Riphah International Colleges
A Project of Riphah International University
Course Outline

Course Information				
	Course Title	**Artificial Intelligence**		
	Course ID		Course Type	Major
	Credit hours	3	Hours per week (C-L)	3-0
	Programs	ADP (ITM)	Preferred Semester	3rd Semester
	Date	Implemented by Fall 2025	Version	

Additional Instruction
Lab is not required to be separately managed but this course requires the classes and the activities using Lab practice work. So Teachers are required to arrange their lectures inside the Lab.

Course Description
Artificial intelligence (AI), the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. Artificial intelligence (AI) makes it possible for machines to learn from experience, adjust to new inputs and perform human-like tasks. Most AI examples that you hear about today – from chess-playing computers to self-driving cars – rely heavily on deep learning and natural language processing. Using these technologies, computers can be trained to accomplish specific tasks by processing large amounts of data and recognizing patterns in the data.

Course Objectives (CO)

The objective of this course is to enable students to understand;

No.	Objective	Relation with PEO
CO1.	To study the applications of AI and agent based approach to AI.	PEO
CO2.	To study and discuss various techniques and algorithm of AI used in problem solving, optimization of problems, and game programming	PEO
CO3.	To study first order predicate logic, reasoning and problem solving using Prolog language.	PEO
CO4.	To familiarize students with various sub-areas of AI, such as expert system, natural language processing and machine learning.	PEO

Course Learning Outcomes (CLO)

At the end of this course students will be able to;

No.	Outcome	Relation with PLO	BT Level	PLO Level
CLO1.	**Know** the fundamental concepts related to Artificial Intelligence, its characteristics and application area, the Sub fields of Artificial Intelligence i.e. Machine Learning, Expert Systems and Natural Language Processing.	PLO1	C1	
CLO2.	**Understand** the Artificial Agents, search strategies, knowledge representation and problem solving.	PLO1	C2	
CLO3.	**Apply** selected basic AI techniques; simple programs in a declarative language.	PLO2	C3	
CLO4.	**Analyze** appropriate AI / machine learning algorithm for simple AI problems	PLO4	C4	
CLO5.	**Define** appropriate knowledge representation scheme, reasoning, machine learning techniques, and natural language processing for AI problems	PLO3	C3	
CLO6.	**Illustrate** an ability to share in discussions of AI, its current scope and limitations, and societal implications.	PLO2	C4	

Lecture type	Lectures
Prerequisites	Know the basic concepts of programming and Data structure (trees and graphs).
Follow up Courses	

TEXTBOOKS AND REFERENCE BOOKS:

	Title	Edition	Authors	Publisher	Year	ISBN
Textbook	Artificial Intelligence A Modern Approach	4th, Global Edition	Stuart J. Russell and Peter Norvig	Pearson series		
	Artificial Intelligence, Machine Learning, and Deep Learning		Oswald Campesato			

Reference Books & Reference Material	[Multiple Books uploaded in the folder and access is given by QR Code](#)						
	The Handbook of Artificial Intelligence		vron Barr and Edward A, Feigenbaum				

Tools and Technologies	Python, NLP and ML tools, pycharm, matplotlib
Design skills / techniques	Project based learning
Helping Material	[CS-subject-Slides.url](#)

GRADE DISTRIBUTION:

Evaluation Type	Percentage %	Activities
Assignments and Presentations	10 %	Min 4 in the semester
Quiz & Projects	10 %	Min 4 in the semester
Class Participation	10 %	
Mid-Term	30 %	Contents from Week-1 to Week-8
Final-Term	40 %	Contents from Week-10-Week-17
Total Points	100	
Methods of Evaluation	Quizzes, Assignments, Mid and Final Term, Lab Paper, Lab-Projects	
Note:	Labs are managed and evaluated separately	

General Classroom Norms:

♦ Class attendance is mandatory. You may miss up to 25% (8 out of 34 sessions) class sessions but save it for emergency only.

♦ In case you exceed this level, you will be withdrawn from the course.

♦ As a courtesy to the instructor and other students, be prepared to arrive at class and be in your seat on time.

♦ In addition, please note that each class lasts for 90 minutes (1.5 Hours).

♦ Cell phones should be powered off or kept on silent mode.

♦ Eatables should be avoided in the class.

♦ Disruptive behaviors are not acceptable in the class.

♦ The Dress Code defined by Campus Administration has to be observed, no warnings will be given, and violators will be referred to the discipline committee for further actions.

♦ Any other rules defined by campus are also mandatory to be followed.

Course Outline (Artificial intelligence)

COURSE CONTENTS							
Week No.	Topic	Lecture No.	Lecture Contents	Relation with CLO	Lecture Material	Class Activity	Tasks
W1.		L1.	• Introduction to Artificial Intelligence Course • Goals of Artificial Intelligence	CLO1		Discussion	

		L2.	• Four Basic of AI,
			  ○ Acting Humanly
			  ○ Thinking Humanly
			  ○ Thinking rationally
			  ○ Acting rationally
				CLO1		Discussion	

W2.		L3.	• Foundation of AI • Role of Philosophers, Mathematician, Psychologist and Computer Engineering • Introduction to programing without AI and with AI • Applications of AI in Gaming, Natural Language Processing, Expert Systems, Vision and Intelligent Robots.	CLO1			Assignment 1:
		L4.	• Introduction to an Artificial Agents • Structure of Agent • How Agent should act • The concept of rationality and Omniscience • Types of Agent Program	CLO1, CLO2			
W3.		L5.	• Introduction and Architecture of Simple Reflex Agent • Introduction and Architecture of Model Based Agents • Introduction and Architecture of Goal Based Agents • Introduction and Architecture Utility based Agents	CLO, CLO2			Quiz 1:
		L6.	• Introduction to an Environment in AI • Properties of Environment • Introduction and examples of Accessible Vs Inaccessible environment • Introduction and example of Deterministic	CLO3			

			• vs non-deterministic environment • Introduction and examples of Episodic and non-episodic environment • Introduction and examples of Static and Dynamic environment				
W4.		L7.	• Introduction and examples of Discrete and Continuous environment • Examples of environment and their characteristics. • Class Activity: Identify the Agents its types and type of environment.	CLO2, CLO3			Assignment 2:
		L8.	• Introduction to Knowledge Based Agent • Architecture of Knowledge based agents • Operations of KBA • Levels of KBA • Introduction to The Knowledge Level • Introduction to The Logical Level • Introduction to the Implementation level	CLO2, CLO3			
W5.		L9.	• Introduction to The Implementation Level • Approaches to design KBA, • Declarative approach and Procedural approach • The concept of reasoning and logic • The concept of knowledge representation language • The concept of Syntax and Semantics	CLO2, CLO3			Quiz 2
		L10.	• Introduction to Propositional Logic: Avery simple logic • The concept of Syntax Rule • The concept of Semantics • Rules of Inference in AI • The Rule of Implication • The Rule of Converse	CLO2, CLO3			
W6.		L11.	• The Rule of contrapositive and Inverse • Introduction to types of Inference Rules • Introduction, Truth table of Modus Ponens, • Introduction, Truth table of Modus Tollens • Introduction, Truth table of Hypothetical	CLO2, CLO3			

			Syllogism, Introduction, Truth table of Disjunctive Syllogism				
		L12.	• Introduction, Truth table of Addition rule • Introduction, Truth table of Simplification rule • Introduction, Truth table of resolution rule • Introduction to First Order logics in Artificial Intelligence • Introduction to FOL • Syntax of FOL	CLO2, CLO3			
W7.		L13.	• The concept of Atomic and Complex sentences in FOL • The concept of Quantifier • Introduction to Universal Quantifier and related examples Introduction to Existential Quantifier and related examples	CLO2, CLO3			
		L14.	• Introduction to Solving problems by searching • Problem Solving agents • Introduction to Problem formulation • Measuring Problem Solving performance				
W8.		L15.	• Choosing states and actions • Introduction to Search Strategies • The Concept of Uninformed and Informed search, • Introduction to BFS and related example • Introduction to Uniform cost search and related examples, Introduction to Depth First Search and related examples • Introduction to Iterative deepening search and related examples	CLO2, CLO3			
		L16.	• Introduction to Greedy BFS and related examples • Introduction to A* Search and related examples • Introduction to Adversarial Search and related examples, • Introduction to Min-Max Algorithm and	CLO2, CLO3			

			related examples				
W9.	Mid Term Exam Week		Mid Term Examination				
W10.		L17.	• Introduction to Subset of AI • Introduction to Expert Systems • Characteristics of Expert Systems • Capabilities of Expert System • Components of ES	CLO3, CLO4, CLO5			
		L18.	• The Concept of Knowledge Base and Inference Engine, • Inference Engine Strategies • Forward chaining and Backward chaining • Expert System Limitations	CLO3, CLO4, CLO5			
W11.		L19.	• Introduction to Machine Learning • Application of Machine Learning (Industry + Research) • Why Machine Learning is Important • The Problems Machine Learning can solve • Supervised Learning Problems • Un-supervised Learning Problems • Semi-Supervised Learning • Reinforcement Learning Problems	CLO3, CLO4, CLO5			
		L20.	• Know Your Task and your Data • Dataset Preparation (Training Data, Validation Data, &Test Data) • Introduction to Python Language. • Python Essential Libraries • Scikit- Learn, Anaconda, Numpy, Scipy, matplotlib,Pandas	CLO3, CLO4, CLO5			Assignment 3:
W12.		L21.	• Introduction to Machine Learning Types • Introduction to classification (Binary and Multi-class) • What is Regression • When to classification or Regression • Clustering (K-Mean)	CLO2, CLO5			Quiz 3
		L22.	• What is Generalization • What is Model Over fitting and Underfitting	CLO2, CLO5,			

			• Relation of Model Complexity to Data Size. • Supervised Learning Algorithm (KNN) • What is KNN • Working of KNN • KNN- Numerical Examples • KNN- Implementation using Iris Dataset				
W13.		L23.	• Introduction to Probability –Based classification • Revision of Probability Concepts. • What is Posterior Probability • What is Prior Probability • Introduction to naïve-Based classification • Working of Naive-Bayes Algorithm • Naïve Bayes Classification	CLO2, CLO5,			
		L24.	• Numerical Example • Email Classification using Bernoulli Distribution • Introduction to Association Rule Mining (Market Basket Analysis) • Introduction to Dimensionality Reduction • PCA, Reduct etc.	CLO2, CLO5			Assignment 4:

W14.		L25.	• Natural Language Processing (NLP):
			  o Introduction
			  o Steps of NLP
			  o Examples of using NLP
			• Image processing
			  o Introduction
			  o Processing steps
				CLO2, CLO5			Quiz 4

		L26.	• Examples of medical images, face recognitions and character recognitions
			• Introduction to Generative AI
			• LLMs with examples
			  o Speech to Image
			  o Voice to Text
			  o Multi-Lingual
				CLO2, CLO5			

W15.		L27.	• Introduction to Artificial Neural Networks Model Representation, Activations, Bias Cost Function	CLO1, CLO5			

			• Back and Forward Propagation • Tuning Neural Networks • Complexity Estimation in Neural Networks • Strength, Weakness and Parameters of NN				
		L28.	• Numerical Examples • Practical: Programs solving classification problems using ANNs • Introduction to Deep Learning	CLO2, CLO5			
W16.		L29.	• Working with Text Data • Types of Data Represented as String • Sentiment Analysis of Movie Reviews	CLO5			
		L30.	• Bag of Words, Tokenization, Stemming and Stop Words • Removal.	CLO5			
W17.		L31.	• Revision	CLO 3			
		L32.	• Final Presentation				
W18.			**Final Term Exam**				

COURSE OUTLINE (ARTIFICIAL INTELLIGENCE (ITM)- LAB-During Class)

Week No.	Topic	Lab Contents / Activity	Home Tasks	Relation with CLO
LAB CONTENTS				
W1.		• AI History and Basics • Introduction to Python		
W2.		• AI and Coding • Installing Python and basics		
W3.		• Python Basics		
W4.		• Problem Understanding with Lexical Terms of Artificial Intelligence + In code.		
W5.		• Use of Numpy in code		
W6.		• Agents - Simple Reflex Agent		
W7.		• Agents in an object-oriented environment (using classes in Python) • Types of Agents		
W8.		• The concept of Graphs and their purposes		
W9.		**Mid Term Exam Week**		
W10.		• Multiple searches algorithms with Python and their applications		
W11.		• Prolog introduction and basics		
W12.		• Machine Learning Introduction- EDA		
W13.		• Supervised learning. KNN Classifier		
W14.		• Supervised algorithms Naïve Bayes Algorithm		
W15.		• Practical: Programs solving classification problems using ANNs		
W16.		• Bag of Words, Tokenization, Stemming and Stop Words		
W17.		**Lab Exam**		
W18.		**Final Term Exams**		