



Data Science with AI, Python, and Modern Tools

Course Outline | Duration: 5 Months | Approx. 60 Hours | Maximum 50 Examples

Introduction

Data Science is a practical skill that combines business understanding, data cleaning, statistics, visualization, Python programming, machine learning, responsible AI use, and clear communication of insights.

Course Objectives (AI Assisted)

- ▶ Build a strong foundation in Python programming for data work.
- ▶ Clean, transform, validate, and analyze real-world CSV, text, and image datasets.
- ▶ Create useful charts, summaries, dashboards, and business recommendations.
- ▶ Understand practical statistics, feature engineering, and model evaluation.
- ▶ Build regression, classification, forecasting, NLP, recommendation, and computer vision examples at an introductory practical level.
- ▶ Use AI responsibly for explanation, debugging, documentation, project planning, and decision support while keeping human review in control.
- ▶ Complete a practical portfolio path within approximately 60 teaching hours.

Tool Selection

Area	Recommended Tools
Core tools	Python, Jupyter Notebook, VS Code, Google Colab or Kaggle Notebooks
Libraries	Pandas, NumPy, Matplotlib, Seaborn, Scikit-learn; optional OpenCV/TensorFlow or Keras for image examples
Data and workflow	CSV, text files, folder-based images, optional SQLite practice from CSV data, Git/GitHub for final projects
AI support	Selected free AI tools for explanation, code support, debugging, documentation, review, and project planning



A. Area-wise Coverage Map

Area	Example Numbers
Python, files, CSV handling	1-5, 9-10, 49-50
Pandas and NumPy data analysis	1-40, 48-50
Data cleaning and validation	5, 13, 22, 24, 29, 44, 50
Missing values, duplicates, outliers	5, 15, 26-28, 34-40, 50
EDA and business analytics	1-25, 49-50
Charts and dashboards	2-4, 6-12, 14-21, 25, 32-33, 49-50
Statistics and KPIs	1-4, 6-21, 23, 25, 30-33, 49
Feature engineering	7, 12, 17-18, 23, 26-40, 48-50
Text analytics and NLP	13, 22, 24, 29, 44-45, 47, 50
Recommendation and market basket	8, 31, 46
Time series and forecasting	7, 18, 32-33, 48
Machine learning regression	27, 34-35, 40, 49
Machine learning classification	26, 28-29, 36-40, 45, 47
Model evaluation and explainability	35-40, 45, 47, 49-50
Computer vision and neural networks	41-43
End-to-end projects and reporting	44, 49-50
AI-assisted learning and responsible AI	All examples as a support method; especially 44, 49-50
Optional SQLite practice from CSV data	3, 10, 12-14, 23, 49
Git/GitHub, documentation, portfolio	49-50

B. 50 Data Science Examples with Concepts Covered

No.	Example	Concepts Covered
1	Student Marks Analysis	Totals, averages, percentages, grading, ranking, pass/fail analysis
2	Monthly Household Expense Analysis	Monthly grouping, category totals, percentage share, charts
3	Sales Summary for a Small Shop	Daily sales, product totals, discounts, bills, revenue summaries



No.	Example	Concepts Covered
4	Attendance Analysis	Attendance percentage, present/absent/late counts, student summary
5	Basic Customer List Cleaning	Duplicate removal, missing values, phone/email cleanup, text standardization
6	Excel Course Enquiry Analysis	Lead source, branch analysis, counsellor performance, conversion rate
7	Temperature Data Analysis	Weather trend, min/max, city comparison, rolling averages
8	Movie Ratings Analysis	Rating distribution, averages, user/item aggregation, recommendations discussion
9	Mobile Phone Price Comparison	Feature comparison, value score, sorting, filtering, price bands
10	Restaurant Order Analysis	Order-level grouping, popular dishes, revenue by channel/time
11	Simple Survey Analysis	Counts, percentages, Likert ratings, satisfaction insights
12	Website Visitor Analysis	Traffic source, device, sessions, page views, bounce/session analysis
13	Bank Transaction Categorization	Text rules, category mapping, spend summaries, basic NLP cleaning
14	Course Batch Performance Analysis	Batch KPIs, attendance, marks, fees, completion comparison
15	Employee Salary Analysis	Salary by department, experience, designation, outlier discussion
16	Retail Inventory Analysis	Stock levels, reorder alerts, safety stock, supplier view
17	Daily Step Count Analysis	Daily/weekly patterns, goals, moving averages, personal analytics
18	Electricity Bill Analysis	Units, bill amount, seasonal use, year-over-year comparison
19	Cricket Player Performance Analysis	Player KPIs, strike rate, economy, ranking, sports analytics
20	YouTube Channel Performance Analysis	Views, watch time, engagement rate, top video analysis
21	Social Media Post Analysis	Platform metrics, content type performance, timing analysis



No.	Example	Concepts Covered
22	Simple Text Word Frequency Analysis	Tokenization, stop words, word counts, basic text mining
23	Customer Purchase Pattern Analysis	Repeat purchase, frequency, basket value, customer behavior
24	Product Review Sentiment Analysis	Text cleaning, sentiment labels, positive/negative/neutral analysis
25	Hotel Booking Analysis	Booking trends, occupancy, cancellations, room/season analysis
26	Loan Applicant Data Analysis	Credit history, income, approval pattern, classification preparation
27	Real Estate Price Analysis	Location, amenities, price per sqft, regression preparation
28	Student Dropout Risk Analysis	Risk indicators, attendance/marks behavior, classification target
29	Email Classification Example	Subject/body cleaning, TF-IDF idea, spam/promo/personal classification
30	Customer Segmentation	RFM features, clustering/segment profiles, customer groups
31	Market Basket Analysis	Frequent itemsets, support, confidence, lift
32	Sales Forecasting Using Past Data	Time series trend, seasonality, moving averages, forecasting
33	Stock Price Trend Analysis	OHLCV, moving averages, volatility, trend signals
34	Taxi Trip Fare Prediction	Regression, feature engineering, distance/time/demand effects
35	House Price Prediction	Regression, train-test split, feature selection, model evaluation
36	Employee Attrition Prediction	Classification, HR analytics, feature importance, retention insights
37	Customer Churn Prediction	Binary classification, churn probability, retention factors
38	Credit Card Fraud Detection	Rare class detection, imbalance, anomaly patterns, precision/recall
39	Medical Appointment No-Show Prediction	Classification, lead time, no-show probability, imbalance
40	Insurance Claim Prediction	Claim likelihood/amount, regression/classification framing, risk factors



No.	Example	Concepts Covered
41	Image Classification: Cats vs Dogs	Image folder structure, preprocessing, CNN basics, validation split
42	Handwritten Digit Recognition	Pixel data, labels, neural network basics, image classification
43	Face Mask Detection	Binary image classification, class folders, transfer-learning discussion
44	Resume Screening System	Resume parsing, keyword matching, skill extraction, ranking
45	Chatbot Intent Classification	Intent labels, text preprocessing, classification, response mapping
46	Recommendation System for Courses	User profiles, ratings, similarity, recommendation logic
47	News Article Classification	Multiclass text classification, TF-IDF, evaluation
48	Demand Forecasting for Multiple Products	Multi-product time series, product/date features, forecast comparison
49	End-to-End Retail Business Dashboard and Prediction	Multi-table joins, dashboard KPIs, prediction, final project workflow
50	AI-Assisted Business Decision System	Cleaning, analytics, text insights, recommendations, responsible AI capstone