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| **B. TECH (COMMON TO AI AND AI&ML) 3rdSem** | | | | | | |
| **Course code** | |  | | **L T P** | | **Credits** |
| **Course title** | | **ARTIFICIAL INTELLIGENCE** | | **3 0 0** | | **3** |
| **Course objective:** | | | | | | |
| Introductory knowledge of historical perspective of AI and its foundations and familiarity with principles of AI toward problem solving, inference, perception, knowledge representation, and learning. Acquiring the knowledge various forms of learning and computation statistics. | | | | | | |
| **Pre-requisites: Basic knowledge of AI and Machine Learning Concepts** | | | | | | |
| **Course Contents / Syllabus** | | | | | | |
| **UNIT-I** | **Introduction** | | **8 HOURS** | | | |
| Introduction to Artificial Intelligence, Historical developments of Artificial Intelligence, well defined learning problems, Designing a Learning System, Basics of problem-solving: problem representation paradigms, state space, satisfiability vs optimality, pattern classification problems, example domains. | | | | | | |
| **UNIT-II** | **Search Techniques** | | **8 HOURS** | | | |
| Searching for solutions, Uninformed Search Strategies: DFS, BFS, Informed Search Strategies: Local search algorithms and optimistic problems, adversarial Search, Search for games, minimax, Alpha - Beta pruning, Heuristic Search techniques, Hill Climbing, Best-first search, Problem reduction, Constraint satisfaction, Means Ends Analysis, Iterative deepening Heuristic Search and A\*. | | | | | | |
| **UNIT-III** | **Logic and Knowledge Representation** | | **8 HOURS** | | | |
| Introduction of Logic, Propositional Logic Concepts, Semantic Tableaux and Resolution in Propositional logic, FOPL, Semantic Tableaux and Resolution in FOPL, Logic Programming in Prolog. Production systems and rules for some AI problems: Water Jug Problem, Missionaries-Cannibals Problem, n-Queen problem, monkey banana problem, Travelling Salesman Problem. Knowledge representation, semantic nets, partitioned nets, parallel implementation of semantic nets. Frames, Common Sense reasoning and thematic role frames, | | | | | | |
| **UNIT-IV** | **Expert System** | | **8 HOURS** | | | |
| Architecture of knowledge-Based System, Rule-based systems, Forward and Backward Chaining, Frame Based systems. Architecture of Expert System, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks. | | | | | | |
| **UNIT-V** | **Planning and Uncertainty** | | **8 HOURS** | | | |
| Planning with state Space Search, Conditional Planning, Continuous planning, Multi-Agent Planning, Forms of learning, inductive learning, Reinforcement Learning, learning decision trees, Neural Net learning and Genetic learning. Probabilistic Methods, Bayesian Theory, Dempster Shafer Theory, Bayes Network.  Evolutionary computation: Swarm Intelligence, ant colony optimization Agents, Intelligent Agents, Structure of Intelligent Agents, Virtual Agents, Multi-agent systems.  **Case Study:**  Health Care, E Commerce, Smart Cities | | | | | | |
| **Course outcome: After completion of this course students will be able to** | | | | | | |
| CO 1 | | Understand fundamental understanding of the history of artificial intelligence (AI) and its foundations | | | K2 | |
| CO 2 | | Apply principles of AI in solutions that require problem solving, inference and perception | | | K3 | |
| CO 3 | | Explain strong familiarity with a number of important AI techniques, including in particular intelligent search methods and solutions | | | K3 | |
| CO 4 | | Apply the concepts of knowledge & reasoning of predicate logic and representing knowledge using rules, Probabilistic reasoning. | | | K3 | |
| CO 5 | | Assess/ Evaluate critically the techniques presented and apply them to real world problems | | | K5 | |
| **Text books** | | | | | | |
| 1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education. Fourth Edition 2021 | | | | | | |
| 1. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill 3rd Edition 2010 | | | | | | |
| **Reference Books** | | | | | | |
| 1. Patrick Henry Winston, “Artificial Intelligence”, Pearson Education Inc., Third edition. | | | | | | |
| 1. Python Machine Learning: Learn Python in a Week and Master It. A Hands-On Introduction to Artificial Intelligence Coding, a Project-Based Guide with Practical Exercises (7 Days Crash Course, Book 2) 2020 | | | | | | |
| 3 Nils J.Nilsson, “Artificial Intelligence - A New Synthesis", Harcourt Asia Pvt. Ltd. | | | | | | |
| 1. AI in the Wild: Sustainability in the Age of Artificial Intelligence 2020 | | | | | | |
| 1. Knowledge-Based Systems Techniques and Applications (4-Volume Set) | | | | | | |
| **NPTEL/ Youtube/ Faculty Video Link:** | | | | | | |
| <https://nptel.ac.in/courses/106/106/106106198/> | | | | | | |
| <https://nptel.ac.in/courses/111/107/111107137/> | | | | | | |
| <https://nptel.ac.in/courses/106/106/106106202/> | | | | | | |
| <https://nptel.ac.in/courses/106/106/106106213/> | | | | | | |
| <https://nptel.ac.in/courses/106/105/106105152/> | | | | | | |

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| **B. TECH(AI-ML) 3rdSem** | | | | | |
| **Course Code** | | |  | **LTP** | **Credit** |
| **Course Title** | | | **ARTIFICIAL INTELLIGENCE LAB** | **0 0 2** | **1** |
| **Suggested list of Experiment** | | | | | |
| **Sr. No.** | | **Name of Experiment** | | | **CO** |
| 1 | | Write a python program to implement simple Chat-bot. | | | CO1 |
| 2 | | Implement Tic-Tac-Toe using A\* algorithm. | | | CO1 |
| 3 | | Implement alpha-beta pruning graphically with proper example and justify the pruning. | | | CO2 |
| **4** | | Write a python program to implement Water Jug Problem. | | | CO2 |
| **5** | | Use Heuristic Search Techniques to Implement Best first search (Best-Solution but not always optimal) and A\* algorithm (Always gives optimal solution). | | | CO3 |
| **6** | | Use Heuristic Search Techniques to Implement Hill-Climbing Algorithm. | | | CO5 |
| **7** | | Write a program to implement Hangman game using python. | | | CO5 |
| **8** | | Write a program to solve the Monkey Banana problem | | | CO4 |
| **9** | | Write a python program to implement Simple Calculator program. | | | CO4 |
| **10** | | Write a python program to POS (Parts of Speech) tagging for the give sentence using NLTK | | | CO5 |
| **11** | | Solve 8-puzzle problem using best first search | | | CO5 |
| **12** | | Solve Robot (traversal) problem using means End Analysis. | | | CO5 |
| **13** | | Implementation of Image features Processing using OPENCV AND OPEN VINO | | | CO4 |
| **14** | | Write a program to implement Naïve Bayes Algorithm | | | CO5 |
| **15** | | Write a Program to implement alpha-beta Pruning. | | | CO2 |
| **Lab Course Outcome:** | | | | | |
| CO 1 | Apply searching problems using various algorithms. Explain functionality of Chat-bot. | | | | |
| CO 2 | Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem. | | | | |
| CO 3 | Implement the program to POS (Parts of Speech) tagging for the give sentence using NLTK. | | | | |
| CO 4 | Design and carry out an empirical evaluation of different algorithms on a problem formalization, and state the conclusions that the evaluation supports. | | | | |
| CO5 | Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming). | | | | |