VISHNU INSTITUTE OF TECHNOLOGY

(AUTONOMOUS) VISHNUPUR, BHIMAVARAM – 534 202



**STUDENT NOTEBOOK**

## II B.Tech II Sem :: 2022 - 23

**Introduction to Artificial Intelligence and Data Science**

Established by

## SRI VISHNU EDUCATIONAL SOCIETY

153, Sita Nilayam, Dwarakapuri Colony, Punjagutta,

**HYDERABAD – 500 082. Ph. No. 040 - 23352916**

# VISION AND MISSION OF THE INSTITUTE

**VISION**

To empower the students through Academic excellence and Ethics so as to bring about social transformation and prosperity.

# MISSION

1. To expand the frontiers of knowledge through quality education.
2. To provide value added Research and development.
3. To embody a spirit of excellence in Teaching, Creativity, Entrepreneurship and Outreach.
4. To provide a platform for synergy of Academy, Industry and Community.
5. To inculcate high standards of Ethical and Professional behavior.

# COURSE STRUCTURE

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **II YEAR II SEMESTER** | | | | | | | | |
| **S.No** | **Category** | **Subjects** | **L** | **T** | **P** | **C** | **I** | **E** |
| 1 | PC | Software Engineering | 3 | 0 | 0 | 3 | 30 | 70 |
| 2 | PC | Data Warehousing and Mining | 3 | 0 | 0 | 3 | 30 | 70 |
| 3 | PC | Operating Systems | 3 | 0 | 0 | 3 | 30 | 70 |
| 4 | PC | Introduction to Artificial Intelligence & Data Science | 3 | 0 | 0 | 3 | 30 | 70 |
| 5 | HS | Universal Human Values | 3 | 0 | 0 | 3 | 30 | 70 |
| 6 | PC Lab | Data Mining Lab using Python | 0 | 0 | 3 | 1.5 | 15 | 35 |
| 7 | PC Lab | Introduction to Artificial Intelligence & Data Science Lab | 0 | 0 | 3 | 1.5 | 15 | 35 |
| 8 | PC Lab | Operating Systems Lab | 0 | 0 | 3 | 1.5 | 15 | 35 |
| 9 | SO | 1. Animations - 3D Animation 2. Web Application Development using Full Stack Module - II | 0 | 0 | 4 | 2 | -- | 50 |
| 10 | MC | Critical Reading and Creative Writing | 2 | 0 | 0 | 0 |  |  |
|  | **Total Credits** | | | | | **21.**  **5** | **19**  **5** | **50**  **5** |
|  | **Total Marks** | | | | | | **700** | |

**FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

**Course Objectives:**

* To provide a strong foundation of fundamental concepts in Artificial Intelligence.
* To provide a basic exposition to the goals and methods of Artificial Intelligence.
* To provide fundamentals of Data Science

**Syllabus**

**UNIT I**

**Introduction:** What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

**UNIT II**

**Problem Solving:** Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions.

**UNIT III**

**Knowledge Representation:** Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, The Internet Shopping World.

**UNIT IV**

**What is Data science?** Datafication, Exploratory Data Analysis, The Data science process, A data scientist role in this process.

**NumPy Basics:** The NumPy ndarray: A Multidimensional Array Object, Creating ndarrays ,Data Types for ndarrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Boolean Indexing, Fancy Indexing, Data Processing Using Arrays, Expressing Conditional Logic as Array Operations, Methods for Boolean Arrays , Sorting , Unique.

**UNIT V**

**Getting Started with pandas:** Introduction to pandas, Library Architecture, Features, Applications, Data Structures, Series, DataFrame, Index Objects, Essential Functionality Reindexing, Dropping entries from an axis, Indexing, selection, and filtering),Sorting and ranking, Summarizing and Computing Descriptive Statistics, Unique Values, Value Counts, Handling Missing Data, filtering out missing data.

**Text Books:**

1) Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach” , 3rd Edition,

Prentice Hall

2) Wes McKinney, “Python for Data Analysis”,O’REILLY, ISBN:978-1-449-31979-3, 1st

edition, October 2012.

3) Rachel Schutt & O’neil, “Doing Data Science”, O’REILLY, ISBN:978-1-449-35865-5, 1st

edition, October 2013.

**Reference Books:**

1) Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011

2) Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill

3) David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational

Agents”, Cambridge University Press 2010.

4) Trivedi, M.C., “A Classical Approach to Artificial Intelligence”, Khanna Publishing House,

Delhi.

5) Joel Grus, “Data Science from Scratch: First Principles with Python”, O’Reilly Media, 2015

6) Matt Harrison, “Learning the Pandas Library: Python Tools for Data Munging, Analysis, and

Visualization , O'Reilly, 2016.

**Web Resources:**

1) https://nptel.ac.in/courses/106105077

2) https://nptel.ac.in/courses/106106126

3) https://aima.cs.berkeley.edu

4) https://ai.berkeley,edu/project\_overview.html

**Course Outcomes:**

Upon successful completion of the course, the student will be able to: \

* Enumerate the history and foundations of Artificial Intelligence
* Apply the basic principles of AI in problem solving
* Choose the appropriate representation of Knowledge
* Enumerate the fundamentals of data science and NumPy .
* Summarize and compute descriptive statistics using pandas.

**Lesson Plan**

**Class: II B.tech Branch: AI&DS**

**Subject: Fundamentals of Machine Learning and Data Science Academic Year: 2022-23**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.N**  **O** | **Name of the Topic** | **No. of Classes** | **Text / Ref / Other Books with Page No.** |
| 1 | What is AI? | 1 | T1 CH:1  1.1 to 1.4 |
| 2 | Foundations of AI | 2 |
| 3 | The History of AI | 1 |
| 4 | The state of the Art | 2 |
| 5 | Agents and Environments | 2 | T1 CH:2  2.1 to 2.4 |
| 6 | Good Behavior : The concept of Rationality | 2 |
| 7 | The Nature of Environments | 1 |
| 8 | The structure of Agents | 1 |
|  | Total number of classes | 12 |  |
| 9 | Problem Solving Agents | 2 | T1 CH:3  3.1 to 3.6 |
| 10 | Example Problems | 2 |
| 11 | Searching for Solutions | 2 |
| 12 | Uninformed Search Strategies | 2 |
| 13 | Informed Search Strategies | 2 |
| 14 | Local Search Algorithms and Optimization Problems | 2 | T1 CH:4 4.1,4.3 |
| 15 | Searching with Non deterministic Actions | 2 |
|  | Total number of classes | 14 |  |
| 16 | Knowledge Representation : Knowledge Based Agents | 2 | T1 CH:7  7.1 to 7.4 |
| 17 | Logic | 1 |
| 18 | Propositional Logic : A Very Simple Logic | 2 |
| 19 | Ontological Engineering | 1 | T1 CH:12  12.1 to 12.7 |
| 20 | Categories and Objects | 2 |
| 21 | Events | 2 |
| 22 | Mental Events and Mental Objects | 1 |
| 23 | Reasoning Systems for Categories | 2 |  |
| 24 | The Internet Shopping World | 2 |  |
|  | Total number of classes | 15 |  |
| 25 | What is Data science?Datafication, Exploratory Data Analysis, | 2 | T3 CH1 |
| 26 | The Data science process, A data scientist's role in this process. | 2 |  |
| 27 | NumPy Basics:The NumPy ndarray: A Multidimensional Array Object, | 2 | T2 CH:4  Page 80-102 |
| 28 | Creating ndarrays ,Data Types for ndarrays, | 2 |  |
| 29 | Operations between Arrays and Scalars, Basic Indexing and Slicing, Boolean Indexing, Fancy Indexing, | 2 |  |
| 30 | Data Processing Using Arrays | 3 |  |
| 31 | Expressing Conditional Logic as Array Operations, Methods for Boolean Arrays , Sorting , Unique. | 3 |  |
|  | Total number of classes | 16 |  |
| 32 | Getting started with pandas: Introduction to pandas, Library Architecture, Features, Applications | 2 | T2 CH:5 Page 111-145 |
| 33 | Data Structures, Series, Data Frame, Index Objects, | 2 |  |
| 34 | Essential Functionality Reindexing, Dropping entries from an axis, Indexing, selection, and filtering), | 2 |  |
| 35 | Sorting and ranking, Summarizing and Computing | 2 |  |
| 36 | Descriptive Statistics, Unique Values, Value Counts, | 2 |  |
| 37 | Handling Missing Data, filtering out missing data. | 2 |  |
|  | Total number of classes | 12 |  |

**Question Bank:**

**UNIT I:**

1. What is AI? Explain the scope and importance of AI.
2. Explain various types of Agents and Environments in AI.
3. Explain the concept of Rationality.
4. Explain the structure of Agents.
5. Explain the nature of various environments in AI?

**UNIT II:**

1. How problem characteristics help in the selection of AI Technique? Explain.
2. What are Heuristics? What is their importance ?
3. Explain The Travelling salesman problem and its solution.
4. Explain the Breadth First Search Technique With An Example.
5. Explain the Depth First Search Technique With An Example.

**UNIT III:**

1. Explain various approaches and properties of knowledge representation.
2. Write Various Knowledge Representation Issues.
3. Explain The Concept Of Propositional Logic.
4. What Is Ontological Engineering? Explain.
5. Explain about Mental events and Mental Objects.
6. Explain how to use the Reasoning system for categories.

**UNIT IV:**

1. What is Data Science? What skills are needed for a data scientist.
2. Write about Data Science and explain the term Datafication?
3. With a neat sketch, explain “the data science process”.
4. What is ndarray? List out different ways to create ndarrays with examples.
5. What are different data types supported for ndarray?
6. Illustrate basic array statistical methods in numpy.

**UNIT V:**

1. Define Data Frame? Demonstrate various ways of creating Data Frames?
2. Elaborate ‘reindexing’ on Series and Data Frame with example code. Also list the reindex function arguments.
3. List and describe various Descriptive and Summary Statistics. Also demonstrate any three of them with example code?
4. Define Sorting and Ranking. Explain how sorting and running is done using Pandas.
5. Explain the process of indexing, selecting and filtering in Pandas Data Frame
6. Write about Sorting and Ranking on Series and Data Frame?
7. What is Series in Pandas? What are the operations on Series in Pandas? How to create a series from dict in Python?
8. List and describe various Descriptive and Summary Statistics. Also demonstrate any three of them with example code?