ANNEXURE – I

Credit Structure for Undergraduate programs

Sr. No.	Category Code	Category	Credits
1	HSSM	Ability Enhancement Course (AEC), Indian Knowledge System (IKS), Value Education Course (VEC),Entrepreneurship/Economics/Management courses	**10**
2	BSC	Basic Science courses	**14**
3	ESC	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	**16**
4	PCC	Professional core courses	63
5	PEC	Professional Elective courses relevant to chosen specialization/branch	15
6	OE	Open subjects – Electives from other technical and /or emerging subjects	**08**
7	ELC	Project work, seminar and internship in industry or elsewhere, Industry Training and Skill Development, Capstone Course	**22**
8	VSEC	Vocations Skill Courses (VSC) , Skill Enhancement Courses(SEC)	**10**
9	CC	Co-curricular Courses (CC) such as Health and Wellness, Yoga education sports, and fitness, Cultural Activities, NSS/NCC and Fine/ Applied/ Visual/ Performing Arts	**04**
10	MDM	Compulsory Multidisciplinary Minor	**14**
		TOTAL	**176**

SEMESTER V

Sr No	Course Category	Course Code	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 Laboratory	-	-	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 Laboratory	-	-	2	1	25	25	50
5	PCC	23AI503T	Operating System	3		-	3	30	70	100
7	PEC	23AI504T	Professional Elective – I	3	-	-	3	30	70	100
8	OE	23AI561T	Open Elective – II	3	-	-	3	30	70	100
9	VSC	23AI506T	Technical Skill Development -II	2	-	-	2	50	-	50
10	SEC	23AI541P	Career Development - V	-	-	2	1	50	-	50
11	MDM	23AI531M	Multidisciplinary Minor – III (Explainable AI)	3	-	-	3	30	70	100
			Total	20	0	10	23	355	495	850

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

	Open Elective – II
23AI505T(i)	Blockchain Technologies
23AI505T(ii)	Fundamentals of AI for Robotics

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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	PHI
2	Machine Learning: The Art and Science of Algorithms that Make Sense of Data,,	Peter Flach	2nd	Cambridge Press

Reference Books

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

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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

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

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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

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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

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23AI504T(i)	PE-I Human Computer Interaction	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
This course is intended to provide • The students for basic understanding of Human Computer Interaction. • students for understanding the novel design and tools for building HCI applications • Understanding human psychology and context aware processing. • The research issues in HCI. Future Trends in HCI and its importance in different fields.	**Students will be able to** • Concepts and Fundamentals of HCI, different kinds of interaction scenarios and design process. • Use of Tools and models for implementing the HCI applications. • Comprehend Human Interaction. • Application Case Studies using HCI Tools • Know the latest Research Trends in Human Computer Interaction.

Unit I- Interactive system design	**[9Hrs]**
Introduction, Course objective and overview, Historical evolution of the field, Interactive system design- Concept of usability - definition and elaboration, HCI and software engineering, GUI design and aesthetics, Prototyping techniques	
Unit II – Model-based Design and evaluation	**[9Hrs]**
Basic idea, introduction to different types of models, GOMS family of models (KLM and CMN-GOMS),Fitts' law and Hick-Hyman's law, Model-based design case studies	
Unit III-Guidelines & Empirical research methods in HCI	**[10Hrs]**
Guidelines - Shneiderman's eight golden rules, **Norman's seven principles**, Norman's model of interaction, Nielsen's ten heuristics with example of its use, Heuristic evaluation, Contextual inquiry, Cognitive walkthrough. Empirical research methods - Introduction (motivation, issues, research question formulation techniques), Experiment design and data analysis (with explanation of one-way ANOVA).	
Unit IV- Dialog Design, Task modeling and analysis	**[8Hrs]**
Dialog Design- Introduction to formalism in dialog design, design using FSM (finite state machines), State charts and (classical) Petri Nets in dialog design. **Task modeling and analysis-** Hierarchical task analysis (HTA), Engineering task models and Concur Task Tree (CTT)	
Unit V- Cognitive architecture, OOP, Design -Case Studies	**[9Hrs]**
Cognitive architecture-Introduction to CA, CA types, relevance of CA in IS design, Model Human Processor (MHP). OOP-Introduction, OOM- Object Oriented Modeling of User Interface Design. Design -Case Studies- Multi-Key press Hindi Text Input Method on a Mobile Phone, GUI design for a mobile phone based Matrimonial application, Employment Information System for unorganized construction workers on a Mobile Phone.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Human Computer Interaction	Alan Dix et al.	1st	Pearson, 2004.
2	Designing the User Interface: Strategies for Effective HCI	Ben Shneiderman et al.	6th	Pearson, 2016.

Reference Books

S.N	Title	Authors	Edition	Publisher
1	The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies and Emerging Applications	Andrew Sears , A. Jacko,	3rd	CRC Press,
2	HCI Beyond the GUI: Design for Haptic, Speech, Olfactory and other Nontraditional Interfaces	Philip Kortum	2nd	Morgan Kaufmann

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23AI504T(ii)	PE-I Edge AI	3	-	-	3	30	70	100

Course Objective	Course Outcome
This course is intended to provide • To learn the concepts and principles of Edge AI • To develop Edge AI models and algorithms • To apply Edge AI frameworks and tools to solve real-world problems • To deploy and integrate Edge AI solutions with cloud and other systems • To evaluate the performance and effectiveness of Edge AI solution.	**Students will able to:** • Describe the concept of Edge AI and explain its advantages, limitations, and ethical implications. • Develop and evaluate Edge AI models and algorithms for classification, prediction, and optimization. • Select and apply appropriate Edge AI frameworks and tools for developing and deploying Edge AI models. • Design, deploy, and integrate Edge AI solutions with cloud and other systems, and evaluate their security, performance, and scalability.

Unit I Introduction to Edge AI **[9Hrs]**

Definition and concept of Edge AI, Edge devices and sensors, Edge computing platforms and architectures, Advantages and limitations of Edge AI, Edge AI vs Cloud AI, Applications of Edge AI, Edge AI market trends and future directions, Ethical considerations of Edge AI.

Unit II Edge AI Models and Algorithms **[9Hrs]**

Overview of Edge AI models and algorithms, Supervised learning for Edge AI, Unsupervised learning for Edge AI, Reinforcement learning for Edge AI, Edge AI algorithms for classification, Edge AI algorithms for prediction, Edge AI algorithms for Optimization, Evaluation metrics for Edge AI models and algorithms.

Unit III Edge AI Frameworks and Tools **[9Hrs]**

Overview of Edge AI frameworks and tools, Comparison of Edge AI frameworks, TensorFlow Lite for Edge AI, OpenCV for Edge AI, Edge AI toolkits for developing and deploying Edge AI models, Edge AI data preprocessing techniques, Edge AI model compression and optimization, Edge AI model deployment on edge devices.

Unit IV Edge AI Deployment and Integration **[9Hrs]**

Edge AI deployment strategies and architectures, Edge AI integration with cloud and other systems, Edge AI security and privacy considerations, Edge AI interoperability and compatibility, Edge AI data management and governance, Edge AI performance monitoring and optimization, Edge AI fault tolerance and reliability, Edge AI scalability and extensibility.

Unit V AI Edge Applications **[9Hrs]**

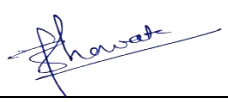
Smart home and building automation using Edge AI, Industrial automation and predictive maintenance using Edge AI, Autonomous vehicles and drones using Edge AI, Healthcare and medical applications using Edge AI, Retail and customer engagement using Edge AI, Agriculture and farming using Edge AI, Energy and utilities using Edge AI, Public safety and emergency management using Edge AI.

Text Books:

S.No	Tilte	Author	Edition	Publisher
1.	Edge Computing for IoT	Rajkumar Buyya, Amir Vahid Dastjerdi, and Negin Moghaddam	2019	Morgan kaufmann
2.	Hands on Edge AI with Tensorflow	Bhagwan Kommadi	2021	Apress

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Edge of Computing: A Primer	Shanhe Yi, Jie Xu, and Qun Li	2019	Springer
2	Edge AI: The Power of Artificial Intelligence on Edge Devices	John K. Waters	2020	The Linux Foundation Wiley

		July 2025	1.0	Applicable for 2025-26
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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23AI505T(i)	Open Elective – II Blockchain Technology	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
This course is intended to • To introduce the fundamentals of blockchain technology, including its evolution, decentralized systems, and smart contracts. • To explore blockchain architecture, cryptocurrency concepts, and real-world use cases, including Bitcoin and alternative coins. • To impart knowledge on blockchain platforms, security threats, and privacy-preserving technologies, preparing students for real-world applications and future developments.	**Students will be able to** • Explain the basic concepts, evolution, and types of blockchain and decentralization techniques. • Analyze the architecture, versions, use cases of blockchain, and understand the role of cryptocurrencies and Bitcoin. • Describe and evaluate the Bitcoin network, hashing, double-spending, wallets, and payment mechanisms. • Compare different blockchain platforms like Ethereum, Hyperledger, and design decentralized applications (DApps). • Identify and analyze security threats and privacy challenges in blockchain and explore mitigation techniques.

Unit I: `Introduction to Blockchain Technology **[9Hrs]**
Blockchain Technology: Blockchain, Growth of blockchain technology, Distributed systems, History of blockchain and Bitcoin, Types of blockchain. Decentralization: Methods of decentralization, Routes of decentralization, Blockchain and full ecosystem decentralization, Smart contracts, Decentralized organizations and platforms for decentralization.
Unit II: Blockchain Architecture and Cryptocurrencies **[9Hrs]**
Blockchain: Architecture, Versions, Variants, Use cases, Life use cases of blockchain, Blockchain vs shared Database, Introduction to cryptocurrencies, Types, Applications. Bitcoins: Introducing Bitcoin, Bitcoin digital keys and addresses, Transactions, Blockchain mining. Alternative Coins. Limitations of Bitcoin.
Unit III: Bitcoin Network, Security Mechanisms, and Payment Infrastructure **[10Hrs]**
Concept of Double Spending, Hashing, Proof of work. Bitcoin Network and payments, Bitcoin network, Wallets, Bitcoin payments, Innovation in Bitcoin, Bitcoin Clients and APIs.
Unit IV: Introduction to Blockchain Platforms **[9Hrs]**
Ethereum, Hyperledger, IOTA, EOS, Multichain, Bigchain, etc. Advantages and Disadvantages, Ethereum vs Bitcoin, Design a new blockchain, Potential for disruption, Design a distributed application, Blockchain applications.
Unit V: Blockchain Security and Privacy **[8Hrs]**
security threats in blockchain, Mitigating attacks: 51% attack, Sybil attack, replay attack, Privacy-enhancing technologies: zk-SNARKs, ring signatures, Regulatory and compliance considerations

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1.	Mastering Blockchain: Unlocking the Power of Cryptocurrencies	Imran Bashir	3rd	Packt Publishing
2.	Blockchain Technology: Concepts and Applications	S. Udhaya Kumar, M. Devi, V. Rajaraman	1st	Wiley India Pvt. Ltd.
3.	Blockchain Basics: A Non-Technical Introduction in 25 Steps	Daniel Drescher	1st	Apress

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1.	Bitcoin and Cryptocurrency Technologies	Arvind Narayanan et al.	1st	Princeton University Press
2.	Blockchain: Blueprint for a New Economy	Melanie Swan	1st	O'Reilly Media

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22AI661O(ii)	Open Elective – 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]**

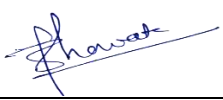
Robotics and Its applications, DDD concept, Intelligent robots, Robot Anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple Problems-Specifications of Robot-Speed of Robot joints and links-Robot Classifications-Architecture of robotic systems-Robot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

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, Forms of Explanation, Methods of Explainable Artificial Intelligence, Metrics for Explainable Artificial Intelligence.	
Unit III: Evaluation Measures for XAI	**[10Hrs]**
Introduction, Basics Related to XAI, Need for Transparency and Trust in AI, XAI's Evaluation Methods, Explainable AI Stakeholders.	
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