|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **Teaching Scheme (Contact Hours)** | | | **Credits Assigned** | | | |
|  |  | Theory | Practical | Tutorial | Theory | Practical & Oral | Tutorial | Total |
| ITL701 | Data Science Lab | -- | 2 | -- | -- | 1 | -- | 01 |

| Subject Code | Subject Name | Examination Scheme | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Theory Marks | | | | Term Work | Practical/  Oral | Total |
| Internal assessment | | | End Sem. Exam |
| Test1 | Test 2 | Avg. of 2 Tests |
| ITL701 | Data Science Lab | -- | -- | -- | -- | 25 | 25 | 50 |

**Lab Objectives:**

1. To apply reasoning for a problem in an uncertain domain.
2. To discuss the solution after building a Cognitive application.
3. To familiarize the students with the basics of Fuzzy Logic and Fuzzy Systems.
4. To familiarize the students with Learning Architectures and Frameworks.
5. To define and apply metrics to measure the performance of various learning algorithms**.**
6. To enable students to analyze data science methods for real world problems.

**Lab Outcomes:**

1. Implement reasoning with uncertainty.
2. Explore use cases of Cognitive Computing
3. Implement a fuzzy controller system.
4. Develop real life applications using learning concepts.
5. Evaluate performance of applications.
6. Implement and analyze applications based on current trends in Data Science.

**Prerequisite:** Artificial Intelligence and Data Science-I, Python Programming, Data Mining & Business Intelligence.

**DETAILED SYLLABUS:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sr. No.** | **Module** | **Detailed Content** | **Hours** | **LO Mapping** | **BTL** | **References** |
| I | Uncertainty in AI | 1. Implement Inferencing with Bayesian Network in Python | 02 | LO1 | Apply | <https://colab.research.google.com/drive/1ZvtaLqPhzZtx5Vjt1UKiWdRlQttHI-M6?usp=sharing> |
| II | Cognitive Computing | 1. Building a Cognitive Healthcare application 2. Smarter cities: Cognitive Computing in Government 3. Cognitive computing in Insurance 4. Cognitive computing in Customer Service | 04 | LO2 | Understand | T2-Chapter 11,12  Online References-1,3,4,5 |
| III | Fuzzy Logic & Its Applications | 1. Implementation of Fuzzy Membership Functions. 2. Implementation of fuzzy set Properties. 3. Design of a Fuzzy control system using Fuzzy tool. | 04 | LO3 | Apply | 6. <https://drive.google.com/file/d/1MVwbyXqlMSeb-25CSQ9WAAxais9LLqhO/view?usp=sharing>  7. <https://drive.google.com/file/d/1WOtOWkaN9Ixi7HnzFyjn7zEegeS3p1DI/view?usp=sharing>  8. <https://drive.google.com/file/d/1VzQtNxZlRWOUuS08wtH-iyWUT9SwlIsl/view?usp=sharing> |
| IV | Introduction to Deep Learning | 1. Implementing Deep Learning Applications like    1. Image Classification System    2. Handwritten Digit Recognition System (like MNIST Dataset)    3. Traffic Signs Recognition System.    4. Image Caption Generator | 06 | LO4 | Apply | 1. <https://stackabuse.com/image-recognition-in-python-with-tensorflow-and-keras/>   <https://towardsdatascience.com/image-recognition-with-machine-learning-on-python-convolutional-neural-network-363073020588>   1. <https://machinelearningmastery.com/handwritten-digit-recognition-using-convolutional-neural-networks-python-keras/> 2. <https://www.analyticsvidhya.com/blog/2021/12/traffic-signs-recognition-using-cnn-and-keras-in-python/> 3. <https://www.geeksforgeeks.org/image-captioning-using-python/> |
| V | Advanced ML Classification Techniques | 1. Implementation of supervised learning algorithm like    1. Ada-Boosting    2. Random forests 2. Evaluation of Classification Algorithms. | 04 | LO4,LO5 | Apply  Evaluate | <https://scikit-learn.org/stable/modules/classes.html#module-sklearn.ensemble>  <https://scikit-learn.org/stable/modules/cross_validation.html> |
| VI | Mini-project on trends and applications in Data Science | 1. Build text/ image/ video/ audio based DS Applications such as    1. Chatbot    2. Document Classification    3. Sentiment Analysis    4. Bounding Box Detection    5. Music/Video Genre Classification | 04 | LO6 | Create | <https://colab.research.google.com/drive/1gzEQly3UxztB7R3qNd1B9h_nxzVXYmOA?usp=sharing> |

**Text Books:**

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, Third Edition, Pearson Education.
2. Judith S. Hurwitz, Marcia Kaufman, Adrian Bowles, “Cognitive Computing and Big Data Analytics”, Wiley India, 2015.
3. S.N. Sivanandam, S.N. Deepa, “Principles of Soft Computing”, Wiley Publication.
4. Dr. S Lovelyn Rose, Dr. L Ashok Kumar, Dr. D Karthika Renuka, “Deep Learning Using Python”, Wiley India, 2020.
5. B. Uma Maheshwari, R. Sujatha, “Introduction to Data Science Practical Approach with R and Python”, Wiley India, 2021.
6. François Chollet, “Deep Learning with Python”, Manning Publications, 2018.
7. Han J, Kamber M, Pei J, “Data Mining Concepts and Techniques”, Third Edition, Morgan Kaufmann.

**References:**

1. Deepak Khemani, “A First Course in Artificial Intelligence”, McGraw Hill Publication.
2. Ethem Alpaydin , “Introduction to Machine Learning”, PHI Learning Pvt. Ltd.
3. Jon Krohn, Grant Beyleveld, Aglae Bassens, “Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence”, Pearson Education.
4. Prateek Joshi, “Artificial Intelligence with Python”, Packt Publishing.

**Online References:**

|  |  |
| --- | --- |
| Sr. No. | Website Links |
| 1 | <https://wisdomplexus.com/blogs/cognitive-computing-examples/> |
| 2 | <http://vlabs.iitb.ac.in/vlabs-dev/labs/machine_learning_old/labs/explist.php> |
| 3 | <https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01329517021676339249401_shared/overview> |
| 4 | <https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01329500219268300841860_shared/overview> |
| 5 | <https://www.udemy.com/course/ibm-watson-for-artificial-intelligence-cognitive-computing/> |

**Term Work:**

Term Work shall consist of at least 10 practical based on the above list. Also Term Work Journal must include at least 2 assignments as mentioned in above syllabus.

Term Work Marks: 25 Marks (Total marks) = 10 Marks (Experiments) + 10 Marks (Mini-project) + 5 Marks (Attendance)

Oral Exam: An Oral exam will be held based on the above syllabus.