



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

## COURSE CONTENT

| DATA ANALYTICS                                             |                       |                        |   |   |                   |               |     |       |
|------------------------------------------------------------|-----------------------|------------------------|---|---|-------------------|---------------|-----|-------|
| VII Semester: IT                                           |                       |                        |   |   |                   |               |     |       |
| Course Code                                                | Category              | Hours / Week           |   |   | Credits           | Maximum Marks |     |       |
| AITD21                                                     | Elective              | L                      | T | P | C                 | CIA           | SEE | Total |
|                                                            |                       | 3                      | - | - | 3                 | 40            | 60  | 100   |
| Contact Classes: 48                                        | Tutorial Classes: Nil | Practical Classes: Nil |   |   | Total Classes: 48 |               |     |       |
| Prerequisite: There is no prerequisite to take this course |                       |                        |   |   |                   |               |     |       |

### I. COURSE OVERVIEW:

The data analytics course is designed to provide students with a comprehensive understanding of the concepts, techniques, and tools used in analyzing and interpreting data. As data becomes an essential asset in decision-making, this course equips learners with the skills to extract meaningful insights and create value from data in various fields such as business, healthcare, finance, and technology.

### II. COURSE OBJECTIVES:

**The students will try to learn**

- I. The fundamental concepts of data analytics, data life cycle, and the role of analytics tools and technologies in solving real-world problems.
- II. Data preprocessing, cleaning, transformation, integration, and management techniques to prepare high-quality datasets for analysis.
- III. How to analyze and interpret data using statistical methods, exploratory data analysis (EDA), and machine learning algorithms to extract meaningful insights.
- IV. The effective data visualizations, dashboards, and analytical reports to communicate insights and support data-driven decision-making.

### III. COURSE OUTCOMES:

**At the end of the course, students should be able to:**

- CO1 Explain the fundamentals of data analytics, its types, applications, and the data analytics life cycle.
- CO2 Perform data collection, preprocessing, cleaning, transformation, and integration using appropriate tools and techniques.
- CO3 Apply statistical methods and exploratory data analysis techniques to summarize, interpret, and validate data.
- CO4 Build and evaluate basic supervised and unsupervised machine learning models using standard data analytics libraries.
- CO5 Create interactive visualizations, dashboards, and reports using Python, Tableau, and Power BI to effectively communicate analytical findings.
- CO6 Utilize data analytics tools and methodologies to solve real-world problems and support evidence-based decision-making in diverse application domains.

#### IV. COURSE CONTENT:

##### MODULE – I: INTRODUCTION TO DATA ANALYTICS (10)

Introduction to data analytics and its applications in various fields Types of Data Analytics: Descriptive, diagnostic, predictive, and prescriptive analytics.: Data generation, collection, storage, and processing. Tools and Technologies: Overview of popular tools like Excel, Python, R, SQL, and visualization tools such as Tableau and Power BI.

##### MODULE – II: DATA PREPROCESSING AND MANAGEMENT (09)

Types of data (structured, unstructured, semi-structured). Data Cleaning: Handling missing values, outliers, duplicates, and inconsistencies. Data Transformation: Normalization, standardization, encoding, and feature engineering. Data Integration and Storage: Basics of databases, data warehouses, and big data storage frameworks (e.g., Hadoop, Spark).

##### MODULE – III: STATISTICAL ANALYSIS AND DATA EXPLORATION (10)

Basics of Statistics: Mean, median, mode, variance, standard deviation, correlation, and regression. Exploratory Data Analysis (EDA): Techniques for summarizing and visualizing data distributions. Hypothesis Testing:

Concept of null and alternative hypotheses, p-values, t-tests, chi-square tests. Tools for Analysis: Practical implementation using Python (pandas, numpy, matplotlib, seaborn).

##### MODULE - IV MACHINE LEARNING FOR DATA ANALYTICS (10)

Supervised Learning: Linear regression, logistic regression, decision trees, random forests. Unsupervised Learning: Clustering (k-means, hierarchical), dimensionality reduction (PCA). Model Evaluation: Accuracy, precision, recall, F1 score, and ROC-AUC. Tools and Libraries: Scikit-learn, TensorFlow, Keras.

##### MODULE –V: DATA VISUALIZATION AND COMMUNICATION (09)

Principles of Data Visualization: Effective storytelling using data. Visualization Techniques: Bar charts, histograms, scatter plots, heatmaps, dashboards. Tools for Visualization: Hands-on with Tableau, Power BI, and Python libraries (matplotlib, seaborn, plotly).Communicating Insights: Crafting reports, presentations, and dashboards for decision-making.

#### V.TEXT BOOKS:

- 1 Peter Bruce and Andrew Bruce, “Practical Statistics for Data Scientists,” O'Reilly Media, 2nd Edition, 2020.
- 2 Thomas A. Runkler, “Data Analytics: Models and Algorithms for Intelligent Data Analysis,” Springer, 3rd Edition, 2020.

#### VI. REFERENCE BOOKS:

1. Foster Provost and Tom Fawcett, “Data Science for Business,” O'Reilly Media, California.
2. Wes McKinney, “Python for Data Analysis,” O'Reilly Media, California.Leslie, Mass Communication Ethics, Thomson Learning, 2004.
3. Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, “An Introduction to Statistical Learning,” Springer, New York.

#### VII. WEB REFERENCES:

1. <https://www.coursera.org/in/articles/data-analytics>
2. <https://www.investopedia.com/terms/d/data-analytics.asp>

#### VIII.MATERIALS ONLINE

- 1 Course template
- 2 Tech-talk topics
- 3 Assignments
- 4 Definition and terminology
- 5 Tutorial question bank
- 6 Model question paper – I
- 7 Model question paper – II
- 8 Lecture notes

9 Early lecture readiness videos (ELRV)

10. Power point presentations