

# Course Curriculum for Data Science

**Proposed by:** Md. Hannan

Data Science & Machine Learning Researcher,

Founder of “CSE’s Programmer Platform” at City University

– Bangladesh Programming Club.

Python Programming Instructor at Doctor ICT’s Chamber.

**Mobile:** +8801726645633, +8801851033411

**Email:** hannanwahid2@gmail.com

**Github:** <https://github.com/hannanwahid>

**LinkedIn:** <https://www.linkedin.com/in/hannan-wahid>

## **Course Prerequisites:**

- ✓ Basic knowledge of algebra, linear algebra, calculus, statistics, and probability
- ✓ Basic knowledge in any programming language
- ✓ Strong motivation and complete dedication

## **Course Inauguration**

- ✓ Introduction to the course (aims, goals, expectations)
- ✓ Course contents
- ✓ Skill evaluation policy, Capstone Projects
- ✓ Schedule, Policies, and Regulations

## **Data Science: A Birds Eye View**

- ✓ What is Data Science?
- ✓ The history of Data Science
- ✓ Applications of Data Science
- ✓ Impact of Data Science in Business
- ✓ The Data Science Venn Diagram
- ✓ Skills needed to be a Data Scientist

## **Environment Setup**

- ✓ Installing Anaconda Python Distribution
- ✓ Introduction to Kaggle and Google Collaboratory

## **Introduction to the Data Science Toolbox**

- ✓ Jupyter Notebook [Coding Environment]
- ✓ SciPy [Math & Stat]

- ✓ StatsModels [Math & Stat]
- ✓ Numpy [Math & Stat]
- ✓ Pandas [Data Processing]
- ✓ Scikit-learn [Machine Learning]
- ✓ Keras [Deep Learning]
- ✓ Matplotlib, Seaborn [Visualization]
- ✓ Others

## **Python Programming for Data Science**

- ✓ Basic Syntax
- ✓ Conditional Statements
- ✓ Loops
- ✓ Strings
- ✓ Lists
- ✓ Tuples
- ✓ Dictionaries
- ✓ Functions
- ✓ File I/O
- ✓ Other Programming Techniques
- ✓ Concise Overview of Object-Oriented Programming

## **Diving into Data Science**

- ✓ Data Science Pipeline
- ✓ Data Collection
- ✓ Data Exploration
- ✓ Data Preprocessing
- ✓ Data Modeling
- ✓ Model Validation
- ✓ Reporting

## **Diving into Data Exploration**

- ✓ Pie charts
- ✓ Line Plot
- ✓ Scatter Plot
- ✓ Bar Plot
- ✓ Histograms
- ✓ Distplot
- ✓ Box Plot
- ✓ Violin Plot
- ✓ Join Plot
- ✓ Heatmap

## **Diving into Data Preprocessing**

- ✓ Pandas Object Creation
- ✓ Pandas Data View
- ✓ Data Selection

- ✓ Pandas Operations
- ✓ Data Merging
- ✓ Data Grouping
- ✓ Data Reshaping
- ✓ Time Series Data
- ✓ Pandas Plotting
- ✓ Pandas Data In/Out
- ✓ Handling Missing Values
- ✓ Handling Outliers
- ✓ Handling Imbalanced Class Problem
- ✓ Handling Categorical Data
- ✓ Data Discretization
- ✓ Data Transformation
- ✓ Data Segregation
- ✓ Feature Selection
- ✓ Feature Engineering

## **Diving into Data Modeling and Validation**

- ✓ Introduction to Machine Learning
- ✓ Supervised Learning Algorithms o Linear Regression
  - Polynomial Regression
  - Lasso Regression (L1)
  - Ridge Regression (L2)
  - Elastic Net (L1-L2)
  - Logistic regression
  - Naive Bayes
  - K-Nearest Neighbors
  - Decision Trees
  - Support Vector Machine
    - Hyperparameter Tuning
  - Grid Search
  - Random Search
  - Bayesian Optimization
- ✓ Capstone Project 1: Regression
- ✓ Capstone Project 2: Classification
- ✓ Unsupervised Learning Algorithms o Gaussian mixture models
  - K-means Clustering
  - DBSCAN Clustering
  - Principal component analysis (PCA)
- ✓ Capstone Project 3: Clustering
- ✓ Ensemble Learning
  - Random Forest
  - AdaBoost
  - Gradient Boosted Trees

- Voting Classifier
  - XGBoost
  - LightGBM
  - CatBoost
- ✓ Model Overfitting and Underfitting
  - ✓ Cross-Validation
  - ✓ Evaluation Metrics for Regression
  - ✓ Evaluation Metrics for Classification

### **Kickstarting Deep Learning**

- ✓ Introduction to Deep Learning
- ✓ A concise history of Deep Learning
- ✓ Introduction to Neural Networks
- ✓ Application of Deep Learning on Regression Problems
- ✓ Application of Deep Learning on Classification Problems

### **Data Science in Cloud**

- ✓ Data Science in Google Cloud
- ✓ Data Science in Amazon Web Services (AWS)

### **Deploying Predictive Models to Production**

- ✓ Exporting Machine Learning Models
- ✓ Building REST APIs using Flask
- ✓ Deploying APIs in Google Cloud

### **Final Project Submission & Defense.**