Information Booklet cum Syllabus

of

Machine Learning with Python

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National Institute of Electronics and Information Technology
An Autonomous Scientific Society under
Ministry of Electronics and Information Technology, Government of India

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1.About Course

A Machine Learning course with Python introduces how computers learn from data using Python tools like NumPy, Pandas, Matplotlib, and Scikit-learn. It covers data preprocessing, visualization, and core ML concepts such as supervised and unsupervised learning, followed by algorithms like linear and logistic regression, decision trees, random forests, KNN, and k-means clustering. The course also teaches model evaluation techniques and usually includes hands-on projects like prediction or classification tasks, helping learners gain practical experience in building and applying ML models to real-world problems.

2.NIELIT

National Institute of Electronics and Information Technology, NIELIT, (Erstwhile DOEACC Society) is an autonomous scientific society of the Ministry of Electronics & Information Technology, Government of India. The Society is registered under the Societies Registration Act, 1860. NIELIT was set up to carry out Human Resource Development and related activities in the area of Information, Electronics & Communications Technology (IECT). NIELIT is engaged both in Formal & Non-Formal Education in the areas of IECT besides development of industry-oriented quality education and training programmer in the state-of-the-art areas. NIELIT has endeavored to establish standards to be the country's premier institution for Examination and Certification in the field of IECT. It is also one of the National Examination Body, which accredits institutes/organizations for conducting courses in IT and Electronics in the non-formal sector.

3. Objective of Course

Understand the fundamental concepts and terminology of Machine Learning.

Apply Python programming skills to implement machine learning algorithms.

Perform data collection, cleaning, preprocessing, and feature engineering.

Build, train, and evaluate supervised and unsupervised learning models.

Use popular Python libraries such as NumPy, Pandas, scikit-learn, and Matplotlib.

Select appropriate machine learning models for real-world problems.

Evaluate model performance using suitable metrics and validation techniques.

Interpret and communicate machine learning results effectively.

Develop modular, reusable machine learning code for practical applications.

Understand ethical considerations and limitations of machine learning systems

4.Job Roles of Course

1. Machine Learning Engineer

- Designs, builds, and deploys ML models
- Uses Python, scikit-learn, TensorFlow, PyTorch

- Works on model optimization and production systems

2. Data Scientist

- Analyzes data to extract insights and predictions
- Uses Python for data preprocessing, visualization, and modeling
- Applies ML techniques to business and research problems

3. AI Engineer

- Develops AI-powered applications and intelligent systems
- Uses ML, deep learning, and Python-based frameworks
- Integrates ML models into software products

4. Deep Learning Engineer

- Builds neural networks for vision, NLP, and speech
- Uses Python with TensorFlow, Keras, or PyTorch
- Works on advanced AI applications

5.Eligibility

- Academic Qualification
- Students who are currently pursuing or have completed:
    - Higher Secondary Education (10+2), or
    - Diploma, Undergraduate, or Postgraduate programs
- Students from any discipline are eligible (technical background preferred but not mandatory).

6. Total Duration Of Course : 5 Days / 10 Hours

Course Content.

Module 1: Introduction to Machine Learning

- Overview of Artificial Intelligence and Machine Learning
- Types of Machine Learning: Supervised, Unsupervised, Semi-supervised, Reinforcement Learning
- Machine Learning applications and use cases
- ML workflow and model lifecycle

Module 2: Python for Machine Learning

- Python basics review
- NumPy for numerical computing
- Pandas for data manipulation and analysis
- Data visualization using Matplotlib and Seaborn

Module 3: Data Preprocessing and Feature Engineering

- Data collection and data understanding
- Handling missing values and outliers
- Data normalization and standardization
- Encoding categorical variables
- Feature selection and feature extraction

Module 4: Supervised Learning – Regression

- Linear Regression
- Multiple Linear Regression
- Polynomial Regression
- Model evaluation metrics (MSE, RMSE, R^2)

Module 5: Supervised Learning – Classification

- Logistic Regression
- k-Nearest Neighbors (KNN)

- Decision Trees
- Naïve Bayes
- Support Vector Machines (SVM)
- Classification evaluation metrics (Accuracy, Precision, Recall, F1-score, Confusion Matrix)

Module 6: Unsupervised Learning

- Clustering concepts
- K-Means Clustering
- Hierarchical Clustering
- DBSCAN
- Dimensionality Reduction (PCA)

Module 7: Model Validation and Optimization

- Train-test split
- Cross-validation techniques
- Bias–variance tradeoff
- Hyperparameter tuning (Grid Search, Random Search)

Module 8: Introduction to Deep Learning

- Basics of Neural Networks
- Perceptron and activation functions
- Introduction to TensorFlow and Keras
- Simple neural network implementation
