INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE								
VI Semester: CSE (AI&ML)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
ACAD19	**Elective**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Prerequisites: Logic Programming for Artificial Intelligence / Applied Artificial Intelligence								

I. COURSE OVERVIEW:

Artificial Intelligence courses introduce the foundational principles, history, and modern applications of Artificial Intelligence (AI). It covers intelligent agents, search strategies, game playing, and knowledge representation. Students will learn logical inference, machine learning methods, and applications in natural language processing (NLP). Emphasis is placed on supervised, statistical, and reinforcement learning techniques. The course blends theory with practical insights into building intelligent systems. Ethical issues in AI, especially in NLP, are also addressed.

II. COURSE OBJECTIVES:

The students will try to learn:

I. The basic concepts, history, and types of problems in Artificial Intelligence.
II. The ways in which AI systems use search algorithms, logical reasoning, and knowledge representation to solve complex problems.
III. The use of AI in real-world applications like game playing, learning, and natural language processing.

III. COURSE OUTCOMES:

At the end of the course students should be able to:

CO1 Outline the foundations of Artificial Intelligence principles to identify intelligent agents and formulate problems effectively.
CO2 Build the search algorithms and game-playing strategies for solving AI-based decision-making problems.
CO3 Compare various knowledge representation methods to reason under uncertainty and design expert system components.
CO4 Illustrate inference mechanisms and learning techniques to interpret and solve AI learning tasks.
CO5 Utilize Natural Language Processing techniques for building language-aware applications such as text classifiers and chatbots.
CO6 Inspect the problem-solving and learning strategies to assess their role in building intelligent and adaptive AI systems.

IV. COURSE CONTENT:

MODULE – I: INTRODUCTION TO ARTIFICIAL INTELLIGENCE (10)

Foundations and History of AI-AI Problems and Problem Characteristics-Intelligent Agents: Structure, Types, and Functions, Agents and Environments, Concept of Rationality, Problem Solving Agents and Problem Formulation.

MODULE – II: PROBLEM SOLVING AND GAME PLAYING (09)

Searching for Solutions-Uninformed Search Strategies: Breadth-First Search, Depth-First Search, Informed Search Strategies: Heuristic Search, Hill Climbing, A*, AO*-Problem Reduction-Game Playing: Adversarial Search, Mini-Max Algorithm, Optimal Decisions in Multiplayer Games, Alpha-Beta Pruning, Evaluation Functions.

MODULE – III: KNOWLEDGE REPRESENTATION AND REASONING (10)

Knowledge Representation Issues-Predicate Logic and Logic Programming-Semantic Networks, Frames, and Inheritance-Constraint Propagation-Knowledge Representation using Rules-Rule-Based Deduction Systems.

Reasoning Under Uncertainty, Probability Review, Bayesian Reasoning, Dempster-Shafer Theory, Expert systems - Representing and using Domain knowledge, expert system shells, Knowledge acquisition.

MODULE – IV: LOGICAL INFERENCE AND LEARNING (09)

First Order Logic and Inference-Propositional vs. First Order Inference-Unification, Forward Chaining, Backward Chaining-Resolution-Learning from Observations-Inductive Learning-Decision Trees Explanation-Based Learning-Statistical Learning Methods-Reinforcement Learning.

MODULE – V: AI APPLICATIONS IN NATURAL LANGUAGE PROCESSING (10)

Introduction to NLP: Scope, Challenges, and Applications, Preprocessing: Tokenization, Stopword Removal, Stemming, Lemmatization- Part-of-Speech Tagging, Named Entity Recognition-Text Representation: Bag of Words, TF-IDF, Word2Vec, GloVe-Overview of Contextual Embeddings (BERT)-Text Classification: Naive Bayes, Logistic Regression, Sentiment Analysis-Introduction to Chatbots and Dialogue Systems-Ethics in NLP: Bias, Privacy, Fairness

V. TEXTBOOKS:

1. Stuart Russell & Peter Norvig, “Artificial Intelligence: A Modern Approach”, Pearson Education.
2. Elaine Rich, Kevin Knight, “Artificial Intelligence”, Tata McGraw-Hill publication 2007.
3. Steven Bird, Ewan Klein, and Edward Loper, “Natural Language Processing with Python”, O’Reilly, 2008.

VI. REFERENCE BOOKS:

1. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007.
2. Peter Jackson, “Introduction to Expert Systems”, Pearson Education, 3rd Edition, 2007.
3. Stuart Russel, Peter Norvig, “AI – A Modern Approach”, Pearson Education, 2nd Edition 2007.
4. G. Luger, W. A. Stubblefield, “Artificial Intelligence”, Addison-Wesley Longman, 3rd Edition, 1998.

VII. WEB REFERENCES

1. https://bpbonline.com/products/applied-machine-learning-solutions-with-python
2. NPTEL: Artificial Intelligence, https://nptel.ac.in/courses/106105077/
3. http://www.udacity.com/
4. http://www.library.thinkquest.org/2705/

5. http://www.ai.eecs.umich.edu/
6. CS50's Introduction to Artificial Intelligence with Python | Harvard University
7. Artificial Intelligence Search Methods for Problem Solving - Course (nptel.ac.in)
8. http://www.ai.eecs.umich.edu

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. PowerPoint presentation
11. E-Learning Readiness Videos (ELRV)