Subject Code	Subject Name (Lab Oriented Theory Course)	Category	L	T	P	C
AI23631	PREDICTIVE AND PRESCRIPTIVE ANALYTICS	PC	3	0	2	4

Objectives:	
•	To introduce the fundamental concepts of predictive analytics.
•	To determine if current and historical data patterns are likely to emerge again.
•	To impart the knowledge on various steps those are necessary before constructing the predictive model.
•	To gain knowledge on the assessment of prescriptive models for decision making.
•	Help organizations allocate resources more efficiently by making informed prescriptive about where they will be most effective.

UNIT-I	INTRODUCTION TO PREDICTIVE ANALYTICS	9
Introduction to Analytics – Predictive Analytics – Parametric vs. Non-Parametric Models -Business Intelligence – Predictive Analytics vs. Business Intelligence – Predictive Analytics vs. Statistics – Predictive Analytics vs. Data Mining – Challenges in using Predictive Analytics.		
UNIT-II	**THE PREDICTIVE ANALYTICS PROCESS**	**9**
Predictive Analytic process, Technical requirements, Data Exploration, Information based learning: Decision trees, Shannons Entropy Model, Information Gain,ID3 Algorithm, Tree Pruning, EDA.		
UNIT-III	**PREDICTIVE DATA ANALYTICS**	**9**
Similarity Based Learning: Nearest Neighbour Algorithm, Handling Noisy Data, Data Normalization, Feature Selection, Probability based learning: Bayes Theorem, Bayesian Prediction, Smoothing, Probability Density function, Binning, Error based learning: Linear Regression, Gradient Descent.		
UNIT-IV	**PRESCRIPTIVE ANALYTICS – GRADIENT DESCENT**	**9**
Introduction to Prescriptive Analytics – Gradient Descent fundamentals - Stochastic Gradient descent regression - Forecasting fundamentals - Forecasting techniques : ARIMA		
UNIT-V	**PRESCRIPTIVE ANALYTICS – OPTIMIZATION AND OPTIMAL DECISION**	**9**
Common problem types for LP Solution- Types of Optimization Models - Linear Programming for Optimization - Transportation Problem - Network models - Heuristics Optimization with Genetic Algorithm.		
	Contact Hours : 45	

List of Experiments		
1	Clustering based data analytics using R/Python. (K-Means, SOM algorithms)	
2	Demonstrate the statistics for a sample data like mean, standard deviation, normal/uniform distribution, variance and correlation.	
3	Demonstrate missing value analysis, fixing missing values and outlier analysis in dataset	
4	Demonstrate data visualization, histograms and multiple variable summaries	
5	Demonstrate transformation, scaling, binning, fixing skewed values and sampling.	
6	Demonstration of Apriori algorithm on transaction dataset to find association rules.	
7	Demonstration of Linear and Logistic regression using various domain datasets.	
8	Demonstration of predictive models such as Decision Tree, Neural network and K-Nearest Neighbor using various domain datasets.	
9	Demonstration of Temporal Mining Techniques	
10	Demonstration of predictive analytics to analysis microarray data	
	Contact Hours	**45**
	Total Contact Hours	**75**

Course Outcomes: On completion of the course, the students will be able to	
•	Develop a foundational understanding of predictive modelling and its applications.
•	Apply regression and classification techniques to real-world problems
•	Gain expertise in using Support Vector Machines and Neural Networks for predictive analytics.
•	Analysing prescriptive modelling techniques for the given data.
•	Assess and interpret different prescriptive models for optimization problem.

Text Books:	
1	Nooruddin Abbas Ali, "Predictive Analytics for the Modern Enterprise: A Practitioner's Guide to Designing and Implementing Solutions", O'Reilly Media Publications, first Edition, May 2024.
2	Richard Hurley, "Predictive Analytics: The Secret to Predicting Future Events Using Big Data and Data Science Techniques Such as Data Mining, Predictive Modelling, Statistics, Data Analysis, and Machine Learning" Ationa publications, February 2020.
3	Prescriptive Analytics: Prescribe with Python: The Definitive Prescriptive Analytics Python Guide, First Edition,2023
4	Walter R. Paczkowski , "Hands-On Prescriptive Analytics: Optimizing Your Decision Making with Python", First Edition,2024

Reference Books:	
1	Daniel Vaughan, Analytical Skills for AI and Data Science: Building Skills for an AI-Driven Enterprise, O'Reilly Media, 1st Edition, April 2021.
2	Eric Siegel, The AI-Powered Enterprise: Harnessing the Power of Machine Learning to Lead with Confidence and Transform Your Business, McGraw-Hill Education, 1st Edition, February 2022.
3	Eric Siegel, Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die, John Wiley & Sons Inc. Publishers, Second edition, 2016.
4	Dursun Delen, "Prescriptive Analytics: The Final Frontier for Evidence-Based Management and Optimal Decision Making" First Edition 2024
5	Dean Abbott, Applied Predictive Analytics: Principles and Techniques for the professional Data Analyst, John Wiley & Sons Inc. Publishers, First edition, 2014.