A.P. State Council of Higher Education
Semester-wise Revised Syllabus under CBCS, 2020-21
Three Year B.Sc. - Semester – V (from 2022-23)
Subject: **B.Sc -Data Science**
Course-7A: **AI Concepts and Techniques**
(Skill Enhancement Course (Elective), 5 credits, Max Marks: 100 + 50

I. Learning outcomes of Course:

1. List the objectives and functions of modern Artificial Intelligence.
2. Categorize an AI problem based on its characteristics and its constraints.
3. Understand and implement search algorithms.
4. Learn how to analyze the complexity of a given problem and come with suitable optimizations.
5. Demonstrate practical experience by implementing and experimenting with the learnt algorithms.

Objectives of Course (AI Concepts and Techniques):

This course provides an introduction to the fundamentals of artificial intelligence. Demonstrates fundamental understanding of the history of artificial intelligence (AI) and its foundations. Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning. Demonstrates awareness and a fundamental understanding of various applications of AI techniques in intelligent Agents.

II. Syllabus: (Total Hours: 90 including Teaching, Lab and internal exams, etc.)

UNIT- 1

Problems and Search: What is Artificial Intelligence, The AI Problems, and Underlying Assumption, what is an AI Technique.

Problems, Problems Spaces, and Search: Defining the problem as a state space search, production systems, problems characteristics, issues in the design of search programs.

UNIT- II

Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis

UNIT- III

Knowledge Representation Issues: Representations and Mapping, Approaches to Knowledge Representation, The frame problem. Using Predicate Logic: Representing simple facts in logic, Representing Isa relationships, predicates, Resolution

UNIT- IV

Representing Knowledge using Rules: Procedural Vs Declarative knowledge, Logic Programming, Forward Vs Backward Reasoning, Matching, Control Knowledge

UNIT- V

Symbolic Reasoning under Uncertainty: Introduction to Non-monotonic Reasoning, Logics for Non-monotonic Reasoning, Implementation issues, Augmenting a Problem solver, implementation: DFS, BFS.

Statistical Reasoning: Probability and Bayes Theorem, Certainty Factors and Rule-Based Systems, Bayesian Networks, Dempster-Shafer Theory.

PRACTCAL SYLLABUS

III. SKILL OUTCOMES

- Explain artificial intelligence, its characteristics and its application areas.
- Formulate real-world problems as state space problems, optimization problems or constraint satisfaction problems.
- Select and apply appropriate algorithms and AI techniques to solve complex problems.
- Design and develop an expert system by using appropriate tools and techniques.

IV Details of Lab/Practical/Experiments/Tutorials syllabus:
7A (L): AI Concepts and Techniques with Python/LISP/PROLOG Lab

1. Write a Program to Implement Breadth First Search
2. Write a Program to Implement Depth First Search
3. Write a Program to Implement Tic-Tac-Toe game.
4. Write a Program to implement 8-Puzzle problem
5. Write a Program to Implement Water-Jug problem
6. Write a Program to Implement Travelling Salesman problem
7. Write a Program to Implement Towers of Hanoi problem
8. Write a Program to implement 8-Queens problem

V. REFERENCES:

1. Artificial Intelligence, Second Edition, Elaine Rich, Kevin Knight, Tata McGraw-Hill Edition.
2. Russell, S., & Norvig, P. Artificial intelligence: a modern approach. Third Edition. Pearson new international edition. 2014.

VI. Co-Curricular Activities:

a) **Mandatory:** (Training of students by teacher on field related skills: 15 hrs)

1. **For Teacher**: Training of students by teacher in laboratory for a total of 15 hours on familiarity of required software tools, installation procedure, preparation of programs, maintaining of observation books.

2. **For Student**: Individual visit to a laboratory in a university/research organization/private sector and study of required technology, tools and its usage. Submission of a hand-written analysis Report not exceeding 10 pages in the given format.

3. Max marks for analysis Report: 05.

4. Suggested Format for analysis work: Title page, student details, content page, introduction, work done, findings, conclusions and acknowledgements.

5. Unit tests (IE).

b) **Suggested Co-Curricular Activities**

1. Training of students by related industrial experts.

2. Assignments (including technical assignments like identifying various software tools in used in laboratory and their applications.

3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).

4. Preparation of videos on tools and techniques in related field.

5. Collection of material/installation procedure/various operational methods related to relevant area and organizing them in a systematic way in a file.

6. Visits to local universities and research organizations etc.

7. Invited lectures and presentations on related topics by teaching professionals and industrial experts.

VII. Suggested Question Paper Pattern

B. Sc DEGREE EXAMINATION

SEMESTER –V

Course 7A: AI Concepts and Techniques

Time:3Hrs **Max.marks:70**

SECTION A (Total: 10 Marks)

Very Short Answer Questions (10 Marks : 5 x2)

1	What is AI Technique?
2	Define State space search
3	Explain Generate and test
4	What is heuristic search technique?
5	What is resolution?

SECTION B (Total: 4x5=20 Marks)

(Answer any four questions. Each answer carries 5 marks.

1.	Describe the Hill climbing.
2.	Explain the state space representation of Water – Jug problem.
3.	Describe the approaches to Knowledge Representation and explain the Issues in Knowledge Representation
4.	Differentiate between Forward Vs Backward Reasoning
5.	Explain the implementation of BFS
6.	Explain Uncertainty implementation issues
7.	Explain Bayes Theorem
8.	Define Dempster-Shafer Theory.

SECTION C(Total: 4x10 = 40 Marks)

(Answer any four questions. Each answer carries 10 marks.

1.	Define Artificial Intelligence. Applications and characteristics of AI.
2.	Define Heuristic search? What are the advantages of Heuristic search?
3.	What is predicate logic? Explain the predicate logic representation with reference to suitable example.
4.	Explain the Issues in Knowledge Representation. Write notes on control knowledge.
5.	Explain logics for non-monotonic reasoning and discuss the implementation issues.
6.	Explain Procedural Vs Declarative knowledge