

Day-Wise Curriculum

Data Science



Phase 1: Python & Core Foundations (Weeks 1–4)

Goal: Build programming and analytical base.

Week 1: Python Basics

- Data types, variables, operators
- Lists, tuples, dictionaries, sets
- Control flow (if, loops)
- Functions (user-defined + built-ins)
- **Mini Project:** Build a calculator + CSV reader

Week 2: Intermediate Python for Data Science

- File handling, error handling
- List comprehensions, lambda functions
- Modules & packages
- Object-Oriented Programming basics
- **Mini Project:** Data cleaning script for CSV files

Week 3: Statistics for Data Science (Foundations)

- Descriptive stats (mean, median, variance, std dev)
- Probability & distributions (normal, binomial, Poisson)
- Sampling & central limit theorem
- **Hands-on:** Pandas for descriptive statistics

Week 4: Inferential Statistics + NumPy

- Hypothesis testing (t-test, chi-square, ANOVA)
- Correlation & covariance
- Intro to NumPy: arrays, indexing, broadcasting, vectorization
- **Mini Project:** A/B testing simulation



Phase 2: Data Handling & Visualization (Weeks 5–8)

Goal: Learn to handle, clean, and visualize real-world datasets.

Week 5: Pandas Basics

- Reading CSV/Excel/JSON
- DataFrames, indexing, filtering
- Handling missing values, duplicates
- Mini Project: Clean a messy sales dataset

Week 6: Pandas Advanced

- GroupBy, pivot tables, merging & joining
- Feature engineering basics
- Time-series handling in Pandas
- **Project**: Student performance dataset analysis

Week 7: Data Visualization (Matplotlib + Seaborn)

- Line, bar, scatter, pie charts
- Histograms, KDE plots, heatmaps
- Styling, multi-plot layouts
- **Project:** Visual storytelling with dataset (e.g., COVID-19 trends)


Week 8: Dashboarding Basics

- Plotly, Dash, or Power BI/Tableau (intro level)
- Interactive visualizations
- **Mini Capstone:** Build a small sales analytics dashboard

Phase 3: Databases & Data Engineering Foundations (Weeks 9–12)

Goal: Handle structured/unstructured data & pipelines.

Week 9: SQL Basics

- SELECT, WHERE, ORDER BY, LIMIT
 - Aggregations: COUNT, SUM, AVG, GROUP BY
 - Joins (INNER, LEFT, RIGHT, FULL)
 - **Hands-on:** Query HR/employee database
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Week 10: SQL Advanced + NoSQL

- Subqueries, CTEs, Window functions
- Transactions & indexing
- Intro to MongoDB (NoSQL)
- **Mini Project:** Build employee analytics reports

Week 11: Data Engineering Basics

- ETL concepts, batch vs streaming
- Bash scripting basics for automation
- **Hands-on:** Automate data cleaning with shell scripts

Week 12: Data Pipelines

- Apache Airflow (basic DAGs)
- Intro to Kafka (concept + small demo)
- **Project:** Create a simple ETL pipeline (CSV > cleaned data > database)

Phase 4: Machine Learning Foundations (Weeks 13–16)

Goal: Learn end-to-end ML modeling.

Week 13: ML Basics + Regression

- ML workflow: data prep > train > evaluate
- Train/test split, cross-validation
- Linear & Logistic Regression
- **Project:** Predict housing prices

Week 14: Classification Algorithms

- Decision Trees, Random Forests
- KNN, Naive Bayes
- Model evaluation (accuracy, precision, recall, F1, ROC)
- **Hands-on:** Classify spam emails

Week 15: Advanced ML Algorithms

- Gradient Boosting (XGBoost, LightGBM, CatBoost)
- Hyperparameter tuning (GridSearch, RandomSearch)
- **Project:** Customer churn prediction

Week 16: Unsupervised Learning

- Clustering (K-Means, DBSCAN, Hierarchical)
- PCA for dimensionality reduction
- **Project:** Customer segmentation

Phase 5: Advanced ML, Deep Learning & Big Data (Weeks 17–20)

Goal: Dive into modern AI workflows.

Week 17: Model Interpretability + Ethics

- SHAP, LIME, feature importance
- Fairness & bias in ML
- **Case Study:** Loan approval fairness

Week 18: Deep Learning Basics

- Neural networks, activation functions
- Backpropagation & optimizers (Adam, RMSProp)
- **Hands-on:** Build neural net with Keras

Week 19: Computer Vision & NLP Basics

- CNN architectures (ResNet, VGG intro)
- Text preprocessing (tokenization, TF-IDF, embeddings)
- **Mini Project:** Sentiment analysis with movie reviews

Week 20: Big Data & Cloud ML

- Hadoop & Spark concepts
- PySpark basics (loading & transforming data)
- Intro to cloud ML (AWS SageMaker / GCP Vertex AI)
- **Hands-on:** PySpark word count or analytics

Phase 6: AI + Capstones (Weeks 21–24)

Goal: Industry-level projects & Generative AI exposure.

Week 21: Time Series Analysis

- ARIMA, SARIMA models
- Forecasting with Facebook Prophet
- **Project:** Demand forecasting

Week 22: Recommender Systems

- Collaborative & content-based filtering
- Hybrid recommenders
- **Project:** Movie/Book recommender system

Week 23: Generative AI & APIs

- Intro to LLMs, ChatGPT, DALL·E
- Using AI APIs with Python (OpenAI, HuggingFace)
- **Project:** Build a chatbot with OpenAI API

Week 24: Capstone & Showcase

End-to-end project combining:

- Data collection + cleaning
- SQL queries
- ML model (regression/classification)
- Visualization dashboard
- (Optional) Deployment via Streamlit

Final presentations & mock interviews



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