**Applied data science with python certification course**

**(K.M.IQBAL , Duration : 24weeks – 250 Hours, lessons - 24 )**

Here is the **Applied data science with python** **Practical Syllabus** for **AI and Data Science**, focusing on hands-on labs and real-world applications. This is ideal if you've completed the beginner basics (Python, data handling, and simple ML models).

**1. Python Programming**

1.1. Write a Python program to demonstrate variables and data types
1.2. Use conditional statements (if, elif, else)
1.3. Use loops (for, while) with examples
1.4. Define and call functions
1.5. Use lists, dictionaries, sets, and tuples

**2. Data Handling with NumPy and Pandas**

2.1. Create and manipulate NumPy arrays
2.2. Perform vectorized operations using NumPy
2.3. Load and explore data using Pandas DataFrames
2.4. Handle missing values and duplicates
2.5. Grouping, filtering, and sorting data

**3. Data Preprocessing and Cleaning**

3.1. Handle null values using fill, drop techniques
3.2. Encode categorical variables (Label Encoding / One-hot Encoding)
3.3. Normalize and standardize data
3.4. Feature selection and extraction basics
3.5. Split dataset into train-test sets

**4. Data Visualization**

4.1. Plot graphs using Matplotlib (line, bar, histogram)
4.2. Use Seaborn for statistical plots (boxplot, pairplot, heatmap)
4.3. Create correlation matrix and heatmaps
4.4. Create pie charts and scatter plots
4.5. Dashboard basics using Streamlit (optional for visual app)

**5. Machine Learning**

5.1. Build a Linear Regression model (predict marks or price)
5.2. Build a Logistic Regression model (predict diabetes or pass/fail)
5.3. Apply K-Nearest Neighbors (KNN) classifier
5.4. Build a Decision Tree and Random Forest model
5.5. Evaluate models using accuracy, confusion matrix, precision, recall

**6. Basics of AI Applications**

6.1. Understand difference: AI vs ML vs DL
6.2. Create a rule-based Chatbot using Python
6.3. Perform Sentiment Analysis on text data (using TextBlob)
6.4. Use OpenCV to detect faces in an image
6.5. Use a pre-trained model (e.g., MobileNet or ResNet) to classify an image

**7. Mini Project**

* House Price Prediction (Regression)
* Student Performance Prediction
* Fake News Detection
* Movie Recommendation System
* Face Mask Detection using AI
* Weather Forecast using past data

**8. Advanced Data Preprocessing**

1.1. Outlier detection and treatment (Z-score, IQR)
1.2. Feature Engineering: binning, interaction features
1.3. Imbalanced data handling (SMOTE, undersampling, oversampling)
1.4. Dimensionality Reduction (PCA, LDA)
1.5. Time series data preprocessing (lag features, rolling stats)

**9. Exploratory Data Analysis (EDA) Projects**

2.1. EDA on COVID-19 dataset (cases, deaths, recovery trends)
2.2. EDA on E-commerce dataset (customer behavior, sales)
2.3. EDA on Finance dataset (stock prices, profit/loss analysis)
2.4. EDA on Biology/Health dataset (heart disease or cancer data)
2.5. EDA Report generation using Seaborn, Pandas Profiling

**10. Intermediate Machine Learning Algorithms**

3.1. Support Vector Machine (SVM) – Classification
3.2. Naive Bayes – Email Spam Detection
3.3. Gradient Boosting (XGBoost or LightGBM)
3.4. k-Means Clustering and DBSCAN – Unsupervised Learning
3.5. Model Tuning – Grid Search, Cross Validation

**11. Natural Language Processing (NLP) Basics**

4.1. Text Cleaning (stopwords, stemming, lemmatization)
4.2. Bag-of-Words & TF-IDF Vectorization
4.3. Text Classification (e.g., sentiment analysis, spam detection)
4.4. Named Entity Recognition using spaCy
4.5. Building a Resume Parser or News Classifier

**12. Introduction to Deep Learning**

5.1. Build a basic Neural Network using Keras/TensorFlow
5.2. Image Classification using CNN (MNIST or CIFAR-10)
5.3. Text Classification using RNN/LSTM
5.4. Transfer Learning (using pre-trained models like VGG, ResNet)
5.5. Introduction to Autoencoders

**13. AI Mini Projects & Applications**

6.1. AI-based Chatbot using NLP + ML
6.2. Real-time Face Detection using OpenCV
6.3. Emotion Detection using Deep Learning
6.4. Credit Card Fraud Detection using ML
6.5. Crop Recommendation System (for agriculture-based use)

**14. Deployment and Visualization**

7.1. Deploy ML model using Flask or Streamlit
7.2. Create interactive dashboards using Power BI or Tableau
7.3. Model explainability using SHAP or LIME
7.4. Version control and collaboration using GitHub

**15. Soft Skills and Professional Development**

* Resume Building and Interview Preparation:
* Mock Interviews
* Behavioral Interview Tips

**Educational Background**

* **Bachelor’s Degree** in:
* BE / B.Tech (From any Branch)
* BBA / B.Com / BSc (in any Branch)
* **Master’s Degree**
* M.Tech / MBA / MCA / M.Sc. / M.Com (in any Branch)

**Tools & Libraries**

* **Programming:** Python, R, SQL
* **Libraries:** scikit-learn, pandas, seaborn, matplotlib, keras, tensorflow, nltk, opencv, streamlit
* **Data Sources:** Kaggle, UCI, WHO, World Bank, GitHub