CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF TECHNOLOGY&ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

CS341: ARTIFICIAL INTELLIGENCE

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objective to give the course AI is

- To introduce conceptual hierarchy of Data, Information, Knowledge and Intelligence.
- To give understanding of basic knowledge related to AI techniques and its applications, which help students to solve complex problem.
- Know programming techniques in logic using Turbo PROLOG.

B. Outline of the Course:

Sr No.	Title of the unit	Minimum number of Hours
1.	Introduction to AI, Problems, Problems Space and Search, Heuristic Techniques	10
2.	Logic and Programming Languages in AI	05
3.	Knowledge Representation and Rules	04
4.	Reasoning	06
5.	Weak Slot-And-Filler Structure and Game Playing and Planning	10
6.	NLP and Text Analytics and Neural Networks	06
7.	Expert Systems and Optimization Techniques and AI & ML Tools	04

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. Detailed Syllabus:

1.	**Introduction to AI**	**10 Hours**	**20 %**

What is AI, Applications of AI, characteristics, advantages and disadvantages.

Problems, Problems Space and Search, Heuristic Search Techniques

Defining The Problems as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues In The Design Of Search Programs,

Heuristic Search Techniques:

Hill Climbing, A*, AO*, Simulated Annealing, Branch and Bound, Nearest Neighbour, Blind Search Techniques: DFS, BFS, Best First Search, Control Strategies.

2	**Logic and Programming Languages in AI**	**05 Hours**	**15 %**

Logic:

Propositional Logic, Predicate Logic and Fuzzy Logic, Monotonic and non-Monotonic

Programming Languages:

Introduction to Prolog: Syntax & Numeric Function, Basic List Manipulation Functions In Prolog, Functions, Predicates & Conditional, Input, Output & Local Variables, Iteration & Recursion, Property Lists & Arrays. GUI Version of Prolog.

Python Programming: Syntax, Data Type, Libraries : NumPy, Numba, NumExpr, SciPy, AstroPy, Pandas, SymPy, MatplotLib, Jupyter, Ipython

3.	**Knowledge Representation**	**04Hours**	**10 %**

Knowledge Representation:

Knowledge Representations And Mappings, Approaches To Knowledge Representation.

Representing Knowledge using Rules

Procedural Versus Declarative Knowledge, Logic Programming,

Forward Versus Backward Reasoning.

4	**Reasoning** **Symbolic Reasoning Under Uncertainty and Statistical Reasoning:** Introduction To Non-monotonic Reasoning, Logics For Nonmonotonic Reasoning **Statistical Reasoning** Probability And Bays' Theorem, Certainty Factors And Rule-Base Systems, Bayesian Networks, Dempster-Shafer Theory	**06Hours**	**10 %**
5.	**Weak Slot-And-Filler Structure and Game Playing and Planning** **Weak Slot-And-Filler Structure:** Semantic Nets, Frames, Ontology, OWL, Reasoner **Game Playing and Planning:** Introduction: Games as Search Problems, Perfect Decisions in Two-Person Games, Imperfect Decisions, Alpha-Beta Pruning, Games That Include an Element of Chance, State-of-the-Art Game Programs : Chess, Checkers or Draughts, Othello, Backgammon, Go The Blocks World, Components Of A Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems.	**10 Hours**	**20 %**
6.	**NLP and Text Analytics and Neural Networks** **NLP and Text Analytics:** Introduction, Syntactic Processing, Semantic Analysis, Semantic Analysis, Discourse And Pragmatic Processing, Text Analytics, Text pre-processing, Bag of Words, Word Cloud, Machine Translation, sentiment analysis **Neural Networks** Introduction: Simple Perceptron, Hopfield Network, Learning In Neural Network, Application Of Neural Networks, Recurrent Networks, Deep Neural Network, Convolution Network, Restricted Boltzmann machine, Transfer learning	**06 Hours**	**15 %**

7. Expert Systems and Optimization Techniques and AI & ML Tools **04 Hours** **10 %**

Expert Systems:

An Introduction To Expert System, Explanation Facilities, Expert System Developments Process, Knowledge Acquisition.

Optimization Techniques and AI & ML Tools:

Genetic Algorithm (GA), Ant Colony Optimization (ACO), Particle Swarm Optimization(PSO), Honey Bee

AI , Machine Learning and Data Analytics Tools

D. Instructional Methods and Pedagogy:

- At the start, of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Faculty would use coached problem-solving method as it is the class format in which faculty provide a structured, guided context for students working collaboratively to solve problems.
- Assignments based on topic content will be given to the students at the end of each unit/topic.
- Surprise tests/Quizzes will be conducted.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum 30 programs of PROLOG in terms of experiments are suggested in the laboratory.

E. Student Learning Outcomes / Objectives:

Upon completion of this course, students will be able to do the following:

- This subject will help students to solve difficult and complex problem of computer science using AI techniques.
- AI knowledge will help student to select any R&D field related to application of AI in PG courses.
- Basic knowledge of AI will let students to understand soft computing and machine learning.

- AI techniques will be utilized to develop software solution as per need of today's IT edge which requires high automation and less human intervention.

F. Recommended Study Material:

❖ **Text Books:**

1. "Artificial Intelligence" -By Elaine Rich and Kevin Knight (2nd Edition) Tata Mcgraw-Hill.
2. Stuart J. Russell and Peter Norvig, Artificial Intelligence 3e: A Modern Approach, 3rd Edition. Person
3. Introduction to Prolog Programming By Carl Townsend

❖ **Reference Books:**

1. "Artificial Intelligence and Expert System, Development"-By D.W.Rolston, Mcgraw-Hill International Edition.
2. "Artificial Intelligence And Expert Systems "By D.W.Patterson
3. "PROLOG Programming For Artificial Intelligence" By Ivan Bratko, Addison-Wesley
4. "Programming with PROLOG" –By Klocksin and Mellish.