SEMESTER V

Sr No	Course Category	CourseCode	Course Title	Hours per Week			Credits	Maximum Marks		
				L	T	P		Continual Assessment	End Sem Examination	Total
1.	PCC	23AI501T	Machine Learning	3		-	3	30	70	100
2.	PCC	23AI501P	Machine Learning Lab	-	-	2	1	25	25	50
3.	PCC	23AI502T	Design and Analysis of Algorithms	3	-	-	3	30	70	100
4.	PCC	23AI502P	Design and Analysis of Algorithms Lab	-	-	2	1	25	25	50
5.	PCC	23AI503T	Operating System	3		-	3	30	70	100
6.	PEC	23AI504T(iii)	PE – I IoT & Edge Computing	3	-	-	3	30	70	100
7.	OE	23AI561O(ii)	OE – II Fundamentals of AI for Robotics	3	-	-	3	30	70	100
8.	VSC	23AI506T	Technical Skill Development -II	2	-	-	2	50	-	50
9.	SEC	23AI541P	Career Development - V	-	-	2	1	50	-	50
10.	MDM	23AI531M	Multidisciplinary Minor – III (Explainable AI)	3	-	-	3	30	70	100
			Total	20	0	6	23	330	470	800

	Professional Elective – I
23AI504T(i)	Human Computer Interaction
23AI504T(ii)	Edge AI
23AI504T(iii)	IoT & Edge Computing

	Open Elective – II
23AI561O(i)	Blockchain Technologies
23AI561O(ii)	Fundamentals of AI for Robotics

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23AI501T	Machine Learning	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
This course is intended to • Introduce Human learning aspects and Machine learning. • Study primitives and methods in learning process by computer. • Familiarize nature of problems solved with Machine Learning	**Students will be able to** • Learn fundamentals of machine learning. • Device Supervised Classification strategies. • Device Logistic Regression. • Demonstrate Distance Based Models and Probability Based Models. And familiarize the concept of clustering techniques for real world applications. • Apply Dimensionality Reduction and Association Rules.

Unit I: Introduction **[9Hrs]**

Introduction to Machine learning (ML), Need of Machine learning, Relationship between ML and human learning, Examples of Machine Learning Problems, Learning Process, Learning methods, Forms of learning, Training versus Testing, Characteristics of Machine learning tasks, Descriptive, Predictive and Prescriptive tasks ML Techniques: Supervised, Semi- Supervised, Unsupervised and Reinforcement Learning. Feature Selection Techniques in Machine Learning, Data Preprocessing operations and their requirements. Machine Learning Perspective of Data and Feature Engineering, Exploratory Data Analysis (EDA), Performance measures.

Unit II: Regression **[9Hrs]**

Regression: Correlation Coefficient, Pearson, Spearman and Kendall Correlation, Linear Regression, Simple Linear Regression, Multiple Linear Regression, assessing performance of Regression- MSE, MAE, MAPE, R2 Score, Adjusted R2, Overfitting, Underfitting. Polynomial Regression, Multivariate Regression, Regression Diagnosis, Nonlinear Regression Regularization Methods: Ridge, LASSO, Elastic Net Regression.

Unit III: Supervised learning **[10Hrs]**

Classification: Binary Classification, Multi-Class Classification, Multi-Label Classification, Imbalanced Classification, Confusion Matrix, Classification Assessment- Precision, Recall, F1-Score and Accuracy. Machine Learning Algorithms based on Classification: Logistic Regression- Sigmoid Function, Finding Probability, Data Model: Receiver Operating Characteristic (ROC),Area Under Curve (AUC), Decision Tree Classification- Entropy, Gini Index, Classification and Regression Trees. Distance Based Models: Neighbors and Examples, Nearest Neighbor Classification, Finding values of K, Distance Measures. Kernel Based Models: Support Vector Machines, Linear SVM, RBF SVM, Sigmoid SVM, Polynomial SVM. Probability Based Models: Conditional Probability, Bayes Theorem, Naive Bayes Classification, Bayesian Regression.

Unit IV: Unsupervised learning **[9Hrs]**

K-means Clustering- Introduction to Clustering, Algorithm, Elbow Method, Sillhoutte Score Hierarchical Clustering- Dendrogram, Distance Measures, Ward method K-medoids Clustering, K-Prototype Clustering, DBSCAN, Performance Evaluation of Clustering, Real Life Example of Clustering

Unit V: Dimensionality reduction techniques **[8 Hrs)**

Association Rules- Rules Mining, Support, Confidence, Lift, Conviction, Leverage, Apriori Algorithm, FP-Growth Algorithm. Dimensionality Reduction- Curse of Dimensionality, Normalization, Standardization, Eigen Vector and Values, Support Vector Decomposition, Principal Component Analysis, Factor analysis.

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1	Introduction to Machine Learning	Ethem Alpaydin	2nd Edition-2013	PHI
2	Machine Learning: The Art and Science of Algorithms that Make Sense of Data	Peter Flach	Edition 2012	Cambridge University Press

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1	Pattern Recognition and Machine Learning	C. M. Bishop	1st Edition-2013	Springer

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	

2	Data Mining, Practical Machine Learning Tools and Techniques	Ian H Witten, Eibe Frank, Mark A Hall	3rd Edition	Elsevier
3.	Machine Learning:	Tom M. Mitchell	1st edition	Tata McGraw Hill

ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech. Scheme of Examination & Syllabus 2023-24

ARTIFICIAL INTELLIGENCE

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23AI501P	Machine Learning Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
This course is intended • Make use of Data sets in implementing the machine learning algorithms • Implement the machine learning concepts and algorithms in any suitable language of choice.	**Students will be able to** • Learn the implementation procedures for the machine learning algorithms. • Design programs for various Learning algorithms. • Apply appropriate data sets to the Machine Learning algorithms. • Identify and apply Machine Learning algorithms to solve real world problems.

Expt. No.	Title of the experiment
1	Apply data preprocessing techniques to make data suitable for machine learning.
2	Train the model using a dataset sourced from UCI ML Repository. Then use a portion of the same dataset as a test to evaluate the accuracy of the model through **linear regression.**
3	Collect the dataset from UCI ML repository. Separate the same data set as a test set to implement **logistic regression techniques.**
4	Train the system using dataset obtained from UCI ML repository. Use a partition of the same data as a test set to determine accuracy using **KNN classifier.**
5	Use a dataset from the UCI ML repository to train the model. Then, evaluate the accuracy of the model by applying **Naïve Bayes** on a portion of the same dataset designated as test set.
6	Train the model using a dataset from UCI ML repository. Then, access the accuracy by applying a **decision tree** on a partitioned portion of the same dataset as the test set.
7	Use a dataset from the UCI ML repository to train the system, then evaluate the accuracy by applying **k-means clustering** on a partitioned portion of the same dataset as the test set.
8	Train the model using a dataset from the UCI-ML repository. Then access accuracy by applying **DBSCAN clustering** on a partitioned portion of the same dataset as the test set.
Content Beyond experiments	
1.	Implementation of neural networks using different activation functions and finding the accuracy of different models
2.	Implementation of Bagging and Boosting ensemble techniques and access the performance.

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1	Introduction to Machine Learning	Ethem Alpaydin	2nd Edition-2013	PHI
2	Machine Learning: The Art and Science of Algorithms that Make Sense of Data	Peter Flach	Edition 2012	Cambridge University Press

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1	Pattern Recognition and Machine Learning	C. M. Bishop	1st Edition-2013	Springer
2	Data Mining, Practical Machine Learning Tools and Techniques	Ian H Witten, Eibe Frank, Mark A Hall	3rd Edition	Elsevier
3.	Machine Learning: A multistrategy approach	Tom M. Mitchell	1st edition	Tata McGraw Hill

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	

ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech. Scheme of Examination & Syllabus 2023-24

ARTIFICIAL INTELLIGENCE

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23AI502T	Design and analysis of Algorithm	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
This course is intended to • Analyze the asymptotic performance of algorithm • Apply important algorithmic design paradigms and methods of analysis • Solve simple to moderately difficult algorithmic problems arising in applications • Able to demonstrate the hardness of simple NP-complete problems	**Students will be able to** • Illustrate different approaches for analysis and design of efficient algorithms and Analyze performance of various algorithms using asymptotic notations. • Determine and Apply various divide & conquer strategies and greedy approaches for solving a given computational problem • Demonstrate and Solve various real time problems using the concepts of dynamic programming • Make use of backtracking and traversal techniques for solving real-world problems • Explain P, NP, NP-hard, NP-complete problems and Cook's Theorem and analyze parallel algorithm structures, models, and performance

Unit I: Introduction **[9Hrs]**
Definition of algorithm and brief explanation about the basic properties of algorithms, Analysis of algorithms, Asymptotic notations, Amortized analysis, Recurrence relations, Bitonic sorting network.
Unit II: Greedy and Divide & Conquer Approach **[10Hrs]**
Divide and conquer strategies: Binary search, Stressen's matrix multiplication algorithm, min-max algorithm. Greedy Approach: Job sequencing with deadlines problem, knapsack problem, optimal merge pattern, Huffman code, minimum cost spanning tree using Prim's and Kruskal's algorithm, Dijkstra's Shortest Path Algorithm.
Unit III: Dynamic Programming **[10Hrs]**
Dynamic Programming: Basic Strategy, Multistage graph (forward and backward approach), Longest Common Subsequence, Optimal Binary Search Tree, 0/1 Knapsack problems, Travelling Salesman problem, single source shortest path using bellman ford algorithm, all pair shortest path using Floyd- Warshall algorithm
Unit IV: Traversal Techniques and Backtracking **[9Hrs]**
Basic Traversal Techniques: Breadth first search and depth first search. Backtracking: Basic strategy, N-Queen Problem and their Analysis (4 & 8-Queen), graph coloring, Hamiltonian cycles.
Unit V: Computational Complexity & Parallel Algorithm **[7Hrs]**
Basic concepts: - P, NP, NP-hard and NP-complete problems, Cook's theorem, Parallel Algorithm: - Introduction, Parallel Algorithm structure, Analysis, Parallel Algorithm – Models.

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1.	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein	3rd	Prentice Hall of India
2.	The Design and Analysis of Computer Algorithms	Alfred V. Aho, John E. Hopcraft, Jeffrey D. Ullman	1st	Pearson education
3.	Fundamentals of Computer Algorithms	Horowitz, Sahani, Rajsekharam	2nd	University Press

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1.	Fundamentals of Algorithms	Brassard, Bratley	1st	Prentice Hall
2.	Design and Analysis of Algorithms	Parag Dave, Himanshu Dave	2nd	Pearson education

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	

ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech. Scheme of Examination & Syllabus 2023-24

ARTIFICIAL INTELLIGENCE

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23AI502P	Design and analysis of Algorithm Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
This course is intended • Analyze the asymptotic performance of algorithm • Apply important algorithmic design paradigms and methods of analysis • Solve simple to moderately difficult algorithmic problems arising in applications • Able to demonstrate the hardness of simple NP-complete problems	**Students will be able to·** • Illustrate different approaches for analysis and design of efficient algorithms and Analyze performance of various algorithms using asymptotic notations. • Determine and Apply various divide & conquer strategies and greedy approaches for solving a given computational problem. • Demonstrate and Solve various real time problems using the concepts of dynamic programming. • Make use of backtracking and graph traversal techniques for solving real-world problems. • Recall and Classify the NP-hard and NP-complete problems

Expt. No.	Title of the experiment
1	Implement a program to perform Binary search algorithms.
2	Implement a code to Find Minimum Cost Spanning Tree of undirected graph using Prim's algorithm.
3	Implement Dijkstra's algorithm for the Single source shortest path problem.
4	Implement 0/1 Knapsack problem using Dynamic Programming.
5	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm
6	Implement any scheme to find the optimal solution for the Traveling Salesperson problem
7	Implement a backtracking algorithm for the N-queens Problem.
8	Implement the BFS and DFS traversal algorithms.
9	Macro Project

Text Books

S.N	Title	Authors	Edition	Publisher
1	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein	Third	Prentice Hall of India
2	The Design and Analysis of Computer Algorithms	Alfred V. Aho, John E. Hopcraft, Jeffrey D. Ullman	First	Pearson education

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Fundamentals of Algorithms	Brassard, Bratley	First	Prentice Hall
2	Design and Analysis of Algorithms	Parag Dave, Himanshu Dave	Second	Pearson Education

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	

ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech. Scheme of Examination & Syllabus 2023-24

ARTIFICIAL INTELLIGENCE

FIFTH SEMESTER

Course Code	Course Name	Th	Pr	Credits	Evaluation		
					CA	ESE	Total
23AI503T	Operating System	3	-	3	30	70	100

Course Objectives	Course Outcomes
• To learn the fundamentals of Operating Systems. • To learn the mechanisms of OS to handle processes and threads and their communication. • To learn the mechanisms involved in memory management in contemporary OS. • To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols. • To know the components and management aspects of concurrency management	• Analyze the structure of OS and basic architectural components involved in OS design. • Explain how processes and CPU scheduling function in an operating system. • Solve common process synchronization problems. • Describe memory management concepts, including virtual memory. • Comprehend disk management and the role of file systems in an operating system

Unit I - Operating System Overview	**[9Hrs]**
Process description & Control: Operating System Objectives and Functions, The Evolution of Operating Systems Process Concept : Processes : Process Definition , Process in memory, Process State, Process Control block(PCB), Operation on Process, context switching	
Unit II – Threads	**[9Hrs]**
Threads: Definition, Benefits of Threads, Types of Threads, Different state of thread. **Process Scheduling**: Scheduling Objective, CPU – I/O burst Cycle, CPU. **Scheduler: Types** of scheduler, Scheduling criteria. Scheduling Algorithms: Pre-emptive and Non Preemptive, FCFS, SRTF, Priority, RR.	
Unit III - Synchronization	**[9Hrs]**
Critical Section problem, Race condition, Peterson solution, Semaphores. Classic problem, IPC Problem: Producer Consumer Problem, Reader Writer Problem. The Dinning _ philosophers Problem.	
Unit IV - Deadlocks	**[9Hrs]**
System model ,Deadlock characterization, Methods of handling deadlocks ,Deadlock Prevention, Deadlock Avoidance : Banker's algorithm ,Deadlock Detection and recovery	
Unit V - Virtual Memory Management & File System	**[9Hrs]**
Virtual Memory Management: Basic of Virtual Memory ,Demand paging ,Page Replacement Algorithm : FIFO ,LRU, Optimal **File System** :File concepts ,File attributes, File operations, File Types .File Access Method : sequential Access ,Direct access	

Text Books

Sr.No	Title	Authors	Edition	Publisher
1	Operating System Concepts	Avi Silberschatz, Peter Baer Galvin, Greg Gagne	9th	John wiley & Sons
2	Operating Systems: Internals and Design Principles	William Stallings	8th	Pearson Education Limited

Reference Books

Sr.No	Title	Authors	Edition	Publisher
1	Operating systems - A concept based Approach	D.M. Dhamdhere	3rd	Tata McGraw
2	Introduction to Operating Systems Concepts	P.C.P. Bhatt	3rd	PHI

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	

ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech. Scheme of Examination & Syllabus 2023-24

ARTIFICIAL INTELLIGENCE

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23AI504T(iii)	PE-I IoT & Edge Computing	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
This course is intended to • To understand the basic concepts of IoT and Edge computing • To get knowledge about the various services provided by IoT. • To familiarize themselves with various communication protocols and networking. • To understand importance and application of IoT & Edge computing security.	**Students will be able to** • Learn the main concepts, key technologies, strength and limitations of Edge computing techniques. • Explore IoT architecture, case studies and its comparison with M2M and SCADA infrastructure models of IoT. • Study the concepts of cloud and fog topologies for IoT applications. • Analyze different communication protocols and cloud protocols for IoT implementation. • Assess the different network security processes involved in Cryptography, Block chain etc.

Unit I- Introduction To IoT And Edge Computing **[9hrs]**
IoT and Edge Computing Definition and Use Cases, Introduction to Edge Computing Scenarios - Edge computing purpose and definition, Edge computing use cases, Edge computing hardware architectures, Edge platforms, Edge vs Fog Computing, Communication Models - Edge, Fog and M2M.
Unit II – Architectures Of IoT Systems **[9Hrs]**
IoT Architecture and Core IoT Modules-A connected ecosystem, IoT versus machine-to-machine versus, SCADA, the value of a network and Metcalfe's and Beckstrom's laws, IoT and edge architecture, Role of an architect, Understanding Implementations with the examples-Example use case and deployment, Case study – Telemedicine palliative care, Requirements, Implementation, Use case retrospective
Unit III- Cloud And Fog Topologies **[9Hrs]**
Cloud services model, Public, private, and hybrid cloud, Constraints of cloud architectures for IoT, Fog computing- Open Fog reference architecture, Fog topologies, Data Analytics and Machine Learning- Basic data analytics, Machine learning- Convolutional neural networks, Recurrent neural networks, IoT data analytics and machine learning comparison
Unit IV- Telecommunication & Cloud Protocols **[9Hrs]**
Telecommunication Protocols: LoRa, LoRaWAN, ZIGBEE, Edge to Cloud Protocols, MQTT, MQTT publish-subscribe, MQTT architecture details, MQTT state transitions, MQTT Packet structure, MQTT data types, MQTT-SN, difference between MQTT and MQTT-SN, CoAP protocol, STOMP, AMQP.
Unit V- Iot & Edge Security **[9Hrs]**
Cyber Security vernacular: Attack and threat terms, defence terms, Anatomy of IoT cyber-attacks: Mirai, Stuxnet, chain reaction, IoT and Edge Security, Physical and hardware security, Shell security, Cryptography, Software-Defined Perimeter, Blockchains and cryptocurrencies in IoT, Government regulations and intervention.

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1	IoT and Edge Computing for Architects	Perry Lea	2nd	Packt
2	Fog and Edge Computing: Principles and Paradigms	Rajkumar Buyya, Satish Narayana Srirama	2nd	wiley

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1	Edge Computing and Computational Intelligence Paradigms for the IoT	G. Nagarajan, R. I. Minu		IGI
2	From Machine-to-Machine to the Internet of Things Introduction to a New Age of Intelligence	Jan Holler, Vlasios Tsiatsis		Academic Press

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	

ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech. Scheme of Examination & Syllabus 2023-24

ARTIFICIAL INTELLIGENCE

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23AI561O(ii)	OE – II Fundamentals of AI for Robotics	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
This course is intended to provide • To introduce the basic principles, techniques, and applications of Artificial Intelligence. • To develop some familiarity with current research problems and research methods in AI by working on a research or design project.	**Students will be able to** • Learn how to solve AI problems by using production rules. • Analyze the appropriate search algorithms for any AI problem. • Comprehend the concepts of heuristic search techniques & logic programming. • Discuss the various knowledge representation techniques. • Analyze how to express and reason about some domain of knowledge

Unit I Introduction To Ai And Problem Representation **[9Hrs]**

Introduction: Artificial Intelligence (AI) and its importance, AI Problems (tictac toe problem, water jug problems), Application area of AI. Problem Representations: State space representation, problem-reduction representation, production system, production system characteristics and types of production system

Unit II Heuristic Search Techniques And Game Playing **[9Hrs]**

Heuristic Search Techniques: AI and search process, brute force search, depth-first search, breadth-first search, time and space complexities, heuristics search, hill climbing, best first search, A* algorithm and beam search, AO search, constraint satisfaction. Game Playing: AI and game playing, plausible move generator, static evaluation move generator, game playing strategies, problems in game playing

Unit III Logic And Knowledge Representation And Acquisition **[9Hrs]**

Knowledge Representation and Structured Knowledge, Logic Prepositional logic, Knowledge Acquisitions: Type of learning, Knowledge Acquisition, Early work in machine learning, learning by induction. Expert System: Introduction to expert system, Phases of expert system, characteristics of expert system and a case study; Introduction of Executive Support System and Decision Support System

Unit IV Introduction to robotics **[9Hrs]**

Definition for Robot, Asimov's laws of robotics, Robotics system components, classification of robots, robots anatomy, Joints and Links, Robotic arm configurations, Cylindrical coordinate arm configuration (RPP), Cartesian coordinate arm configuration (CCR), Degree of freedom, Need of automation, types of automation.

Unit V Robotis And Its Application **[9Hrs]**

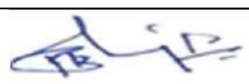
Robotics and Its applications, DDD concept, Intelligent robots, Robot Anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple Problems-Specifications of Robot-Speed of Robot joints and links-Robot Classifications-Architecture of robotic systems-Robot Drive Systems-Hydraulic, Pneumatic and Electric system

Text Books

S.N	Title	Authors	Edition	Publisher
1	Artificial intelligence a modern approach	Stuart Russel & Peter Norvig	1ST	Pearson
2	Introduction to artificial intelligence	Eugene Charniak & Drew McDermott	1ST	Addison-Wesley Professional

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Artificial Intelligence structures and strategies for complex problem solving	George F. Luger	1ST	Pearson

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	

ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech. Scheme of Examination & Syllabus 2023-24

ARTIFICIAL INTELLIGENCE

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23AI506T	Technical Skill Development -II	2	-	-	2	-	50	-	50

Course Objectives	Course Outcomes
This course is intended • Apply advanced object-oriented principles and design patterns to build modular, scalable, and maintainable Java applications. • Integrate Java applications with relational databases using JDBC for CRUD operations, transaction management, and performance tuning. • Develop interactive web applications using Servlets, JSP, and RESTful APIs following modern HTTP-based architectures.	**Students will be able to** • Apply advanced object-oriented principles and design patterns to develop modular, scalable, and maintainable Java applications. • Integrate Java applications with databases using JDBC for CRUD operations, transaction handling, and performance optimization. • Develop and deploy interactive web applications using Servlets, JSP, and RESTful APIs, following modern HTTP-based architectures • Build enterprise-grade applications using the Spring Framework and implement micro services with Spring Boot. • Demonstrate proficiency in testing, packaging, and deploying Java applications using build tools, unit testing frameworks, and containerization.

Module 1	**[4 Hrs]**
Module 1: Advanced Object-Oriented Programming, Design Patterns (Singleton, Factory, Observer, Strategy, etc.),SOLID Principles and Clean Code Practices, Refactoring Techniques for Large Codebases	
Module 2:	**[4 Hrs]**
Module 2: Java I/O and Serialization, Working with Streams and Files, Object Serialization and Deserialization, Java NIO and Buffer Management)	
Module 3:	**[4 Hrs]**
Module 3: Java Database Connectivity (JDBC),Connecting Java Applications to Relational Databases, CRUD Operations and Prepared Statements, Connection Pooling and Transaction Management	
Module 4:	**[4 Hrs]**
Module 4:: ,Module 4: Web Development with Servlets and JSP,Introduction to HTTP and Web Architecture, Building Dynamic Web Applications with Servlets and JSP,Session Management and Authentication	
Module 5:	**[4 Hrs]**
Module 5: RESTful Web Services,REST Principles and HTTP Methods, Creating REST APIs with JAX-RS or Spring Boot, Consuming Web Services using HttpClient,	
Module 6:	**[4 Hrs]**
Module 6: Introduction to Spring Framework, Dependency Injection and Inversion of Control, Spring MVC Architecture, Spring Boot for Micro service Development	
Module 7:	**[4 Hrs]**
Module 7: Unit Testing and Build Tools,Writing Unit Tests using JUnit and Mockito, Using Maven/Gradle for Dependency Management, Code Coverage, Logging, and Build Pipelines,	
Module 8:-	**[2 Hrs]**
Module 8: Application Deployment and Packaging, WAR vs. JAR Packaging, Using Docker for Containerization, Introduction to Deployment on Cloud Platforms (e.g., AWS Elastic Beanstalk or Heroku	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Mastering SOLID: Advanced Software Architecture & Design Principles	R. Parvin	Kindle Edition	Amazon Kindle Publishing
2	Java I/O: Tips and Techniques for Putting I/O to Work	Elliotte Rusty Harold	2nd Edition	O'Reilly Media
3	Java I/O, NIO and NIO.2	Jeff Friesen	1st Edition	APress

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	

ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech. Scheme of Examination & Syllabus 2023-24

ARTIFICIAL INTELLIGENCE

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23AI541P	Career Development V	2	-	-	Audit	Audit		

Course Objectives	Course Outcomes
The sole objective of imparting aptitude training is to make students able to critically evaluate various real-life situations by resorting to an analysis of key issues and factors. This Aptitude Training helps them to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions. To categorize, apply and use thought process to distinguish between concepts of Quantitative methods.	CO1. Students shall Apply the concepts of Time and work, Chain Rule and Pipe & Cisterns. CO2. Students shall draw conclusions or Understand the concept of seating arrangement and puzzles of different types so that their thinking Ability increases. CO3. Students shall draw conclusions or Understand the concept puzzles of different types so that their thinking Ability increases. CO4. Enable students to critically analyze and Apply the learning on Time and distance, Trains and Boats and Streams CO5. The ability to analyses and solve the problems of Direction sense and coding decoding.

Unit I	**[3Hrs]**
Time and Work, Chain Rule, Pipe and Cistern	
Unit II	**[1Hrs]**
Seating Arrangement:- Linear Seating Arrangements, Circular Seating arrangements	
Unit III	**[3Hrs]**
Puzzles:- Analytical puzzle Tabular Puzzle, Box or Floor based Puzzle, Rank based Puzzle,	
Unit IV	**[2Hrs]**
Time Speed and Distance:- Basic Problems, Average Speed, Relative Speed Problems on Trains Boats and Streams	
Unit V	**[1Hrs]**
Directions sense Problems, Coding and Decoding	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Quantitative Aptitude By R. S. Aggarwal	R.S. Aggarwal		
2	Quantitative Aptitude	Shripad Deo		Allied Publication
3	A Modern Approach to Verbal & Non-Verbal Reasoning	R.S. Aggarwal		

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Quantitative Aptitude for CAT by Arun Sharma	Arun Sharma		

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	

ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech. Scheme of Examination & Syllabus 2023-24

ARTIFICIAL INTELLIGENCE

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23AI531M	Multidisciplinary Minor – III (Explainable AI)	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
This course is intended to • Understand the fundamental concepts, evolution, and significance of Explainable Artificial Intelligence (XAI). • Explore and categorize various methods, forms, and frameworks used for building XAI models. • Evaluate AI models using appropriate metrics that emphasize transparency, fairness, and interpretability. • Analyze the multidisciplinary applications of XAI, especially in the healthcare domain. • Understand the ethical, regulatory, and human-centric considerations involved in designing trustworthy and XAI systems.	**Students will be able to** • Define and describe the concept, motivations, and evolution of XAI. • Identify and apply different methods and frameworks for implementing explainable AI models. • Evaluate the performance and transparency of AI systems using XAI evaluation metrics. • Examine and critique the use of XAI techniques in real-world healthcare applications. • Interpret the ethical and regulatory requirements for trustworthy AI and demonstrate understanding of human-AI interfaces.

Unit I: Introduction to Explainable AI **[9Hrs]**
Definition and Evolution of Explainable AI, Diversity of Motives for Creating Explainable AI, Contradiction Between the Motives for Creating Explainable AI, Paradigm Shift of Explainable AI, Proposed AI Model, Proposed Architecture.
Unit II: XAI Methods, Forms and Frameworks **[9Hrs]**
XAI Methods and Their Classifications, Methods of Explainable Artificial Intelligence, Forms of Explanation, Frameworks for Model Interpretability and Explanation.
Unit III: Evaluation Measures for XAI **[10Hrs]**
Techniques of Explainable AI, Explainable Modeling Methodologies, Metrics for Explainable Artificial Intelligence, Need for Transparency and Trust in AI, XAI's Evaluation Methods, Explainable AI Stakeholders, XAI Applications.
Unit IV: XAI's Application in Healthcare **[9Hrs]**
Introduction, The Multidisciplinary Nature of Explainable AI in Healthcare, Different XAI Techniques Used in Healthcare, Application of XAI in Healthcare.
Unit V: Trustworthy AI **[8Hrs]**
Introduction, Regulatory Requirements for Trustworthy AI, Explicability—An Ethical Principle for Trustworthy AI, An Example Use Case: Computational Pathology.

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1.	Explainable AI: Foundations, Methodologies and Applications	Mayuri Mehta, Vasile Palade, Indranath Chatterjee	1st	Intelligent Systems Reference Library
2.	Explainable AI for Practitioners	Michael Munn, David Pitman	1st	O'Reilly Media, Inc
3.	Interpretable Machine Learning, A Guide for Making Black Box Models Explainable	Christoph Molnar	1st	Leanpub

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1.	Explainable AI with Python	Leonida Gianfagna, Antonio Di Cecco	1st	Springer
2.	Hands-On Explainable AI (XAI) with Python: Interpret, visualize, explain, and integrate reliable AI for fair, secure, and trustworthy AI apps	Denis Rothman	1st	Packt Publishing Limited

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