

Title of the Course	Artificial Intelligence for Real World Application
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Credits	T	P	E	C
	3	1	0	4
Course Type (Theory/Practical/Integrated)	Integrated			
Course Category	Core Discipline			
Pre-Requisite	<ol style="list-style-type: none"> 1. Proficient with Python 3.x, including libraries like NumPy, Pandas, scikit-learn, TensorFlow, Keras, and NLTK/spaCy 2. Experience with OOP concepts: classes, inheritance, encapsulation, abstraction 3. Linear algebra fundamentals: vectors, matrices, matrix operations 4. Basic calculus: derivatives, gradients (especially relevant for deep learning) 5. Probability and statistics: distributions, random variables, hypothesis testing, evaluation metrics (e.g., accuracy, precision, recall) 			
Learning Objectives	<ol style="list-style-type: none"> 1. Provide a strong foundation in AI concepts, including its evolution, branches, and real-world applications along with ethical considerations. 2. Develop essential mathematical understanding and programming proficiency using Python and relevant libraries. 3. Introduce core machine learning paradigms and enable students to understand their working and applications. 4. Familiarize students with neural networks and deep learning architectures for solving complex problems. 5. Introduce NLP techniques and emerging areas such as Generative AI and Large Language Models. 			
Course Outcomes & Bloom's Level	CO Code	Course Outcome Statement	Bloom Level	
	CO1	Explain fundamental AI concepts, branches, and ethical considerations	L2	
	CO2	Apply mathematical concepts and Python tools for AI-based data analysis	L3	
	CO3	Implement and analyze basic machine learning models	L4	
	CO4	Develop and evaluate deep learning models using neural network architectures	L5	
	CO5	Apply NLP techniques and analyze text-based data	L4	

	CO6	Design AI solutions using Generative AI and LLM concepts	L6
Course Elements	Course Element	Coverage Level	
	Skill Development	Strong	
	Entrepreneurship	Moderate	
	Employability	Strong	
	Professional Ethics	Moderate	
	Gender	Low (Indirect)	
	Human Values	Moderate	
	Environment & Sustainability	Low–Moderate	
SDG (Goals)	SDG 4: Quality Education		
Total Hours of Pedagogy	45 hours Theory (15 hours Self-paced content + 30 hours lecture) 30 hours Practical		

Module#	Content	Pedagogy
M-1	Introduction to Artificial Intelligence (AI) Definition, History, and Evolution of AI: From symbolic AI to modern approaches; AI vs. ML vs. DL: Clear distinctions and overlaps; Key Branches of AI: Expert Systems, Robotics, Computer Vision, Natural Language Processing, Machine Learning, Deep Learning, Generative AI; Real-World Applications of AI: Healthcare, Finance, Autonomous Systems, Customer Service, Gaming, Content Creation; Foundation of AI: Search, Reasoning, and Planning; Concepts of Fuzzy Logic: Fuzzy Sets, Fuzzy Operations, Fuzzy Logic System & Applications; Ethical AI: Introduction to bias, fairness, transparency, accountability in AI systems.	Self-paced content, Lecture, Modular Assignment
M-2	Foundational Mathematics and Python for AI Probability and Statistics for AI: Basic probability rules, descriptive statistics, data distributions; Python Fundamentals: Data structures, control flow, functions, object-oriented programming (OOPs) concepts; NumPy & Pandas: Efficient numerical computing and data manipulation; Scikit-learn: Building, training & evaluating ML models; Matplotlib & Seaborn: Basic data visualization.	Self-paced content, Lecture, Modular Assignment
M-3	Introduction to Machine Learning Core ML Concepts: Learning from data, training vs. testing, overfitting vs. underfitting, bias, variance, regularization, optimization; Supervised Learning Overview - Regression: Concept of predicting continuous values (e.g., Linear Regression basics) & Classification: Concept of predicting categories (e.g., Logistic Regression basics, Decision Trees basics); Unsupervised Learning Overview - Clustering: Concept of grouping similar data (e.g., K-Means basics) & Dimensionality Reduction: Concept of reducing features (e.g., PCA basics); Reinforcement Learning Overview: Agents, environments, states, actions, rewards; Basic Model Evaluation: Accuracy, error, confusion matrix (conceptual).	Self-paced content, Lecture, Modular Assignment

M-4	<p>Introduction to Neural Networks and Deep Learning</p> <p>The Perceptron: Basic building block of neural networks; Feedforward Neural Networks (MLPs): Architecture, layers, activation functions (Sigmoid, ReLU); Training Neural Networks: Loss functions, Backpropagation algorithm; Introduction to Deep Learning: Advantages and challenges; Convolutional Neural Networks (CNNs) for Computer Vision: Conceptual understanding of convolution, pooling, and applications (image classification); Recurrent Neural Networks (RNNs) for Sequence Data: Conceptual understanding of recurrence, basic applications (time series, simple text); Introduction to TensorFlow/Keras: Basic model definition and training.</p>	Self-paced content, Lecture, Modular Assignment
M-5	<p>Natural Language Processing (NLP) Fundamentals</p> <p>Introduction to NLP: Challenges of human language, key applications; Text Preprocessing: Tokenization, stemming, lemmatization, stop words removal; Word Embeddings: Representing words as vectors (e.g., Word2Vec high-level idea); Basic NLP Tasks: Sentiment analysis, text classification; Introduction to Transformers: The attention mechanism, its impact on modern NLP (mention BERT/GPT as examples of new paradigm).</p>	Self-paced content, Lecture, Modular Assignment
M-6	<p>Emerging Trends: Generative AI & LLMs</p> <p>Introduction to Generative AI: Definition, key applications, ethical considerations; Overview of Generative Models: Autoencoders, Generative Adversarial Networks; Large Language Models (LLMs): Key Architectures, Basic Prompt Engineering, Applications of LLMs</p>	Self-paced content, Lecture, Modular Assignment

List of DIY Modular Assignments

1. AI - Search, Reasoning and Planning
2. AI – Forward and Backward Chaining
3. Probability and Statistics for AI
4. Python Fundamentals
5. Predicting Student Marks using Linear Regression
6. Backpropagation for Neural Network Training
7. NLP-Powered Chatbot Text Classification
8. Basic Sentiment Analysis using NLP

Modular Assignment Mapping

<i>S. No.</i>	<i>DIY Assignment Title</i>	<i>Mapped CO(s)</i>	<i>Bloom Level</i>
1	AI – Search, Reasoning and Planning	CO1, CO3	L3, L4
2	AI – Forward and Backward Chaining	CO1, CO3	L3, L4
3	Probability & Statistics for AI	CO2	L2, L3
4	Python Fundamentals	CO2	L2, L3
5	Predicting Student Marks using Linear Regression	CO3	L3, L4, L5
6	Backpropagation for Neural Network Training	CO4	L3, L4, L5
7	NLP-Powered Chatbot Text Classification	CO5, CO6	L4, L5, L6
8	Basic Sentiment Analysis using NLP	CO5	L3, L4, L5

Reference Books	<ol style="list-style-type: none"> Artificial Intelligence: A Modern Approach Stuart Russell, Peter Norvig, 4th Edition, Pearson Education, 2020. Machine Learning Tom M. Mitchell, 1st Edition, McGraw-Hill Education, 1997. Hands-On Machine Learning with Scikit-Learn Keras and TensorFlow Aurélien Géron, 2nd Edition, O'Reilly Media, 2019.
Supplementary References	<p>Official documentation:</p> <ul style="list-style-type: none"> Python, NumPy, Pandas, Scikit-learn, TensorFlow, Keras <p>Online platforms:</p> <ul style="list-style-type: none"> Kaggle (Datasets & Practice) Hugging Face (Transformers & LLMs)

Course Articulation Matrix

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	–	–	1	2	1	2	–	–	–	1
CO2	3	2	2	1	3	–	–	–	–	–	–	2
CO3	3	3	2	2	3	–	–	–	–	–	–	2
CO4	3	3	3	2	3	–	–	–	–	–	–	2
CO5	3	2	2	2	3	–	–	–	–	–	–	2
CO6	3	3	3	2	3	1	1	2	1	1	1	3