	SRINIVASA INSTITUTE OF ENGINEERING AND TECHNOLOGY **(UGC – Autonomous Institution)** (Approved by AICTE, Permanently affiliated to JNTUK, Kakinada, ISO 9001: 2015 certified Institution) (Accredited by NAAC with 'A' Grade; Recognised by UGC under sections 2(f) & 12(B)) NH-216, Amalapuram-Kakinada Highway, Cheyyeru (V), AMALAPURAM -533216.	**AIML**	A.Y: 2024-25
		YEAR: III	SEMESTER: II

COURSE SCHEDULE – AT A GLANCE

Name of the Faculty : K VIJAY BABU

Name of the Course : AI&ML

Course Code : :21P61602

Branch : MECH

The Schedule for the whole Course is: 23/12/2024 To 26/04/2025

Unit	Description	Duration (Date)		Total No. of Periods
		From	To	
1	**Interduction:** Definition of Artificial Intelligence, Evolution, Need, and applications in real world. Intelligent Agents, Agents and environments; Good Behavior -The concept of rationality the nature of environments, structure of agents. Neural Networks and Genetic Algorithms; Neural network representation, problems perceptrons, multilayer networks and back propagation algorithms, Genetic algorithms	23/12/2024	18/01/2025	15
2	Knowledge-Representation and Reasoning: Logical Agents: Knowledge based agents, the Wumpus world, logic. Patterns in propositional Logic, inference in Fist-Order Logic propositional vs fist order inference unification and lifting.	20/01/2025	10/02/2025	15
3	**Bayesian and computational learning:** Bayes theorem concept learning, maximum likelihood, minimum description length principle, Gibbs Algorithm. Naive Bayes Classifier, Instance Based Learning- K-Nearest neighbour learning Introduction to Machine Learning (ML) : Definition, Evolution, Need applications of ML in industry and real world, classification; differences between supervised and unsupervised learning paradigms.	11/02/2025	06/03/2025	13
4	**Basic Methods in Supervised Learning:** Distance -based methods, Nearest- Neighbors, Decision Trees, Support Vector Machines, Nonlinearity and Kernel Methods. Unsupervised Learning: Clustering, K-means, Dimensionality Reduction. PCA and kernel	10/03/2025	29/04/2025	15
5	**Machine Learning Algorithm Analytics:** Evaluating Machine Learning algorithms, Model, Selection, Ensemble Methods (Boosting, Bagging, and Random Forest). Modeling Sequence/Time-Series Data and Deep Learning: deep generative models, Deep Boltzmann Machines, Deep auto-encoders, Applications of Deep Networks.	01/04/2025	26/04/2025	16

Total No. of Instructional periods available for the course: 74

LESSON PLAN

COURSE: AI&ML

Unit No.	Topic	Plan		Actual		Teaching Methodology	Signature of the faculty
		No of hours	Date	No of hours	Date		
UINIT-1	**Introduction to Artificial Intelligence (AI)** A general overview of AI. And AI as a branch of computer science aimed at building systems capable of performing tasks that normally require human intelligence.	1	23/12/24				
	Definition of Artificial Intelligence Defining AI in the context of problem-solving, learning, reasoning, and decision-making. And Key areas of AI (e.g., machine learning, natural language processing, robotics).	1	24/12/24				
	Evolution of Artificial Intelligence Historical development of AI from its inception to modern advancements. And Milestones like Turing test, early neural networks, expert systems, and modern AI breakthroughs.	1	26/12/24				
	The Need for Artificial Intelligence The demand for AI in addressing complex problems and tasks. And AI's role in automating tasks, improving efficiency, and enhancing decision-making.	1	28/12/24				
	Applications of Artificial Intelligence in the Real World Examples of AI applications in various industries: healthcare, automotive, finance, retail, education, etc. and AI's role in virtual assistants, robotics, autonomous vehicles, and AI-powered software.	1	30/12/24				
	Introduction to Intelligent Agents What intelligent agents are and how they behave autonomously. And Components of an intelligent agent system (perception, reasoning, action).	1	31/12/24				
	Agents and Environments The concept of agents and their environments. And Types of environments	1	02/01/25				

	(e.g., fully observable vs partially observable, deterministic vs nondeterministic).						
	Good Behavior in AI Defining what constitutes good behavior for an intelligent agent. And How an agent's actions are judged based on outcomes, efficiency, and goals.	1	03/01/25				
	The Concept of Rationality in AI Rational behavior in AI: an agent is rational if it acts to maximize its expected utility given its knowledge. And Balancing rationality and practicality in decision-making.	1	04/01/25				
	Nature of Environments in AI Understanding the various characteristics of environments (static vs dynamic, discrete vs continuous). And How environments impact agent behavior and design.	1	06/01/25				
	Structure of Agents in AI Discussing different types of agent structures (simple reflex agents, model-based reflex agents, goal-based agents, utility-based agents). And Understanding how these structures influence agent's decision-making and interaction with the environment.	1	07/01/25				
	Introduction to Neural Networks Overview of neural networks and their inspiration from the human brain. And Types of neural networks and how they are used to process complex data inputs.	1	08/01/25				
	Neural Network Representation How data is represented in neural networks: neurons, layers, and weights. And The process of learning and adjusting weights in a neural network.	1	09/01/25				
	Perceptrons, Multilayer Networks, and Backpropagation Algorithms Explaining the perceptron model and its limitations. And Introduction to multilayer networks (deep learning) and the backpropagation algorithm for training neural networks.	1	16/01/25				
	Introduction to Genetic Algorithms Overview of genetic algorithms as optimization techniques. And The concept of natural selection, reproduction, mutation, and crossover in algorithmic design.	1	18/01/25				

UNIT-2	**Introduction to Knowledge Representation and Reasoning** Overview of knowledge representation and reasoning in AI. And Importance of representing knowledge for intelligent agents to process and make decisions.	1	20/01/25				
	Logical Agents Understanding logical agents and their role in AI. And How logical agents use logic to represent and reason about knowledge.	1	21/01/25				
	Knowledge-Based Agents What a knowledge-based agent is and how it functions. And How these agents use a knowledge base and inference mechanisms to make decisions.	1	22/01/25				
	The Wumpus World Introduction to the Wumpus world as a classic AI problem. And How knowledge representation and reasoning are applied to navigate and solve the Wumpus world.	1	23/01/25				
	Logic in AI The role of logic in AI, particularly in reasoning and decision-making. And Types of logic used in AI systems (propositional logic, first-order logic).	1	25/01/25				
	Propositional Logic Overview Introduction to propositional logic (also known as Boolean logic). And Basic components: propositions, logical connectives (AND, OR, NOT, etc.).	1	27/01/25				
	Patterns in Propositional Logic Recognizing and using common logical patterns (e.g., tautologies, contradictions, equivalences). And How patterns in propositional logic help simplify inference processes	1	28/01/25				
	Inference in Propositional Logic Understanding how reasoning or inference works in propositional logic. And Methods for deriving new knowledge, such as truth tables, rules of inference, and deduction.	1	29/01/25				
	First-Order Logic (FOL) Overview Introduction to First-Order Logic (FOL) and how it extends propositional logic. And Explanation of quantifiers (existential and universal) and predicates	1	30/01/25				

	Propositional Logic vs. First-Order Logic Comparison of propositional logic and first-order logic. And Key differences in expressiveness, syntax, and inference capabilities.	1	01/02/25				
	Inference in First-Order Logic (FOL) How inference works in First-Order Logic. And Techniques for FOL inference, including forward and backward chaining.	1	03/02/25				
	Unification in Logic Explanation of the unification process in logic. And How unification is used to match terms and variables in First-Order Logic and its role in reasoning.	1	04/02/25				
	Lifting in Logic The concept of lifting in logic, particularly in terms of generalizing knowledge. And How lifting helps in creating more powerful logical agents by expanding the range of inferences.	1	05/02/25				
	The Role of Knowledge Representation in AI Reasoning How different methods of knowledge representation affect reasoning. And The importance of efficient knowledge representation for effective inference in AI systems.	1	06/02/25				
	Combining Knowledge Representation and Reasoning Integrating knowledge representation techniques with reasoning mechanisms. And Real-world examples of how knowledge-based systems use logic for reasoning (e.g., expert systems, automated theorem proving).	1	10/02/25				
UNIT-3	**Bayesian and Computational Learning Overview** Introduction to Bayesian learning and computational approaches in machine learning.	1	11/02/25				
	Bayes Theorem in Concept Learning Explanation of Bayes' Theorem and its application in concept learning.	1	12/02/25				
	Maximum Likelihood Estimation (MLE) Detailed exploration of Maximum Likelihood Estimation, its principles, and usage in learning.	1	13/02/25				

	Minimum Description Length Principle Overview of the Minimum Description Length (MDL) principle and how it relates to model selection and complexity.	1	15/02/25				
	Gibbs Algorithm Introduction to the Gibbs sampling algorithm and its role in Bayesian computation.	1	17/02/25				
	Naive Bayes Classifier Explanation of the Naive Bayes classifier, assumptions, and its application in classification tasks.	1	18/02/25				
	Instance-Based Learning (IBL) Introduction to instance-based learning and its concept.	1	19/02/25				
	K-Nearest Neighbor Learning (K-NN) Explanation of the K-Nearest Neighbor (K-NN) algorithm, how it works, and its applications in classification.	1	20/02/25				
	Introduction to Machine Learning (ML) A comprehensive definition of Machine Learning, its significance, and its role in modern AI.	1	22/02/25				
	Evolution of Machine Learning Historical evolution and milestones in the field of machine learning.	1	03/03/25				
	Need for Machine Learning Discussion on the necessity of ML in solving real-world problems and its increasing importance.	1	04/03/25				
	Applications of ML in Industry and the Real World Overview of real-world applications of machine learning across various industries.	1	05/03/25				
	Supervised vs. Unsupervised Learning Paradigms Comparative analysis between supervised and unsupervised learning, with examples of both.	1	06/03/25				
UNIT-4	**Introduction to Supervised Learning** Overview of supervised learning, its definition, and types of tasks involved (e.g., classification, regression).	1	07/03/25				
	Distance-Based Methods in Supervised Learning Explanation of distance-based approaches in supervised learning, focusing on the use of distance metrics (e.g., Euclidean distance).	1	10/03/25				

	K-Nearest Neighbors (K-NN) Algorithm Detailed exploration of the K-Nearest Neighbors (K-NN) algorithm, its working principles, and applications.	1	11/03/25				
	Decision Trees in Supervised Learning Introduction to decision tree algorithms, how they are built, and their role in classification and regression tasks.	1	12/03/25				
	Support Vector Machines (SVM) Explanation of Support Vector Machines, the concept of hyperplanes, and their use in classification tasks.	1	13/03/25				
	Nonlinearity in Supervised Learning Discussion on how nonlinearity arises in supervised learning and the methods used to address it.	1	15/03/25				
	Kernel Methods in Supervised Learning Overview of kernel methods, including how they enable the transformation of data into higher-dimensional spaces to handle nonlinearity.	1	18/03/25				
	Introduction to Unsupervised Learning Definition and key concepts in unsupervised learning, including clustering and dimensionality reduction.	1	19/03/25				
	Clustering in Unsupervised Learning Explanation of clustering techniques and how they group similar data points without labeled outcomes.	1	20/03/25				
	K-Means Clustering Algorithm Detailed exploration of the K-Means clustering algorithm, its steps, and its practical applications.	1	22/03/25				
	Dimensionality Reduction Techniques Overview of dimensionality reduction methods in unsupervised learning, aimed at reducing the feature space.	1	24/03/25				
	Principal Component Analysis (PCA) In-depth discussion of PCA, its mathematical foundation, and its use in reducing data dimensionality.	1	25/03/25				

	Kernel PCA for Nonlinear Dimensionality Reduction Explanation of Kernel Principal Component Analysis (Kernel PCA) and how it extends PCA to handle nonlinearity.	1	26/03/25				
	Comparison between Supervised and Unsupervised Learning A brief comparison of supervised and unsupervised learning methods, highlighting their differences and use cases.	1	27/03/25				
	Applications of Supervised and Unsupervised Learning Overview of real-world applications of both supervised and unsupervised learning in various fields such as healthcare, finance, and marketing.	1	01/04/25				
UNIT-5	**Introduction to Machine Learning Algorithm Analytics** Overview of the importance of evaluating machine learning algorithms and understanding model performance.	1	02/04/25				
	Evaluating Machine Learning Algorithms Detailed discussion on the metrics and techniques for evaluating machine learning algorithms, such as accuracy, precision, recall, F1-score, and ROC curves.	1	03/04/25				
	Model Selection in Machine Learning Exploration of methods used to select the best model, including cross-validation, grid search, and performance comparison.	1	07/04/25				
	Introduction to Ensemble Methods Overview of ensemble methods in machine learning, and their role in improving model accuracy and robustness.	1	08/04/25				
	Boosting in Ensemble Methods Explanation of boosting techniques, such as AdaBoost, Gradient Boosting, and XGBoost, and how they improve model performance.	1	09/04/25				

	Bagging in Ensemble Methods Introduction to bagging techniques, including the concept of bootstrap sampling and its role in reducing variance.	1	10/04/25				
	Random Forest in Ensemble Methods Detailed exploration of the Random Forest algorithm, its structure, and how it combines decision trees for better predictions.	1	15/04/25				
	Modeling Sequence/Time-Series Data:Introduction to Sequence/Time-Series Data Overview of sequence and time-series data, and the unique challenges involved in modeling such data.	1	16/04/25				
	Time-Series Forecasting Techniques Exploration of techniques used for time-series forecasting, such as ARIMA, SARIMA, and state-space models.	1	17/04/25				
	Recurrent Neural Networks (RNNs) for Time-Series Data Introduction to Recurrent Neural Networks (RNNs), their architecture, and applications for sequence modeling.	1	19/04/25				
	Long Short-Term Memory (LSTM) Networks Detailed explanation of LSTM networks, their ability to capture long-term dependencies, and their use in time-series prediction.	1	21/04/25				
	Introduction to Deep Learning A comprehensive introduction to deep learning, explaining its architecture, layers, and key concepts like backpropagation.	1	22/04/25				
	Deep Generative Models Overview of deep generative models, such as GANs (Generative Adversarial Networks) and VAEs (Variational Autoencoders), and their role in data generation.	1	23/04/25				

	Deep Boltzmann Machines Explanation of Deep Boltzmann Machines (DBMs), their structure, and how they are used in unsupervised learning tasks.	1	24/04/25				
	Deep Autoencoders Detailed exploration of deep autoencoders, their architecture, and their applications in data compression and feature extraction.	1	26/04/25				
	Applications of Deep Networks Overview of the various applications of deep learning in fields like computer vision, natural language processing, healthcare, and more.	1	25/04/25				

Text Books:

1. Deep Learning- Ian Goodfellow, Yoshua Bengio and Aaron Courvile, MIT Press, 2016
2. Deep Learning with Python - Francois Chollet, Released December 2017, Publisher(s): Manning Publications,ISBN: 9781617294433
3. Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence - Jon Krohn, Grant Beyleveld, Aglaé Bassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 9780135116821

Reference Books:

1. Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc.,ISBN: 9781492041412
2. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
3. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013 4. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.

Faculty **HOD** **Dean-Academics** **Principal**