#SYLLABUS THAT I MUST COVER IS AS FOLLOWS

**📊 Step 3: Data Handling & Preprocessing**

Learn to prepare data for modeling.

* Data Collection & Loading
* Data Cleaning
  + Handling Missing Values
  + Removing Duplicates
  + Outlier Detection
* Feature Engineering
  + Feature Creation
  + Feature Transformation
  + Feature Selection
* Encoding Categorical Variables
* Feature Scaling (Standardization, Normalization)
* Train/Test/Validation Splits

**🤖 Step 4: Core Machine Learning Algorithms**

Start building models.

**Supervised Learning**

* Linear Regression\*
* Logistic Regression\*
* Decision Trees\*
* k-Nearest Neighbors (k-NN)
* Support Vector Machines (SVM)
* Naive Bayes
* Ensemble Methods\*
  + Random Forest\*\*\*
  + Gradient Boosting (XGBoost\*, LightGBM)

**Unsupervised Learning**

* K-Means Clustering\*
* Hierarchical Clustering\*
* DBSCAN
* Principal Component Analysis (PCA)
* t-SNE

**🧪 Step 5: Model Evaluation & Tuning**

Make your models better.

* Evaluation Metrics
  + Accuracy, Precision, Recall, F1 Score\*
  + Confusion Matrix\*
  + ROC-AUC
  + MAE, MSE, RMSE\*
* Cross-Validation\*
* Hyperparameter Tuning\*\*\*
  + Grid Search
  + Random Search

**🧰 Step 6: Advanced Tools & Libraries**

Level up your toolkit.

* Scikit-learn (core ML library)
* TensorFlow & Keras (deep learning)
* PyTorch (deep learning)
* XGBoost, LightGBM (boosting models)

**🧠 Step 7: Deep Learning**

Dive into neural networks.

* Neural Network Basics
  + Perceptron, Activation Functions
  + Forward & Backward Propagation
* Deep Neural Networks
* Convolutional Neural Networks (CNNs)
* Recurrent Neural Networks (RNNs)
  + LSTM, GRU
* Transfer Learning
* Autoencoders
* GANs (Generative Adversarial Networks)

**🗣️ Step 8: Natural Language Processing (NLP)**

Work with text data.

* Text Preprocessing
  + Tokenization, Lemmatization, Stopwords
* Bag of Words, TF-IDF
* Word Embeddings (Word2Vec, GloVe)
* Transformers (BERT, GPT)
* Applications: Sentiment Analysis, Text Classification

**📈 Step 9: Time Series Analysis**

Handle sequential data.

* Time Series Components
* Stationarity
* ARIMA, SARIMA
* Prophet
* LSTM for Time Series

**🚀 Step 10: Model Deployment**

Make your models usable.

* Saving Models (Pickle, Joblib)
* Building APIs (Flask, FastAPI)
* Streamlit for ML Apps
* Docker Basics
* Cloud Deployment (AWS, GCP, Azure)

**🔁 Step 11: MLOps & Production**

Manage models in real-world systems.

* CI/CD for ML
* Model Monitoring
* Data Drift & Concept Drift
* Retraining Pipelines

**🧑‍⚖️ Step 12: Ethics & Explainability**

Build responsible AI.

* Bias & Fairness
* Explainable AI (SHAP, LIME)
* Privacy & Security

**🧪 Step 13: Practice & Projects**

Apply what you've learned.

* Kaggle Competitions
* Real-World Projects
* Portfolio Building
* Reading Research Papers