**Course Outline**

### Module 1*:* Introduction to Data Science Topics:

* What is Data Science?
* What does Data Science involve?
* Era of Data Science
* Business Intelligence vs Data Science
* Life cycle of Data Science
* Tools of Data Science

### Module 2*:* Data Extraction, Wrangling, & Visualization Topics:

* Data Analysis Pipeline
* What is Data Extraction?
* Types of Data
* Raw and Processed Data
* Data Wrangling
* Exploratory Data Analysis
* Visualization of Data

### Module 3*:* Introduction to Machine Learning with Python Topics:

* Python Revision (numpy, Pandas, scikit learn, matplotlib)
* What is Machine Learning?
* Machine Learning Use-Cases
* Machine Learning Process Flow
* Machine Learning Categories
* Linear regression
* Gradient descent

### Module 4*:* Supervised Learning - I Topics:

* What is Classification and its use cases?
* What is a Decision Tree?
* Algorithm for Decision Tree Induction
* Creating a Perfect Decision Tree
* Confusion Matrix
* What is Random Forest?

### Module 5*:* Dimensionality Reduction Topics:

* Introduction to Dimensionality
* Why Dimensionality Reduction?
* PCA
* Factor Analysis
* Scaling dimensional model
* LDA

### Module 6*:* Supervised Learning - II Topics:

* What is Naïve Bayes?
* How Naïve Bayes works?
* Implementing Naïve Bayes Classifier
* What is a Support Vector Machine?
* Illustrate how Support Vector Machine works?
* Hyperparameter optimization
* Grid Search vs Random Search
* Implementation of Support Vector Machine for Classification

### Module 7*:* Unsupervised Learning Topics:

* What is Clustering & its Use Cases?
* What is K-means Clustering?
* How K-means algorithm work?
* How to do optimal clustering?
* What is C-means Clustering?
* What is Hierarchical Clustering?
* How Hierarchical Clustering works?

### Module 8*:* Reinforcement Learning Topics:

* What is Reinforcement Learning?
* Why Reinforcement Learning?
* Elements of Reinforcement Learning
* Exploration vs Exploitation dilemma
* Epsilon Greedy Algorithm
* Markov Decision Process (MDP)
* Q values and V values
* Q values and V values
* α values

### Module 9*:* Forecasting Analysis Topics:

* What is Time Series Analysis?
* Importance of TSA
* Components of TSA
* White Noise
* AR model
* MA model
* ARMA model
* ARIMA model
* Stationarity
* ACF & PACF
* Cross Sectional Data

### Module 10*:* Model Selection and Boosting Topics:

* What is Model Selection?
* Need of Model Selection
* Cross – Validation
* What is Boosting?
* How Boosting Algorithms work?
* Types of Boosting Algorithms
* Adaptive Boosting

### Module 11*:* In-Class Project Topics:

* Predict the species of Plant.