

COURSE TITLE	DATA ANALYTICS
COURSE CODE	01CA1312
COURSE CREDITS	3

Objective:

- 1 To understand the implementation of data mining in manufacturing

Course Outcomes: After completion of this course, student will be able to:

- 1 Apply knowledge of data and its structure to organize and manage datasets for analysis.
- 2 Analyze the significance of data analytics techniques in manufacturing applications.
- 3 Apply data collection and processing techniques for effective data handling.
- 4 Apply appropriate data analytics techniques to enhance manufacturing efficiency.
- 5 Evaluate data analytics techniques for improving product quality.

Pre-requisite of course: Basic concept of linear algebra, calculus, probability, Manufacturing Processes

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	Introduction to Data Analytics in Manufacturing Define data, Type of data, Importance of data in manufacturing, Use of data in manufacturing, Concept of data analyst, Various application of data analyst in manufacturing.	6
2	Data Collection and Processing of Data Various approach of data collection, Reduction in data, Processing of data, Selection of variables/parameters, Concept of principal component analysis, Factor analysis, Case study on any of above methods	6
3	Introduction to probability Definition of probability, Range of probability, Method of assigning probability, Classical probability, Relative frequency probability, Subjective probability, Probability terminology, Operation in probability, conditional probability, Contingency table,	6

Contents : Unit	Topics	Contact Hours
4	Probability Distribution Introduction, need of distribution, Concept of random distribution, PDF of random variable, Discrete distribution, Cumulative distribution function, expected value of random variable, Mean, Variance, Standard deviation, Properties of expected value and variance, Covariance Binomial, Poisson and Hyper geometric distribution, Uniform, Exponential and Normal Distribution.	6
5	Statistical Method for Data Analytics Sampling and sampling distribution, Distribution of sample means population and variance, confidence interval estimation, hypothesis testing ANOVA, Linear and multiple regression, Logistic regression, ROC, Clustering analysis, CART	5
6	Data Analytics in Manufacturing Data analytics for high quality and quick response manufacturing, Analyzing maintenance data mining method, Methodology of analytics Massive data set for improving manufacturing efficiency, Evaluation of sampling method for data analytics with fuzzy C Means, Fuzzy Neural Genetic Layered Multi agent reactive control, Method specific knowledge compilation	12
Total Hours		41

Textbook :

- 1 Data Mining: Practical Machine Learning Tools and Technique, Witten, Ian H. Morgan , Kaufmann Publishers, 2016
- 2 Concise Introduction to Machine Learning , Faul, A.C, CRC Press, 2018
- 3 Machine Learning , Mitchell, Tom M, McGraw Hill Education (India) Private Limited., 2019

References:

- 1 Data Analysis for Physical Scientists: featuring excel, Data Analysis for Physical Scientists: featuring excel, Kirkup, Les , Cambridge University Press, 2020
- 2 Statistics and Data Analysis: from elementary to intermediate , Statistics and Data Analysis: from elementary to intermediate , Tamhane, Ajit C, Prentice Hall, Inc., 2019
- 3 Data Mining Methods and Techniques, Data Mining Methods and Techniques, A B M Shawkat | Wasimi, Saleh , A Cengage Learning India Private Limited, 2016

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
15.00	20.00	30.00	30.00	5.00	0.00

Instructional Method:

- 1 Data Science for Engineer by Prof. Raghunathan Rengasamy IIT Madras
- 2 Data analytics with python by Prof. A Ramesh IIT Roorkee

Supplementary Resources:

- 1 1. <https://www.python.org/>
- 2 2. <https://colab.research.google.com/>
- 3 3. <https://www.iitk.ac.in/ee/data-mining-lab/>