processes.
2. Analyze and implement Bandit algorithms to solve exploration-exploitation dilemmas in industrial scenarios.
3. Solve MDPs using Dynamic Programming, Monte Carlo, and Temporal Difference (TD) methods.
4. Apply Deep Learning function approximators (DQN) to solve RL problems with high-dimensional state spaces.
5. Design hierarchical and policy-based solutions for complex, multi-step engineering tasks.

SYLLABUS

UNIT I

9 HOURS

Introduction and Bandit Problems: - Introduction to RL: The Agent-Environment Interface, Rewards, and Goals. The Exploration-Exploitation Trade-off; Multi-armed Bandits: ϵ -greedy, Upper Confidence Bound (UCB), PAC-learning, Median Elimination, and basic Policy Gradient for Bandits.

UNIT II

9 HOURS

Markov Decision Processes (MDPs):- Finite MDPs: States, Actions, and Transitions. Return and Episodes; Bellman Equations: State-Value and Action-Value functions; Bellman Optimality Equations. Modeling industrial processes (e.g., chemical reactor control) as MDPs.

UNIT III

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Fundamental Solution Methods: - Dynamic Programming: Policy Evaluation, Policy Iteration, and Value Iteration. Monte Carlo Methods for prediction and control. Temporal Difference (TD) Learning: TD (0), SARSA, and Q-Learning. Eligibility Traces: TD (λ) and n-step Bootstrapping.

UNIT IV

9 HOURS

Function Approximation and Deep RL: - Scaling RL: Value function approximation, Linear methods, and Least Squares RL. Deep Q-Networks (DQN): Experience Replay and Target Networks. Policy Gradient Methods for full RL: REINFORCE algorithm and Actor-Critic architecture.

UNIT V

9 HOURS

Advanced RL Architectures: - Hierarchical Reinforcement Learning (HRL): Options framework and goal-conditioned RL. Partially Observable MDPs (POMDPs): Belief states and applications. Case studies in robotics and automated system optimization.

TEXTBOOKS:

1. R. S. Sutton and A. G. Barto, *Reinforcement Learning: An Introduction*, 2nd ed. Cambridge, MA, USA: MIT Press, 2018.
2. C. Szepesvari, *Algorithms for Reinforcement Learning*. San Rafael, CA, USA: Morgan & Claypool, 2010.

REFERENCE:

1. D. P. Bertsekas, *Reinforcement Learning and Optimal Control*. Belmont, MA, USA: Athena Scientific, 2019.
2. M. Laskin, *Deep Reinforcement Learning in Action*. Shelter Island, NY, USA: Manning Publications, 2020.
3. K. Arulkumaran, M. P. Deisenroth, M. Brundage, and A. A. Bharath, "Deep Reinforcement Learning: A Brief Survey," *IEEE Signal Processing Magazine*, vol. 34, no. 6, pp. 26-38, Nov. 2017.
4. https://onlinecourses.nptel.ac.in/noc26_cs81/preview

LIST OF PRACTICALS

1. **Bandit Lab:** Implementation of ϵ -greedy and UCB algorithms for a 10-armed bandit problem.
2. **Frozen Lake (DP):** Solving the Frozen Lake environment using Policy Iteration and Value Iteration.
3. **Blackjack (MC):** Implementation of First-visit Monte Carlo for predicting win rates in Blackjack.
4. **Cliff Walking (TD):** Comparative study of SARSA (on-policy) and Q-Learning (off-policy) in a grid world.

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B. Tech - CSE/ CSE (ES/MA/AI/DS/FSDB/AI ML/MLCC/ICS/BDCE) /IT

SEMESTER-VII (2023-2027)

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*				
BTDSE720	DSE	Reinforcement Learning	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.

- Mountain Car (Linear FA):** Solving the Mountain Car problem using linear function approximation with tiling.
- Cart Pole (DQN):** Implementation of a Deep Q-Network with Experience Replay to balance a pole.
- Lunar Lander (DQN):** Tuning hyper-parameters (learning rate, γ) for a stable landing using DQN.
- REINFORCE Implementation:** Solving the Acrobot environment using basic Policy Gradient.
- Actor-Critic:** Implementing the Advantage Actor-Critic (A2C) algorithm on a continuous control task.
- Custom Environment:** Building a custom MDP environment for a simple chemical process (e.g., tank level control) and solving it via Q-Learning.

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			THEORY			PRACTICAL					
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BTDSE722	DSE	Prompt Engineering and Fine Tuning	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 understand the architectural foundations of LLMs and the mechanics of tokenization and temperature.
2. To master advanced prompting techniques like Chain-of-Thought, ReAct, and Few-Shot learning.
3. To explore multi-modal prompting for image, voice, and video generation.
4. To learn the end-to-end process of Fine-Tuning, including dataset preparation and PEFT (Parameter-Efficient Fine-Tuning)
5. To evaluate the ethical, safety, and cost implications of deploying AI-driven solutions.

COURSE OUTCOMES:

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

1. Apply foundational knowledge of LLMs to design effective "Prompt Cards" and structured inputs for text mastery.
2. Design and implement complex "Vibe Coding" workflows and low-code Chabot's for industrial automation.
3. Conduct investigations into model performance by comparing zero-shot prompting vs. supervised fine-tuning.
4. Execute Parameter-Efficient Fine-Tuning (LoRA/QLoRA) on open-source models for specialized domain tasks.
5. Assess the security, ethical, and economic constraints of shipping AI products to production.

SYLLABUS

UNIT I

9 HOURS

Foundational Prompting & Text Mastery: - LLM Foundations: Tokenization, Context Windows, and Temperature. The "Prompt Card" Framework. Techniques for Text Mastery: Summarization, Information Extraction, and Domain-specific Translation. Structured output generation (JSON/Markdown).

UNIT II

9 HOURS

Advanced Reasoning & Multi-modal Prompting: - Reasoning Frameworks: Chain-of-Thought (Cot), Tree-of-Thoughts, and React prompting. Visual Prompting: Image generation, branding consistency, and DALL-E/ Midjourney integration. Introduction to Voice and Video prompting workflows.

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BTDSE722	DSE	Prompt Engineering and Fine Tuning	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

9 HOURS

AI-Assisted Development & Low-Code Solutions: - "Vibe Coding" and Copilots: Using AI to write, debug, and optimize code. Building Chatbots using no-code/low-code platforms (e.g., Flowise, Lang Flow). Prompt Chaining and Autonomous Agents basics.

UNIT IV

9 HOURS

Dataset Engineering & Fine-Tuning Foundations: - When to Prompt vs. When to Fine-Tune. Dataset Preparation: Cleaning, formatting (JSONL), and synthetic data generation. Supervised Fine-Tuning (SFT). Parameter-Efficient Fine-Tuning (PEFT): Introduction to LoRA and QLoRA.

UNIT V

9 HOURS

Deployment, Ethics, and Governance: - Quality Assurance in Prompting: A/B testing prompts and LLM-as-a-judge. Ethical AI: Bias mitigation, Red-Teaming, and Jailbreak prevention. Cost Management: Token optimization and caching. Shipping and Showcasing AI products.

TEXTBOOKS:

1. N. Schwalbe, *Prompt Engineering for LLMs: Art and Science*. Sebastopol, CA, USA: O'Reilly Media, 2024.
2. S. Raschka, *Build a Large Language Model (from Scratch)*. Shelter Island, NY, USA: Manning Publications, 2024.

REFERENCE:

1. B. Ahmadi, *Hands-On Graph Neural Networks with Python*. Birmingham, UK: Packt Publishing, 2023.
2. T. Brown et al., "Language Models are Few-Shot Learners," *arXiv preprint arXiv:2005.14165*, 2020.
3. E. Hu et al., "LoRA: Low-Rank Adaptation of Large Language Models," *In Proc. of ICLR*, 2022.
4. https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mg131

LIST OF PRACTICALS

1. **Prompt Card Design:** Create a standardized prompt template for extracting safety data from chemical industry reports.
2. **Text Mastery Lab:** Perform multi-step summarization and translation of technical research papers.
3. **Reasoning Lab:** Implement "Chain-of-Thought" prompting to solve complex chemical stoichiometry

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BTDSE722	DSE	Prompt Engineering and Fine Tuning	60	20	20	30	20	3	0	2	4

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problems.

- Multi-modal Branding:** Use DALL-E/Stable Diffusion to create a consistent brand identity for a hypothetical AI startup.
- No-Code Chatbot:** Build a customer support chatbot using Lang Flow that interfaces with a local PDF knowledge base.
- Synthetic Data Gen:** Use a large model (GPT-4) to generate 100 high-quality training pairs for a smaller model (Llama-3).
- Model Evaluation:** Conduct a "blind taste test" comparing the outputs of three different LLMs on the same prompt set.
- Fine-Tuning (PEFT):** Implement LoRA fine-tuning on a 7B parameter model using a specialized dataset (e.g., Medical or Legal).
- Security Audit:** Perform "Red-Teaming" on an LLM to identify vulnerabilities to prompt injection.
- Cost Optimization:** Calculate and compare the cost-per-inference for different token-saving prompting strategies.

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS705N	SEC	Industrial Training	0	0	0	0	50	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:

The student will have ability to:

1. To expose students to authentic engineering environments, corporate operations, and professional workflows, bridging the gap between classroom theory and industry practice.
2. To train students in systematic problem identification, data collection, and analytical troubleshooting by tackling real-world engineering issues or software deployment constraints.
3. To cultivate essential workplace competencies, including professional ethics, time management, collaborative teamwork, and structured technical reporting.

COURSE OUTCOMES:

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

1. Analyze the operational architecture, infrastructure, and technical tools utilized by a modern engineering enterprise or research institution.
2. Formulate, evaluate, and propose optimal engineering or software-driven solutions for a minimum of three distinct real-world technical problems observed during the training period.
3. Compile an industry-grade technical training report and professionally defend their observations, technical skills, and project outcomes before an expert evaluation committee.

Guidelines for Students Undergoing Industrial Training

1. Overview & Institutional Scope

Students need to complete a mandatory **minimum 2-week industrial training** program during the summer vacation of after third year.

- **Prerequisite:** Before starting your training, students must obtain clear instructions and official approval from the designated Faculty In-Charge and then by Head of Department (HOD).
- **Alternative Attachments:** In place of a traditional corporate internship, students are permitted to complete an academic attachment of equal duration at a recognized national institution (such as an IIT, NIT, or IIIT) or an accredited university abroad.

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BTCS705N	SEC	Industrial Training	0	0	0	0	50	0	0	4	2

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- **Professional Value:** This training serves as initial transition into corporate engineering. It is designed to cultivate practical engineering skills, build industry networks, enhance employability, and establish a foundational awareness of workplace behavior, interpersonal dynamics, and professional ethics.

2. Operational Phasing & Responsibilities

Students are completely responsible for ensuring their conduct throughout the placement cycle is ethical, conscientious, and professional.

1. Application & Approval: Pre-Training.

Apply for a suitable training slot through the Training and Placement (T&P) Officer at least one semester in advance. Once an offer is secured, submit a copy of the official offer letter to your HOD or Faculty Coordinator. You are strictly prohibited from changing your company choice once it has been officially approved.

2. Verify Company Eligibility: Conflict of Interest Check.

To prevent a conflict of interest, students are strictly prohibited from completing training at a family-owned business or an enterprise where close relatives hold direct management authority.

3. Immediate Joining Notification: Day 1 of Training.

Upon arriving at training site, students must immediately contact to Faculty Coordinator. Provide your exact start date, company name, your active contact details, and the contact information of your designated industry supervisor.

4. Problem Formulation & Study: During Training.

Actively engage with the industry's technical tasks. Students must identify and document 3 to 4 practical problems currently faced by the facility or software engineering team

5. Professional Conduct & Confidentiality: Daily Operations.

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BTCS705N	SEC	Industrial Training	0	0	0	0	50	0	0	4	2

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Maintain 100% attendance and strictly follow all rules, safety protocols, and regulations enforced by the host organization. Protect the company's intellectual property; students are legally and ethically bound to maintain absolute confidentiality and must not share proprietary company data with third parties.

3. Industrial Training Report Guidelines

Students must compile a comprehensive technical report of **at least 25 to 30 pages** documenting their work. If multiple students are trained at the same organization, each student must author and submit an entirely independent, unique report.

Core Content Requirements

The technical manuscript must thoroughly document the following areas:

- **Enterprise Profile:** Essential history, market domain, infrastructure, and corporate introduction of the company.
- **Operational Workflows:** The sequence of manufacturing operations, production systems, or software development lifecycles (SDLC) deployed at the site.
- **Physical or Logical Layout:** A clear description of the facility floors, laboratories, workshops, or administrative networks.
- **Technical Configurations:** The major industrial equipment used, or the complete computer/server architecture and development environments required for running specialized enterprise software.
- **Logistics (Where Applicable):** The physical movement of raw, semi-finished, and finished materials (exempt for pure software engineering tracks).
- **Technical Case Studies:** Detailed formulation of your 3 to 4 technical problems, including the underlying data gathered, analysis steps, precise software commands or engineering math used, and your final data-driven recommendations.

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BTCS705N	SEC	Industrial Training	0	0	0	0	50	0	0	4	2

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- **Industrial Validation:** A formal certificate of completion issued, signed, and stamped by your industry supervisor covering the exact duration of your training.

Document Structure Checklist

The final report must be organized in the following order:

1. Preface & Acknowledgements
2. Official Training Certificate (featuring the signature and seal of the authorized industry representative)
3. Table of Contents
4. Introduction to the Organization
5. Training Schedule & Timeline
6. Daily Work Logs & Technical Observations
7. Specific Assignment / Handled Project Details
8. Post-Training Learning Outcomes & Personal Reflections
9. Executive Summary & Bibliography (properly referencing all text citations, books, technical papers, or engineering standards used)

4. Assessment Framework & Evaluation

Evaluation is continuous and designed to measure the quality of your insights relative to graduate-level engineering attributes. A copy of your finalized report must be distributed to your industry employer, your internal department advisor, and your personal archive.

Evaluation Mechanism

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BTCS705N	SEC	Industrial Training	0	0	0	0	50	0	0	4	2

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The overall grade will be determined by the Faculty Coordinator and an appointed departmental expert committee via a formal **Seminar Presentation and Viva-Voce**.

Assessment Component	Evaluation Focus Criteria	Expected Graduate Attributes Tested
Technical Report	- Analytical depth of the case studies - Technical accuracy of data and logs - Structure and formatting compliance	- Engineering Knowledge - Problem Analysis - Investigation of Complex Problems
Seminar Presentation	- Clarity and quality of visual slides - Professional delivery and communication flow - Depth of technical knowledge during Q&A	- Modern Tool Usage - Design/Development of Solutions - Executive Presence

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BTICS721	DCC	Threat Intelligence Lab	0	0	0	30	20	0	0	2	1

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; *Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

The student will have ability:

1. To understand and apply concepts of Cyber Threat Intelligence (CTI) in real-world scenarios.
2. To perform threat collection, analysis, and reporting using tools and Frameworks.
3. To develop skills in threat hunting, OSINT, and attack analysis.

COURSE OUTCOMES:

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

1. Identify and classify cyber threats using intelligence frameworks.
2. Collect and analyse threat data from multiple sources.
3. Perform threat hunting and incident analysis.
4. Generate intelligence reports for decision-making

SYLLABUS

UNIT I

9 HOURS

Introduction to Threat Intelligence: Fundamentals of Cyber Threat Intelligence (CTI), Importance of CTI in cybersecurity, Types of threat intelligence: Strategic, Tactical, Operational, Technical, Threat intelligence lifecycle: Planning, Collection, Processing, Analysis, Dissemination, Overview of evolving cyber threat landscape, Threat intelligence platforms: MISP, OpenCTI

UNIT II

9 HOURS

Data Collection and OSINT: Techniques for gathering threat data, Open-Source Intelligence (OSINT) fundamentals, Data sources: Public, Private, Dark Web (introductory concepts), Tools for OSINT: Maltego, Shodan, Recon-ng, Collecting intelligence on domains, IPs, emails, social media, Legal and ethical considerations in intelligence collection.

UNIT III

9 HOURS

Threat Analysis and Frameworks: Indicators of Compromise (IoCs) and Indicators of Attack (IoAs), Basics of malware behavior and analysis, MITRE ATT&CK framework, Cyber Kill Chain model, Threat actor profiling, Tactics, Techniques, and Procedures (TTPs)

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BTICS721	DCC	Threat Intelligence Lab	0	0	0	30	20	0	0	2	1

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UNIT IV

9 HOURS

Fundamentals of threat hunting, Log analysis techniques, Security Information and Event Management (SIEM): Splunk, ELK Stack, Network traffic analysis using Wireshark, Identifying anomalies and suspicious patterns.

Fundamentals of threat hunting, Log analysis techniques, Security Information and Event Management (SIEM): Splunk, ELK Stack

Network traffic analysis using Wireshark

Identifying anomalies and suspicious patterns

UNIT V

9 HOURS

Threat Intelligence Reporting and Sharing: Preparing structured threat intelligence reports, Risk assessment and impact analysis, Threat intelligence sharing standards: STIX, TAXII, Best practices for secure dissemination of intelligence.

TEXTBOOKS:

1. Martin Lee, “Cyber Threat Intelligence”, Wiley.
2. Kyle Wilhoit and Joseph Guarino, “Practical Cyber Intelligence”, Packt Publishing.
3. Robert M. Clark, “Intelligence Collection”, CQ Press

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTICS721	DCC	Threat Intelligence Lab	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.

1. Richard J. Heuer Jr., “Psychology of Intelligence Analysis”, CIA Center for the Study of Intelligence

LIST OF PRACTICALS

1. Study Cyber Threat Intelligence (CTI) concepts by referring to publicly available cyber security reports and identify real-world use cases.
2. Understand and demonstrate the Threat Intelligence Lifecycle by selecting a simple cyber-attack case study and mapping all stages (Planning, Collection, Processing, Analysis, Dissemination).
3. Perform basic Open-Source Intelligence (OSINT) using search engines (Google Dorking) to collect publicly available information such as documents, emails, and links.
4. Conduct manual domain and IP analysis using WHOIS and DNS lookup tools (use built-in system tools or open-source tools if required) to gather domain-related information.
5. Identify and classify Indicators of Compromise (IoCs) from given datasets, such as malicious IP addresses, domains, and file hashes.
6. Study and map cyber attack techniques using the MITRE ATTACK Navigator by analyzing a known attack and identifying its tactics and techniques.
7. Analyze cyber-attacks using the Cyber Kill Chain model by mapping different stages of an attack based on a selected case study.
8. Perform basic network observation using Wireshark (only when packet capture is required) to study network traffic and protocols.
9. Carry out simple log analysis using sample log files through manual inspection or with Kibana (if required) to identify suspicious activities. Identifying phishing emails using sample datasets (manual inspection)
10. Case study analysis of recent cyber attacks (APT, ransomware) using publicly available reports.

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BTCS706N	SEC	Project	0	0	0	120	80	0	0	8	4

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COURSE OBJECTIVES:

The student will have ability to:

1. Enable students to identify real-world, complex engineering problems and apply systematic research methodologies to formulate viable technical solutions.
2. Train students in designing, engineering, testing, and validating a complete product, system module, or computing architecture using modern engineering tools and industry-standard practices.
3. Foster collaborative engineering management skills, technical report writing, and the professional defense of engineered solutions before an evaluation panel.

COURSE OUTCOMES:

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

1. Formulate a well-defined problem statement by critically reviewing contemporary research literature, identifying technical gaps, and establishing clear engineering requirements.
2. Design and develop an architectural framework, hardware prototype, or software system by incorporating sustainable design methodologies, algorithm design, and resource optimization.
3. Implement and deploy the proposed system using modern development environments, programming paradigms, cloud infrastructure, or advanced technical tools.
4. Evaluate the performance, scalability, and security parameters of the developed system against standard benchmark metrics, interpreting the results through rigorous testing.
5. Compile comprehensive, industry-grade technical project reports and documentation compliant with standard engineering formats, defending the work effectively through oral presentations.

Project Timeline

Phases

Phase 1: Planning & Requirement Analysis (Weeks 1–2)

Focus: Defining the scope, setting up infrastructure, and identifying functional requirements.

- **Week 1: Project Initiation**

- Form teams and define the problem statement.
- **Tooling:** Set up **Jira** boards (Scrum or Kanban), create Backlog, and initialize **Git** repositories.
- **Deliverable:** Project Vision document and initial Product Backlog.

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- Week 2: Functional Modeling**

- Identify Actors and Use Cases.
- UML Deliverables: * Use Case Diagram:** To define system boundaries.
 - Use Case Descriptions:** Detailed text for each primary flow.
- Tooling:** Map Use Cases to Jira User Stories.

Phase 2: Object-Oriented Analysis (Weeks 3–4)

Focus: Understanding the "What" of the system without focusing on implementation.

- Week 3: Static Analysis**

- Identify domain entities and their relationships.
- UML Deliverables:**
 - Object Diagram:** To model specific instances and data snapshots.
 - Initial Class Diagram (Domain Model):** Focus on attributes and relationships (1:1, 1:N, M:N) without methods.

- Week 4: Dynamic Analysis**

- Model how the system reacts to events.
- UML Deliverable: Activity Diagram:** To model complex business logic and parallel workflows.

Phase 3: Object-Oriented Design (Weeks 5–7)

Focus: Defining the "How" – architecture, patterns, and component interactions.

- Week 5: Interaction Modeling**

- UML Deliverable: * Sequence Diagram:** Detailed logic showing how objects communicate over time to fulfill a use case.

- Week 6: Detailed Class Design & Packaging**

- Apply SOLID principles and Design Patterns.
- UML Deliverables:**
 - Detailed Class Diagram:** Including methods, visibility, and interfaces.
 - Package Diagram:** Organizing classes into logical modules/subsystems.

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- **Week 7: System Architecture**

- **UML Deliverables:**

- **Component Diagram:** Visualizing physical modules (API, Database, UI).
 - **Deployment Diagram:** Mapping software components to hardware/nodes (Cloud, Servers).

Phase 4: Implementation & CI/CD Integration (Weeks 8–10)

Focus: Coding, version control, and automated pipelines.

- **Week 8: Sprint 1 - Core Features**

- Develop core logic based on the Class and Sequence diagrams.
 - **Git Strategy:** Use branching (Feature branches → Develop → Main).

- **Week 9: CI/CD Pipeline Setup**

- Configure **GitHub Actions** or **GitLab CI**.
 - Automate build triggers on every git push.

- **Week 10: Sprint 2 - Integration**

- Develop UI and connect to the database.
 - **Jira:** Move stories to "In Progress" and "Testing."

Phase 5: Testing & Deployment (Weeks 11–12)

Focus: Quality assurance and final delivery.

- **Week 11: Testing Phase**

- **Unit Testing:** (JUnit, PyTest) ensuring methods work as intended.
 - **Integration Testing:** Testing the flow between components.
 - **Tooling:** Integrate test reports into the CI/CD pipeline.

- **Week 12: Deployment & Final Review**

- Finalize the **Deployment Diagram** to match the production environment.
 - Deploy to a staging/production environment (Heroku, AWS, or Azure).
 - Project Demo and handover.

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Jira Backlog and a Git Branching Strategy

1. Jira Backlog & Sprint Structure

The project is divided into **six 2-week Sprints**. **Sample Jira Epic & Story Structure:**

Epic	Sample User Stories (Tasks)	Status
Requirements & Design	Create Use Case Diagrams; Draft System Architecture; Set up Jira Board.	Done/Sprint 1
Infrastructure	Initialize Git Repo; Configure CI/CD Pipeline; Setup Database.	Sprint 2
User Management	Design User Class; Implement Login/Auth; Sequence Diagram for Auth.	Sprint 3
Core Features	[Project Specific Logic]; Unit Tests for Core Logic.	Sprint 4-5
Deployment	Final Deployment Diagram; Production Hosting; Documentation.	Sprint 6

2. Git Branching Strategy

Students should avoid pushing directly to the main branch. A **Feature Branch Workflow** is best for academic teams to prevent code conflicts.

- **main branch:** Contains stable, production-ready code.
- **develop branch:** The integration branch where all features are merged before going to main.
- **feature/feature-name branches:** Created for every individual Jira task (e.g., feature/user-login).

3. Testing & CI/CD Pipeline

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To meet your requirement for testing software and CI/CD, the students should implement a pipeline that triggers on every **Pull Request** to the develop branch.

The Pipeline Flow:

1. **Build:** Compile the code to ensure there are no syntax errors.
2. **Unit Test:** Automatically run tests (e.g., JUnit, PyTest, or Jest). If tests fail, the merge is blocked.
3. **Static Analysis:** Use tools like SonarQube or ESLint to check for code "smells."
4. **Deploy:** Automatically deploy to a staging environment (like Vercel, Netlify, or AWS).

4. UML to Code Mapping (Object-Oriented Focus)

Students must ensure that their diagrams are not just "drawings" but blueprints:

- **Class Diagram** → Directly maps to the Classes and Attributes in their code.
- **Sequence Diagram** → Maps to the logic inside their methods (which object calls which method).
- **Package Diagram** → Maps to the Folder Structure of their project.

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Project Grading Rubric (Total 100%)

1. Analysis & Design (30%)

- **UML Consistency:** Do the diagrams match the actual code implementation?
 - *Check:* Does the **Class Diagram** reflect the actual inheritance and associations in the source code?
- **Behavioral Accuracy:** Do **Sequence Diagrams** correctly identify method calls between objects?
- **Architectural Soundness:** Does the **Deployment Diagram** accurately map to the cloud/server infrastructure used?

2. Object-Oriented Implementation (25%)

- **Encapsulation:** Are attributes private? Are getters/setters used appropriately?
- **Inheritance/Polymorphism:** Are these used to reduce code redundancy?
- **Solid Principles:** Is the code modular? (e.g., Single Responsibility Principle).
- **Design Patterns:** Did the team implement at least one recognizable pattern (e.g., Singleton, Factory, or Observer)?

3. DevOps & Tooling (20%)

- **Jira Management:** Is the backlog updated? Are stories assigned to specific members?
 - *Check:* Do commit messages reference Jira ticket IDs?
- **Git Workflow:** Is there evidence of Pull Requests and Code Reviews?
 - *Check:* Avoid "Mega-commits" (one giant commit at the end of the week).
- **CI/CD Pipeline:** Does the pipeline automatically trigger on pushes? Is the build status visible (Green/Red)?

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4. Testing & Quality (15%)

- **Unit Testing:** Is there a significant percentage of code coverage?
- **Integration Testing:** Are API endpoints or database connections tested?
- **Documentation:** Is the README.md clear, including setup instructions and a system overview?

5. Final Deployment (10%)

- **Accessibility:** Is the project hosted on a live URL?
- **Stability:** Does the system handle basic "unhappy path" errors without crashing?

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Definition of Done (DoD) Checklist

A Jira ticket is only considered **Done** when it meets the following criteria:

1. Design & Modeling

- **UML Alignment:** Any changes to the code structure are reflected in the **Class Diagram**.
- **Logic Validation:** For complex logic, a **Sequence Diagram** has been updated or created.
- **Documentation:** Public methods and classes are documented using standard docstrings (e.g., Javadoc, Docstring).

2. Code Quality & Standards

- **OO Principles:** Code follows Encapsulation and avoids "God Classes" (Single Responsibility Principle).
- **No Hardcoding:** Configuration values (like API keys or DB URLs) are in environment variables.
- **Peer Review:** At least one other team member has reviewed the **Pull Request (PR)** on Git.

3. Testing & CI/CD

- **Unit Tests:** New logic has corresponding unit tests.
- **CI Pipeline:** The CI/CD build is **Green** (passing) on the feature branch.
- **Zero Regressions:** Existing functionality still works as expected.

4. Integration

- **Git Merge:** The feature branch has been merged into the develop branch.
- **Jira Update:** The ticket is moved to the "Done" column and the "Actual Time Spent" is logged.

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Evaluation Schedule

Phase	Milestone	Expected Artifacts
Month 1	Foundation	Use Case, Activity, and Object Diagrams. Jira Backlog setup.
Month 2	Design	Sequence, Class, and Package Diagrams. Git Feature branches active.
Month 3	Execution	Component and Deployment Diagrams. Working CI/CD pipeline and Unit Tests.

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Weekly Progress Report Template

Project Title: [Project Name]

Team ID: [ID]

Date: [Date Range]

1. Executive Summary

- Current Sprint:** [Sprint # of 6]
- Sprint Goal:** (e.g., Finalize Sequence Diagrams and setup Database connection)
- Status:** On Track | At Risk | Delayed

2. UML & OOAD Progress

- Diagrams Completed this week:** (e.g., Package Diagram, Component Diagram)
- Diagrams Revised:** (List any changes made based on implementation feedback)
- OO Concept Applied:** (e.g., "Implemented Interface Inheritance for the Payment module")

3. Technical Execution (DevOps & Git)

- Jira Tasks Completed:** [Link to Jira tickets]
- Git Activity:**
 - Active Branches: [List branch names]
 - Merged Pull Requests: [List PR IDs]
- CI/CD Status:** [e.g., Build Passing / 85% Code Coverage]

4. Testing Summary

- Total Unit Tests:** [Number]

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- **Pass Rate:** [Percentage]%
- **Key Bug Identified:** [Brief description of one technical challenge overcome]

5. Goals for Next Week

- [Goal A]
- [Goal B]

Project Guide Signature

Project In-charge Signature

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BBAI501	AECC	Human Values and Professional Ethics	60	20	20	0	0	3	0	0	3

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Course Educational Objectives (CEOs):

The objective of the course is to disseminate the theory and practice of moral code of conduct and familiarize the students with the concepts of “right” and “good” in individual, social and professional context

Course Outcomes (COs):

1. Help the learners to determine what action or life is best to do or live.
2. Right conduct and good life.
3. To equip students with understanding of the ethical philosophies, principles, models that directly and indirectly affect business.

COURSE CONTENT

Unit I: Human Value

6 HOURS

1. Definition, Essence, Features and Sources
2. Sources and Classification
3. Hierarchy of Values
4. Values Across Culture

Unit II: Morality

5 HOURS

1. Definition, Moral Behaviour and Systems
2. Characteristics of Moral Standards
3. Values Vs Ethics Vs Morality
4. Impression Formation and Management

Unit III: Leadership in Indian Ethical Perspective.

6 HOURS

1. Leadership, Characteristics
2. Leadership in Business (Styles), Types of Leadership (Scriptural, Political, Business and Charismatic)
3. Leadership Behaviour, Leadership Transformation in terms of Shastras (Upanihads, Smritis and Manu-smriti).

Unit IV: Human Behavior – Indian Thoughts

7 HOURS

1. Business Ethics its meaning and definition
2. Types, Objectives, Sources, Relevance in Business organisations.
3. Theories of Ethics, Codes of Ethics

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Shri Vaishnav Institute Of Information Technology
B.Tech(CSE), B.Tech+MBA(CSE) and B.Tech+M.Tech(CSE)
Choice Based Credit System (CBCS)-2023-27
SEMESTER-VII

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*				
BBAI501	AECC	Human Values and Professional Ethics	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.

Unit V: Globalization and Ethics

6 HOURS

1. Sources of Indian Ethos & its impact on human behavior
2. Corporate Citizenship and Social Responsibility – Concept (in Business),
3. Work Ethics and factors affecting work Ethics.

Suggested Readings

1. Beteille, Andre (1991). *Society and Politics in India*. AthlonePress:New Jersey.
2. Chakraborty, S. K. (1999). *Values and Ethics for Organizations*. oxford university press
3. Fernando, A.C. (2009). *Business Ethics - An Indian Perspective*. India: Pearson Education: India
4. Fleddermann, Charles D. (2012). *Engineering Ethics*. New Jersey: Pearson Education / Prentice Hall.
5. Boatright, John R (2012). *Ethics and the Conduct of Business*. Pearson. Education: New Delhi.
6. Crane, Andrew and Matten, Dirk (2015). *Business Ethics*. Oxford University Press Inc:New York.
7. Murthy, C.S.V. (2016). *Business Ethics – Text and Cases*. Himalaya Publishing House Pvt. Ltd:Mumbai
8. Naagrajan, R.R (2016). *Professional Ethics and Human Values*. New Age International Publications:New Delhi.

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