Semester: I/II						
AI Foundations for Engineers **Category: Emerging Technology Course** **Stream: Common to ALL Programs** **(Theory)**						
Course Code	**:**	**CI114TA/CI124TA**		**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**3:0:0**		**SEE**	**:**	**100 Marks**
Total Hours	**:**	**45L + 45 EL**		**SEE Duration**	**:**	**3 Hours**

Unit-I	**07 Hrs**
Introduction: What is AI? Acting humanly: The Turing test approach, thinking humanly: The cognitive modelling approach, Thinking rationally: The "laws of thought" approach, Acting rationally: The rational agent approach; The foundations of AI: Mathematics, Economics, Neuroscience, Psychology, Computer Engineering; The State of the Art; Risks and Benefits of AI **General Introduction to Responsible AI:** What is Responsible AI? Why it is important **Intelligent Agents:** Agents and Environments, The concept of Rationality, The Nature of Environments	
Unit – II	**10 Hrs**
Solving Problems by Searching: Problem-solving agents: Search problems and solutions, Formulating problems, Example Problems: Grid world problems (Vacuum world, Sokoban Puzzle), Real-world problems (Route-finding problems) **Search Algorithms:** Uninformed Search Strategies(BFS, DFS); Informed (Heuristic) Search Strategies(A* Search)	
Unit –III	**10 Hrs**
Introduction to Machine learning: Well-posed learning problems, designing a learning System: Choosing the training experience, Choosing the target function, choosing representation for the target function, Choosing a function approximation algorithm, the final design; Prospects and Issues in ML **Decision Tree Learning:** Decision Tree Representation, Appropriate Problems for DT learning, The basic DT algorithm, and Applications **Bayesian Learning:** Bayes' Theorem, Bayes' Theorem and Concept Learning,and Applications **Instance-Based Learning:** K-Nearest Neighbor learning, and Applications	
Unit –IV	**10 Hrs**
Artificial Neural Networks: Biological Motivation, Neural Network Representations, Appropriate Problems for Neural Network Learning, Perceptrons, Multilayer Networks and the Backpropagation Algorithm **General Introduction to Deep Learning Models:** Recurrent Neural Networks (RNN), Convolutional Neural Networks (CNN), Reinforcement Learning, and Applications	
Unit –V	**08 Hrs**
Responsible AI: Understanding Human-centered Design, Responsible AI Lifecycle, Envisioning and Impact Assessment, Data Collection and Processing, Prototyping, Testing, Building for Production, Deployment, Monitoring, Tools for Responsible AI, Case studies	

Course Outcomes: After completing the course, the students will be able to:-	
CO1	Explain fundamental concepts of Artificial Intelligence, including approaches to building intelligent systems, foundations, state of the art, and assess the potential risks and benefits of AI.
CO2	Apply problem-solving techniques and search algorithms to model and solve real-world problems using uninformed and informed search strategies.
CO3	Demonstrate an understanding of key machine learning techniques, including decision trees, Bayesian learning, instance-based learning, and neural networks incorporating backpropagation, and analyze their applications within AI systems.
CO4	Apply the principles of Responsible AI and human-centered design to assess the impacts of AI systems, ensure ethical development throughout the AI lifecycle for building trustworthy AI solutions.

Reference Books	
1.	Artificial Intelligence: A Modern Approach, Stuart J. Russell and Peter Norvig, 4th Edition, Publisher: Pearson, 2020, ISBN-13: 978 0134610993 (Unit1 & Unit2)
2.	Machine Learning, Tom M. Mitchell, McGraw-Hill, 1997. (Unit3 & Unit4)
3.	Responsible AI Architect's Guide-Responsible AI Best Practices, NASSCOM(White Paper) (Unit5)
4.	Artificial Intelligence: A Guide for Thinking Humans, Melanie Mitchell, Publisher: Farrar, Straus and Giroux, 2019, ISBN-13: 978 0374257835

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	QUIZZES: Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. **THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.**	20
2.	TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). THREE tests will be conducted (Two regular tests and one optional improvement test). Each test will be evaluated for 50 Marks, adding upto 100 Marks. **FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.**	40
3.	EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20) Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). **ADDING UPTO 40 MARKS.**	40
	MAXIMUM MARKS FOR THE CIE (THEORY)	**100**