Information Booklet cum Syllabus

Of

Python & Machine Learning

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

NIELIT Gorakhpur
M.M.M.U.T. Campus, Deoria Road
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1. About 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 programmes 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.

2. Objective of Course : Python & Machine Learning

This course aims to equip students with foundational programming concepts using the Python language, emphasizing its simplicity, versatility, and wide-ranging applications. Students will learn core programming principles through a blend of theory and practical exercises, gaining hands-on experience with various tools for writing and executing Python programs. Additionally, the course will introduce fundamental machine learning concepts, enabling students to apply Python for data analysis, model building, and visualization. By the end of the course, candidates will be proficient in using Python for both general programming and machine learning applications.

After completing this course, the candidate will be able to:

- Understand the Python language and its features.
- Create Python programs using control structures and user-defined functions (UDFs).
- Work with sequence data types (lists, tuples, sets, and dictionaries).
- Handle files in Python.
- Utilize NumPy for numerical operations.
- Grasp the basics of Object-Oriented Programming (OOP).
- Explain key machine learning concepts and differentiate between types of learning.
- Pre process and clean data for analysis.
- Implement and evaluate machine learning algorithms, including classification and regression.
- Use Python libraries like Pandas, Matplotlib, and Seaborn for data manipulation and visualization.
- Apply ensemble methods and understand model performance challenges.

3. Eligibility

Students perusing or passed B.Tech./BCA/MCA/12th with Basic Knowledge of Computer.

4. Job Roles available for Python Programmers

After learning Python & Machine Learning, the candidates may be employed in the industries for following occupations:

- Assistant Programmer
- Training/Faculty

And candidates may also make Career in Data Science/ Machine Learning/ Artificial Intelligence as Data Scientist, Automation engineer, Machine learning engineer, back-end web developer etc.

5. Total duration of the Course

8 weeks (67 Hours)

6. Course Details

S. No.	Unit Name	Contents	Learning Objectives
1	Introduction to Python Programming	• Introduction, Applications, Diff. b/w C and Python. • Python Virtual Machine (PVM), Installation, Execution of program • Managing Input and Output with examples	After completion of this unit of module, Learner will be able to • Understand Basic of Python Programming Compare it's with other programming language understand Data type. • Installation of Python. • Able to make Program by accepting user input.
2	Operators, Expression in Python	• Operators, Data types, Literals, Constants, Identifiers, Naming Conventions with examples	After completion of this unit of module, Learner will be able to • Understand the Operators and expressions in Python Programming. • Able to make Program by using different types of operators in python programming.

3	Python Statements (Conditional statement, Looping statement, break statement, continue statement & pass statement)	• Concept of Indentation and if, if...else, if…elif…else statement with examples • While loop, for loop, range () function, break and continue, pass & return statements. • Nesting of loops	After completing this unit, Learner will be able to understand • Able to make Program by using conditional Statement Understand the concept of Loop, Nested Loop and able to make program Based on loop & nested loop.
4	Sequence Data Types (List, Tuple, Set & Dictionary)	• List, Tuples • Sets, Dictionary	After completing this unit, Learner will be able to understand • Know very well what Sequence Data type is and how to use it. Able to make program by using Sequence Data type
5	String Handling in Python	• String Handling in Python.	After completing this unit, Learner will be able to understand String in Python.
6	Functions (Types of functions, return statement, Types of arguments, concepts of local & global variable, recursion)	• Concept of Functions with Examples • Anonymous functions (Lambda Function), Recursive Functions. • Built-in Modules, Import statement, Packages, Date and Time Modules	After completing this unit, Learner will be able to understand • User Defined Function and Lambda Function • Understand the concept of arguments. • Understand the concept of local & global variables. Able to make program byusing recursion.

7	File input/output operations	• Introduction to File Handling, File Operations.	After completing this unit, Learner will be able to understand • Able to read/write data from a file.
8	Built-in Modules, Import statement, Packages, Date and Time Module	• Built in Module. • Different inbuilt module	After completing this unit, Learner will be able to understand • Understand the concept of Built in Module. • Able to use different inbuilt module
9	Introduction to NumPy	• Understand the concept of NumPy. • Inbuilt methods of NumPy.	After completing this unit, Learner will be able to understand • Understand the concept of NumPy. Able to use inbuilt methodsof NumPy.
10	OOPs Concepts	• Object Oriented Programming Concepts • Classes and Objects, Encapsulation Constructor, Destructor and Inheritance	After completing this unit, Learner will be able to understand • Concept OOPs. • Understanding Class and object. • Features of OOPs like Inheritance, Constructor/ Destructor and polymorphism.
11	IDE Installation	Anaconda Installation • Learning about Jupyter Notebook	Install Anaconda to set up a Python environment and gain proficiency in using Jupyter Notebook for data analysis and machine learning projects.
12	ML Libraries	• Numpy • Pandas • Matplotlib • Seaborn	Gain proficiency in essential Python libraries for data analysis, including Numpy for numerical computations, Pandas for data manipulation, Matplotlib for basic plotting, and Seaborn for advanced data visualization.

13	Introduction to Machine Learning	• What is Machine Learning? • Applications of Machine Learning in Various Fields • Overview of Supervised, Unsupervised, and Reinforcement Learning.	• Define machine learning and distinguish it from traditional programming • Trace its evolution and explore its applications across various industries • Differentiate between supervised, unsupervised, and reinforcement learning, identifying their use cases.
14	Data Visualization	• Understanding Data: Types, Features, Labels, and Instances • Data Preprocessing & Data Cleaning: Handling Missing Data, Outliers	• Identify different data types and features, understand labels and instances • Learn data preprocessing techniques, including handling missing data and outlier
15	Supervised Learning	• Overview of supervised learning, regression vs. classification • Overview of Classification and Regression Tasks	• Understand the fundamentals of supervised learning, differentiate between regression and classification tasks.
16	Classification Algorithms	• Introduction to Classification • k-Nearest Neighbours (k-NN) • Naïve Bayes • Gradient Descent	• Understand the fundamentals of classification, implement the k-NN algorithm using distance metrics and voting strategies, apply the Naïve Bayes classifier, and learn the gradient descent.

17	Regression Algorithms	• Logistic Regression • Linear Regression: Concepts, Assumptions, and Interpretation	• Understand the principles of logistic and linear regression, including their assumptions and interpretation.
18	Unsupervised Learning	• Introduction to Clustering • k-Means Clustering: Centroid Calculation and Cluster Formation	• Understand the basics of clustering, implement k-means clustering with centroid calculation and cluster formation.
19	Bias and Variance	• Bias-Variance Trade off • Avoiding Overfitting and Underfitting	• Understand the bias-variance trade-off in model performance and learn techniques to avoid overfitting and underfitting in machine learning models.
20	Model Selection	• Ensemble Methods (Bagging & Boosting) • Adaboost and Random Forest	• Understand ensemble methods, including bagging and boosting techniques, and learn how to implement Adaboost and Random Forest for improved model performance.

7. Study Material : It will be provided by NIELIT free of cost.

8. References Books

- Python Programming Python Programming for Beginners By Adam Stewart
- Python Cookbook By David Beazley and Brian K. Jones
- Introduction to Python Programming By Gowrishankar S. Veena A.
- Machine Learning an algorithmic Perspective by Stephen Marshland

- Introduction to Machine Learning with python by Andreas C Muller, Sarah Guido.
- Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition by Aurélien Géron.

9. Program Coordinator & Contact Person:

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