INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

PREDICTIVE DATA ANALYTICS								
VI Semester: CSE(DS) | CSE (AI&ML)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
ACDD17	**Elective**	3	0	0	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Prerequisites: Basic knowledge of statistics, programming, data structures, and databases.								

I. COURSE OVERVIEW:

Predictive data analytics is the art of building and using models that make predictions based on patterns extracted from historical data. Analytics is the process of transforming data into insight for making better decisions (INFORMS). There are three primary types of analytics: "Descriptive," which examines historical data and identifies and reports historical patterns and trends; "Predictive," which predicts outcomes and future trends from existing data to help discover new relationships; "Prescriptive," which formulates and evaluates new ways for a business to operate. This course focuses on the second type, Predictive Analytics, which is of particular importance for business because it helps decision makers evaluate possible.

II. COURSE OBJECTIVES:

The students will try to learn:

I. The fundamental concepts and techniques used in predictive analytics, including data preparation, model selection, and validation.
II. The role of statistical and machine learning methods in discovering patterns and making predictions from historical data.
III. How predictive models are applied in real-world scenarios such as marketing, finance, healthcare, and operations.
IV. The ethical considerations, limitations, and challenges involved in building and deploying predictive analytics solutions.

III. COURSE OUTCOMES:

CO1 **Describe** the fundamental principles and frameworks of predictive data analytics. *(Level: Remember/Understand)*.
CO2 **Preprocess** and **transform** data for effective model building and analysis. *(Level: Apply)*
CO3 **Select** appropriate statistical and machine learning algorithms for predictive modeling tasks. (Level: Analyze)
CO4 **Build** and **train** predictive models using tools such as Python, R, or other analytics platforms. (Level: Apply/Create)
CO5 **Evaluate** model performance using metrics such as accuracy, precision, recall, and ROC curves. (Level: Evaluate)
CO6 **Develop** predictive solutions for real-world problems in domains like marketing, healthcare, and finance. (Level: Create)

IV. COURSE CONTENT:

MODULE – I: MACHINE LEARNING FOR PREDICTIVE DATA ANALYTICS (09)
Introduction to Predictive Data Analytics, Predictive Data Analytics project life cycle CRISP-DM, Predictive Data Analytics Tools, Data to insights to Decisions, Accessing Feasibility, Designing the Analytics Base Table and case study.

MODULE – II: DATA TO INSIGHTS TO DECISION (09)
Designing and Implementing Features, The Normal Distribution and Case Study, Handling Data Quality Issues, Identifying Data Quality issues, Advanced Data Exploration, Data Preparation, Case Study.

MODULE – III: INFORMATION BASED LEARNING (12)
Big Idea, Fundamentals, Decision Trees, Shannon Entropy Model, Information Gain, The ID3 Algorithm, Extensions and Variations.

Similarity Based Learning, Big Idea and Fundamentals, The Nearest Neighbor Algorithm with a Worked Example, Extensions and Variations.

MODULE – IV: PROBABILITY BASED LEARNING (09)
Fundamentals, Bayes Theorem, Bayesian Prediction, Conditional Independence and Factorization. The Naïve Bayes Model with an Example, Extensions and Variations, Continuous Features, Probability Density Function, Binning, Bayesian Networks

MODULE – V: ERROR BASED LEARNING (09)
Fundamentals, Simple Linear regression, Measuring Error, Error Surfaces, Multivariable Linear Regression with Gradient Decent with an Example, Extensions and Variations.

V. TEXTBOOKS:

1. John D. Kelleher, Brian Mac Namee, D'Arcy, "Fundamentals of Machine Learning for Predictive Data Analytics", The MIT Press Cambridge, Massachusetts London, England, 2015.
2. Finlay S, Palgrave," Predictive Analytics Data Mining and Big Data Myths Misconceptions and Methods", 2014.

VI. REFERENCE BOOKS:

1. BarberD," Bayesian reasoning and machine learning", Cambridge University Press, 2012.
2. Bertin, J," Semiology of Graphics: Diagrams, Networks, Map", ESRI Press, 2010.
3. Bishop CM, "Neural Networks for Pattern Recognition", Oxford University Press, 1996.
4. Daelemans, W. and A. van den Bosch," Memory-based Language Processing". Studies in natural language processing", Cambridge University Press, 2005.

VII. ELECTRONICS RESOURCES:

1. https://www.predictiveanalyticstoday.com/what-is-predictive-analytics/
2. https://www.educba.com/data-analytics-vs-predictive-analytics/
3. https://www.sisense.com/glossary/predictive-data-analytics/
4. https://www.omnisci.com/technical-glossary/predictive-analytics

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. PowerPoint presentation

11. E-Learning Readiness Videos (ELRV)