

# INT428:ARTIFICIAL INTELLIGENCE ESSENTIALS

L:3 T:0 P:1 Credits:4

**Course Outcomes:** Through this course students should be able to

CO1 :: describe basic knowledge representation, problem solving, and learning methods of artificial intelligence.

CO2 :: compare uninformed and informed search strategies to solve AI problems.

CO3 :: discuss knowledge representation and statistical reasoning methods for AI.

CO4 :: analyze different AI strategies for game playing and NLP essentials.

CO5 :: explain Generative AI fundamentals and prompt engineering for crafting effective prompts.

CO6 :: apply the learned skills and techniques through hands-on tasks that involve a combination of GPT tools, data analysis, visualization, and presentation creation.

## Unit I

**Introduction** : What is intelligence?, what is artificial intelligence?, Foundations of artificial intelligence(AI), History of AI, Basics of AI, Artificial Intelligence Problems, Artificial Intelligence Techniques, applications of AI, branches of AI, Modern AI tools and their Applications

**Problem Spaces and Search** : Defining the problem as a state space search, Production systems, Problem characteristics, Production system characteristics, Issues in designing search problems

## Unit II

**Uninformed Search Strategies** : Breadth first search (BFS), Depth first search (DFS), Bi-directional Search, Iterative Deepening

**Informed Search Strategies** : Heuristic functions, Generate and Test, Hill Climbing, Simulated Annealing, Best first search, A\* algorithm, Constraint satisfaction

## Unit III

**Knowledge Representation** : Approaches in knowledge representation, Issues in knowledge representation, Propositional logic, Predicate logic, Forward versus backward reasoning

**Statistical reasoning methods** : Probability & Bayes' theorem, Bayesian networks, Dempster Shafer-Theory, Certainty factors & rule-based systems

## Unit IV

**Game playing** : Evaluation function, Minmax Problem, The min-max search procedure, Alpha-beta cutoffs, Alpha-beta pruning

**Natural Language Processing** : Introduction to NLP, NLP phases, Construction of parse tree, Spell checking, Bag of words model, Soundex algorithm, Applications of NLP, Chatbots, Alexa, Siri, Cortana

## Unit V

**Introduction to Generative AI** : Fundamentals of Generative AI, Generative AI model types, How Gen AI works, Difference between GPTs and search engines

**Prompt Engineering** : Fundamentals of prompt, Importance of Prompt Engineering, Overview of language models, Key elements of a good prompt, Prompt Patterns, Prompt Tuning

## Unit VI

**ChatGPT Advance Data Analysis** : ChatGPT Advanced Data Analysis vs. ChatGPT, Building Data Visualization and Creating a Presentation, Working with structured data, Working with media, Zip files for automation, Working with small documents, Appropriate use of ChatGPT Advanced Data Analysis, Human and AI Process planning, Error identification techniques, Error handling

**Advanced topics in Artificial Intelligence** : Machine Learning and its types, Overview of Neural Networks, Overview of Genetic Algorithms, Overview of Fuzzy Logics

## List of Practicals / Experiments:

### List of Practicals

- Implement state space search and production system to solve water jug problem.
- Implement Breadth First Search (BFS) and Depth First Search (DFS).
- Implement Best first search on a given problem.

- Using AI tools for content creation and editing of text and presentation
- Using AI tools for image, audio and video editing
- Implement Bayes theorem and Bayesian network and perform inference.
- Implement the Minimax algorithm with Alpha-Beta pruning for a simple game.
- Create a web application where users can drag and drop documents to get AI-generated summaries.
- Implement a chatbot to automate customer support for common queries.
- Use ChatGPT Advanced Data Analysis to build data visualizations and create presentations based on structured data.

**Text Books:**

1. ARTIFICIAL INTELLIGENCE by RICH, KNIGHT, MCGRAW HILL EDUCATION

**References:**

1. INTRODUCTION TO GENERATIVE AI by NUMA DHAMANI AND MAGGIE ENGLER, Manning Publications
2. ARTIFICIAL INTELLIGENCE: A MODERN APPROACH by STUART RUSSELL, PETER NORVIG, PEARSON