

Year: B. Tech III (Semester V)

Subject Name: Artificial Intelligence

Subject Code: BTCO13503

Type of course: Professional Core Course

Prerequisite (if any): Data Structures

List of Courses where this course will be prerequisite:

Rationale: Learners can gain a thorough understanding of the fundamentals of Artificial Intelligence, the recent applications and the various components of Artificial Intelligence. This course provides insights into the different search methods including heuristic and adversarial search, various bio inspired learning methods, reasoning, Logic programming and natural language processing along with the applications.

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	2	4	60	25	15	30	20	150

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Content	Total Hrs
1	Introduction and Ethical concerns of AI : Introduction to Artificial Intelligence (AI), Scope and view of Artificial Intelligence, typical AI problems, Intelligent behavior, history of AI, Turing test, Popular AI applications, AI agent, AI and Ethical concerns.	3

2	State space search and problem characteristics : Goal directed agent, State space search problem and its representation, Search tree - 8 puzzle, Water jug problem, N Queen problem, Tic-Tac-Toe, Travelling Salesman Problem, Missionary Cannibal; Production system, Control strategies, Problem characteristics.	5
3	Search strategies : Uninformed search and analysis - Breadth First Search, Depth First Search, Iterative Deepening Depth First Search, Bi-directional search; Informed search and analysis - Simple Hill Climbing, Steepest Ascent Hill Climbing, Simulated Annealing, Greedy Best-First Search, A*, AND-OR Graph, AO*; Solving Constraint Satisfaction Problem.	9
4	Game Playing : Overview, Zero Sum Games, Adversarial Search, MiniMax, Alpha-Beta Cut-off, Refinements.	4
5	Bio Inspired Learning: Introduction to Artificial Neural Networks (ANN), Hopfield Network, Perceptron, Linearly separable problems, complex problems, Learning of the network, Back propagation, Activation functions, Applications of ANN. Genetic Algorithm (GA): Introduction, Encoding schemes, GA Operators - Parent selection, Mutation, Crossover; Fitness, Application of GA Overview of Particle Swarm Optimization, Ant Colony Optimization	8
6	Probabilistic Reasoning : Probability and Bayes' Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Fuzzy Logic.	4
7	Knowledge presentation and Reasoning: Knowledge representation - Issues and Approaches; Proposition, Inference and Deduction, First Order Logic, Unification, Resolution by refutation, Rule based systems, Non-monotonic reasoning.	6
8	Logic programming in Prolog : Introduction To Prolog, Syntax and Numeric Function, Basic List Manipulation Functions In Prolog, Functions, Predicates and Conditional, Input, Output and Local Variables, Iteration and Recursion, Property Lists and Arrays, Miscellaneous Topics	4
9	Natural Language Processing : Introduction, Steps in NLP: Morphological analysis, Syntactic Processing, Semantic Analysis, Discourse And Pragmatic Processing; applications of NLP.	2

Suggested Specification table with Marks (Theory): (For B. Tech. only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	20	10	0	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

Sr No	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication / Publication Edition
1	Artificial Intelligence	Elaine Rich And Kevin Knight	Tata Mcgraw-Hill, 9780070087705	
2.	Artificial Intelligence:A Modern Approach	Stuart Russel, Peter Norvig	Prentice Hall, 0136042597	
3.	PROLOG Programming For Artificial Intelligence	Ivan Bratko	Addison-Wesley	

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Compare and select appropriate A.I. based technique for problem solving	10%
CO-2	Examine different uninformed and heuristic search techniques	25%
CO-3	Examine knowledge representation issues, reasoning, formulate predicates-rules for real life problem solving	30%

CO-4	Apply suitable AI technique like Neural Networks, Fuzzy logic, Natural Language Processing, and Bio inspired learnings to solve real life problems	25%
CO-5	Apply efficient and robust AI algorithms for game playing	10%

List of Open learning website:

- NPTEL online course: An Introduction to Artificial Intelligence (<https://nptel.ac.in/courses/106102220>)
- NPTEL online course: Artificial Intelligence: Introduction (<https://nptel.ac.in/courses/106106126>)

List of Open Source Software:

- Prolog compiler
- Python

FOR LAB SESSIONS:

List of Experiments:

Sr. No	Practical
1	Implement the WaterJug Problem.
2	Write a program to implement BFS (for 8 puzzle problem or Water Jug problem or any AI search problem) .
3	Write a program to implement DFS (for 8 puzzle problem or Water Jug problem or any AI search problem)
4	Write a program to Implement A* Algorithm
5	Write a program to implement Single Player Game (Using Heuristic Function)

6	Implement the game of Tic – Tac -Toe, where one player is a human and the other is the Computer.
7	Write a program to solve travelling salesman problem using any heuristic search.
8	Solve quadratic equation using Genetic algorithm.
9	Write a program to create and train a ANN model for i) AND gate ii) X-OR gate
10	Write Prolog Program to Explore basic Prolog syntax and structure.
11	Write Prolog Program to Explore operators and input output.
12	Write a Prolog Program to Explore Cut, Fail and Repeat predicates.
13	Write prolog programs for following list operations (a) Check the membership of an item in a given list. (b) Find the size of a list (c) Find the nth element of a given list. (d) Find the last element of a given list. (e) Delete an element in a given list. (f) Append two given lists. (g) Reverse a given list.
1	Explore NLTK and write program to demonstrate basic NLTK functions.