

Foundations of Data Science

Course Description:

Foundations of Data Science for Management, introduces students to the fundamental concepts, techniques, and applications of data science in the context of business and management. The course covers topics such as data collection and pre-processing, exploratory data analysis, statistical inference, predictive modelling, and data-driven decision-making. Through a combination of theoretical lectures and practical exercises, students will develop the skills and knowledge necessary to analyse and interpret data to inform strategic business decisions.

Course Objectives:

Upon completion of this course, students will be able to:

Understand the basic principles and concepts of data science and its relevance to management.

Collect, pre-process, and explore datasets to extract meaningful insights.

Apply statistical techniques and models to analyse data and draw conclusions.

Develop predictive models to forecast future trends and outcomes.

Utilize data-driven approaches to support strategic decision-making in business.

Unit 1: Introduction to Data Science (6 hours, 10 Marks)

Definition and scope of data science

Role of data science in business and management

Overview of data lifecycle and data-driven decision-making

Pedagogy: Lectures, case studies, and discussions

Unit 2: Data Collection and Preprocessing (Theory - 2 hours, Practical - 6 hours; 10 Marks)

Data sources and types

Data acquisition and cleaning

Data transformation and feature engineering

Pedagogy: Hands-on exercises with data manipulation tools (e.g., Excel, Python)

Unit 3: Exploratory Data Analysis (Theory - 2 hours, Practical - 4 hours; 10 Marks)

Descriptive statistics and data visualization

Univariate and bivariate analysis

Exploratory data visualization techniques (e.g., histograms, scatter plots)

Pedagogy: Practical exercises using data visualization tools (e.g., Tableau, PowerBI)

Unit 4: Statistical Inference and Predictive Modelling (Theory - 2 hours, Practical - 6 hours, 10 Marks)

Statistical inference and hypothesis testing

Regression analysis and model building

Introduction to machine learning algorithms (e.g., decision trees, logistic regression)

Pedagogy: Lectures, demonstrations, and hands-on practice with statistical software (e.g., Python)

Unit 5: Data-Driven Decision-Making (Theory - 4 hours; 10 Marks)

Decision support systems and business intelligence
Application of data analytics in marketing, finance, operations, and human resources
Ethical considerations and challenges in data-driven decision-making
Pedagogy: Group projects, and presentations

Assessment:

Sessional Examination: 10 Marks
End-Term Examination: 30 Marks
Assignments/Projects: 10 Marks

Pedagogical Approach:

Lectures: To provide theoretical concepts and frameworks.
Hands-on Exercises: To reinforce theoretical concepts through practical application.
Case Studies: To illustrate real-world applications of data science in management.
Group Projects: To encourage collaboration and problem-solving skills.
Presentations: To enhance communication and critical thinking abilities.
Practical Sessions: To provide hands-on experience with data analysis tools and techniques.

References:

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- Pyle, D. (2015). Data Preparation for Data Mining. Morgan Kaufmann.
- VanderPlas, J. (2016). Python Data Science Handbook: Essential Tools for Working with Data. O'Reilly Media.
- James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). An Introduction to Statistical Learning: with Applications in R. Springer.
- Zikopoulos, P., Eaton, C., & Zikopoulos, P. C. (2011). Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data. McGraw-Hill Osborne Media.