CSE11055	Application of Machine Learning in Industries and Anomaly Detection	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisite/Exposure	Basic Programming Skills, Statistics and Probability, Introduction to Machine Learning, Basic Knowledge of Databases				
Co-requisite	Logical Ability				

Course Objectives:

1. Equip students with knowledge and skills to apply machine learning techniques in industrial settings and detect anomalies.
2. Cover the entire machine learning project lifecycle, including problem understanding, data processing, and model training and evaluation.
3. Provide hands-on experience with popular AI platforms and tools, and explore industrial applications of machine learning and anomaly detection.

Course Outcomes:

1. Understand the fundamental steps in a machine learning project, including problem analysis, data preparation, and model training/testing.
2. Utilize major AI platforms such as AWS, Google Cloud AI, Microsoft Azure Learning Studio, and IBM Watson, and apply modern AI tools like TensorFlow and RapidMiner.
3. Implement machine learning solutions for various industrial applications, performing data sourcing, feature extraction, and model development.
4. Apply different statistical and machine learning methods for anomaly detection, including statistical outlier tests, distance-based methods, and isolation forests.
5. Evaluate and compare the performance of anomaly detection models in practical scenarios such as credit card fraud, fake news detection, and applications in insurance and healthcare.

Course Description:

This course provides an in-depth exploration of the application of machine learning in industrial contexts and anomaly detection. It starts with an introduction to machine learning projects, covering problem understanding, data processing, and model training/testing. The course then introduces students to popular AI platforms and tools, providing hands-on experience. Students will learn to apply machine learning in various industries through case studies and practical examples. The latter part of

the course focuses on anomaly detection, discussing statistical methods, distance-based approaches, and advanced techniques like isolation forests. Real-world applications of these techniques will be examined in detail.

Course Content:

Units	Lecture Hours
UNIT-I: MACHINE LEARNING PROJECT OVERVIEW • Understanding machine learning problems • Processing datasets • Overview of ML projects • Case study on ML algorithms: analysing problem requirements, dataset preparation, training, and testing	**9**
UNIT-II: AI PLATFORMS AND TOOLS • Overview of popular AI platforms: AWS, Google Cloud AI, Microsoft Azure Learning Studio, IBM Watson • Hands-on learning with AI tools: Google's TensorFlow, Deep Learning with RapidMiner	**9**
UNIT-III: APPLICATION OF ML IN INDUSTRIES • Data sourcing and feature extraction • Understanding taxonomies and relationships • Modelling process • Real-world case problems: prediction, detection, and estimation	**9**
UNIT IV: ANOMALY DETECTION I: • Different aspects of anomaly detection • Statistical outlier detection: Grubb's test • Anomalies in time series • Distance and density-based anomaly detection: KNN distance, Local Outlier Factor (LOF), LOF calculation and visualization	**9**

<u>Unit V: Anomaly Detection II</u> • Isolation Forest • Visualizing isolation score • Comparing performance: labeled anomalies, measuring performance • Applications: credit card fraud detection, fake news detection, insurance, healthcare	**9**