

**Year: B. Tech III (Semester V)**

**Subject Name:** Fundamentals of Artificial Intelligence  
**Type of course:** Open Elective -1  
**Prerequisite (if any):**

**Subject Code:** BTCO15501

**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 search, fundamentals of Artificial Neural Networks, Logic programming and knowledge representation.

**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	<b>Introduction and Ethical concerns of AI :</b> Introduction to Artificial Intelligence (AI), Foundation of AI, Scope and view of Artificial Intelligence, Intelligent behavior, history of AI, Turing test, Popular AI applications, AI agent, Structure of Agents, AI and Ethical concerns.	8
2	<b>State space search and problem characteristics :</b> State space search problem and its representation, search tree, State representation for different applications where searching is required, production system, control strategies, problem characteristics.	6
3	<b>Solving problem by searching :</b> Uninformed search and analysis : Breadth First Search, Depth First Search, Iterative Deepening Depth First Search, Bi-directional search, Heuristic function, Informed search and analysis - Simple Hill Climbing, Steepest Ascent Hill Climbing, Simulated Annealing, Greedy Best-First Search, A*, Constraint Satisfaction Problem.	10
4	<b>Learning:</b> Forms of learning, Learning Decision trees. Ensemble learning, Statistical learning methods - maximum likelihood parameter learning discrete and continuous model, Naive Bayes models; Learning with hidden variables - The EM algorithm	12

	Introduction to Artificial Neural Networks (ANN), Hopfield Network, Single layer feed forward neural networks (Perceptron), Learning of the network, Back propagation for perceptron, activation functions, applications of ANN. Case study	
5	<b>Knowledge Representation and Reasoning:</b> Knowledge representation - Issues and Approaches; Proposition, Inference and Deduction, First Order Logic, Unification, Resolution by refutation, Rule based systems, Non-monotonic reasoning.	5
6	<b>Logic programming in Prolog :</b> 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

**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
20	20	15	5	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:A Modern Approach	Stuart Russel, Peter Norvig	Prentice Hall, 0136042597	Latest Edition
2.	Artificial Intelligence	Elaine Rich And Kevin Knight	Tata Mcgraw-Hill, 9780070087705	
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 to solve real life problems	20%
CO-5	Apply different learning methods for problem solving	15%

**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
- WEKA machine learning tool

**FOR LAB SESSIONS:**

**List of Experiments:**

Sr.No	Practical
1	Implement the WaterJug Problem.
2	Write a program to implement BFS (for the problem given in lab)
3	Write a program to implement DFS (for the problem given in lab)
4	Write a program to Implement A* Algorithm
4	Write a program to create and train a ANN model for i) AND gate ii) X-OR gate
5	Write Prolog Program to Explore basic Prolog syntax and structure.
6	Write a Prolog program to create Family tree and test various relations (as per instructions given in the lab)
7	Write a Prolog program for the following:



	(a) To compute factorial (b) To find Fibonacci number
8	Write Prolog Program to Explore operators and input output.
9	Write a Prolog Program to Explore Cut, Fail and Repeat predicates.
10	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.

