Lok Jagruti Kendra University
University with a Difference

Diploma in Cloud Computing & Big Data

LJ Polytechnic

Course Code: 025100508

Fundamentals of AI

Programme / Branch Name			Diploma in Cloud Computing & Big Data			
Course Name	Fundamentals of AI				**Course Code**	025100508
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week / Credits				**Evaluation Scheme**			
L	**T**	**P**	**Total Credit**	**CCE**	**SEE (Th)**	**SEE (Pr)**	**TOTAL**
3	0	4	5	50	50	50	150

Legends:
L: Lectures T: Tutorial P: Practical
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisites

- ✓ Basic knowledge of programming
- ✓ Basic knowledge of data structures and mathematics.

3. Rationale

With the use of internet and World Wide Web increasing day by day, the field of AI and its techniques are being applied in many areas that directly affect human life. Various techniques for encoding knowledge in computer systems such as predicate logic, production rules, semantic networks find applications in real world problems. Areas of AI such as Game Playing, Natural Language Processing, and Connectionist Models are also important. Student should know some programming language for AI.

4. Objectives

- ✓ The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.
  - To review and strengthen important mathematical concepts required for AI & ML.
  - Introduce the concept of learning patterns from data and develop a strong theoretical foundation for understanding state of the art Machine Learning algorithms.

5. Contents

Unit No.	Topics	Sub-Topics	Learning Outcomes	% Weightage	Hours
1	**Introduction to AI**	1.1.Introduction 1.2.Applications and History of AI 1.3.The AI Risks and Benefits 1.4.Agents and Environments 1.5.Problems, Problem spaces 1.6.Production Systems, Production Characteristics 1.7.Knowledge Representation 1.8.Propositional Logic, Predicate logic 1.9.Reasoning	• Understand what is Artificial Intelligence • Understand and use different types of knowledge and logic representation schemes	30	12
2	**Search Techniques**	2.1.Issues in the Design of Search Programs 2.2.Uniformed search techniques (Best-First Search, Depth-First search) 2.3.Heuristic search techniques (Generate-And-Test, Hill Climbing, A* algorithm) 2.4.Adversarial search techniques (Game playing, MINIMAX algorithm)	• Understand the search technique procedures applied to real world problems • Understand Game Playing technique and apply to programs	20	7
3	**Inference Techniques**	3.1.Propositional Logic 3.2.First-order logic 3.3.Representing knowledge using rules 3.4.Procedure versus Declarative knowledge 3.5.Forward versus Backward Reasoning	• Understand various inference techniques • Understand various logic types and how to apply them	20	9
4	**Libraries and Datasets**	4.1.Jupyter Installation and Use 4.2.Datasets: Kaggle 4.3.Python Libraries: NumPy, Pandas, Matplotlib.	• Learn to install Jupyter notebook and how to use it • Understand the basics of datasets and libraries required for Machine Learning	15	6

5	**Data Analysis and Processing**	5.1.Introduction to Data Analysis and Visualization 5.2.Types of data (numerical, categorical, text) 5.3.Introduction to Data Preprocessing 5.4.Handling Missing Values 5.5.Handling Outliers and Inconsistencies	• To understand of types of data • To learn about structure and quality of data • An understanding about data preprocessing and its techniques	15	8
				Total Hours	**42**

6. List of Practicals / Exercises

The practical/exercises should be properly designed and implemented in an attempt to develop different types of skills so that students can acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

Sr. No.	Practical / Exercises	Key Competency	Hours
1	Write a program to implement Tic-Tac-Toe game problem.	To improve strategy and cognitive skills.	4
2	Write a program to implement BFS (Water Jug problem or any AI search problem).	To understand BFS and Water Jug problem.	4
3	Write a program to solve Missionaries and Cannibals problem.	To understand Missionaries and Cannibals problem.	4
4	Write a program to implement DFS.	To solve any problem using DFS.	4
5	Write a program to solve Hill Climbing problem.	To understand Hill Climbing problem.	2
6	Write a program to implement Single Player Game (Using Heuristic Function).	To improve logical skills of students.	4
7	Write a program to implement A* algorithm.	To understand how to implement A* algorithm.	4
8	Write a program to solve Tower of Hanoi problem.	To understand how to solve Tower of Hanoi problem.	2
9	Write a program to solve N-Queens problem.	To understand and solve N-Queens problem.	2
10	Write a program to solve 8-puzzle problem.	To understand how to solve 8-puzzle problem.	2
11	Write a program to solve travelling salesman problem.	To understand travelling salesman problem.	2

12	Explore the NumPy, Pandas library and implement various operations. • Data Processing using various statistical technique (Numpy library) • Preparing data using data frame and apply statistical techniques (Pandas library)	To improve skills for data operations.	6
13	Explore the Matplotlib library and implement various visualization based operations. • Bar plot • Scatter plot • Pie plot	To improve skills for data visualization and data abstraction.	6
14	Choose any one dataset from Kaggle and implement pre-processing tasks. • Data profiling • Data cleansing • Data reduction • Data transformation • Data enrichment • Data validation	To improve skills for the data cleaning and another various data preprocessing techniques.	6
15	Implement data pre-processing and data visualization on built-in dataset from Scikit-learn and implement simple Machine Learning algorithm.	To improve skills for all preprocessing tasks, statistical tasks and apply Machine Learning algorithm on data.	4
		Total Hours	**56**

7. Suggested Specification Table with Hours

Unit No.	Chapter Name	Teaching Hours	Distribution of Topics According to Bloom's Taxonomy					
			R %	U %	App %	C %	E %	An %
1	Introduction to AI	12	40	30	20	-	5	5
2	Searching Techniques	7	30	30	20	-	10	10
3	Inference Techniques	9	20	30	30	-	10	10
4	Libraries and Datasets	6	20	20	20	10	15	15
5	Data Analysis and Processing	8	20	20	30	10	10	10

Legends: R: Remembering U: Understanding
App: Applying C: Creating
E: Evaluating An: Analyzing

8. Textbooks

1) Artificial Intelligence: A Modern Approach, Stuart Russel, Peter Norvig, PHI.
2) Python for Data Analysis, Wes McKinney, O'Reilly Media

9. Reference Books

1) Artificial Intelligence: A new Synthesis, Nilsson. J. Nils, Harcourt Asia Pvt. Ltd., 2000
2) Artificial Intelligence, Elaine Rich And Kevin Knight (2nd Edition), Tata McGraw-Hill

10. Open Sources (Website, Video, Movie)

1) https://nptel.ac.in/courses/106/105/106105077/
2) http://www.journals.elsevier.com/artificial-intelligence/
3) https://www.nltk.org/#natural-language-toolkit
4) https://pandas.pydata.org
5) https://numpy.org