

Information Booklet cum Syllabus

Of

AI and ML using Python

Revision-I



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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**

Artificial intelligence is broad and fast growing sub-field of computer science concerned with the intelligence demonstrated by machines, in contrast to the intelligence displayed by humans. This course covers all the foundation skills necessary to start the Artificial Intelligence and its implementation in Python.

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 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.

3. **Objective of Course**

Artificial intelligence is broad and fast growing sub-field of computer science concerned with the intelligence demonstrated by machines, in contrast to the intelligence displayed by humans. This course covers all the foundation skills necessary to start the Artificial Intelligence and its implementation in Python. Python is a open-source language with a simple syntax, and a powerful set of libraries. It is an interpreted language, with a rich programming environment. It is widely used in many scientific areas for data exploration and prediction, Expert System, Neural network, Speech recognition and Natural language processing.

After completing the module, the learner will be able to:

- Understand the basic concepts of Python language.
- Understand the development of GUI based application
- Understand Database Connectivity with python application
- Understand the basics of Machine Learning & their types.
- Understand various learning models, methods and applications under supervised and unsupervised learning.
- Understand data preprocessing for Machine Learning.
- Solve real world problems through machine learning implementation leading to predictions.

4. **Job Roles of Course**

After successful completion of the qualification the candidates shall be employed in the industries for following occupations:

- Python Developer
- Machine Learning Developer

5. Eligibility

12th with knowledge of Programming Language

6. Total duration of the Course

90 Hours (Theory:60 Hrs, Practical: 30Hrs)

7. Course Details

Course Outline and Objective of Each Unit

S. No.	Unit Name	Duration (Practical) in Hours	Duration (Theory) in Hours	Total Learning Hrs.	Learning Objectives
1	Module 1 - Python Programming	08	05	13	<p>After completion of this unit of module, Learner will be able to</p> <ul style="list-style-type: none">• Understand features of Python that make it one the most popular languages in the industry.• Use the basic operators and expressions available in Python in developing program. <p>Understand and use various Python statements like conditional constructs, looping constructs in writing Python program. Work with various built-in Sequence data types and Their use.</p> <ul style="list-style-type: none">• Work with modular approach using user defined functions.• OOP's Concept and implementation.• Connectivity of database with python programs.
2	Module 2 – Data Science	12	05	17	<p>After completion of this module the participants will be able to</p> <ul style="list-style-type: none">• Data Manipulation using Numpy and Pandas.• Data Visualization using Matplotlib.

3	Module 3 - Machine learning.	18	08	26	After completion of this module the participants will be able to <ul style="list-style-type: none"> • Data Preprocessing for Machine Learning. • Tasks performed by Machine Learning Algorithms– Classification, Regression. • Various machine learning algorithms and their implementation • Able to apply machine learning algorithm on given data. • Able to develop mini project GUI and database.
4	Module 4 - Artificial Intelligence (AI)	20	10	30	After completion of this module, the candidate will be able to : <ul style="list-style-type: none"> • Understand the concept of AI and use of Python in AI
5	Module5- Mini Project	02	02	04	

Detailed Syllabus

Unit Name	Contents	Hrs.
Module1-Python Programming	<ul style="list-style-type: none"> • Introduction to Python • Conditional Statements • Lists • Tuple • Dictionaries • Functions • OOPs Concept • Modules • Exception Handling • Input-Output • Database Connectivity • Introduction to GUI programming 	13
Module 2 – Data Science	<ul style="list-style-type: none"> • Introduction and Installation of NumPy, Panda and Matplotlib. • Data Manipulation using Numpy & Panda • Data Visualization using Matplotlib • Introduction of GUI Programming with Tkinter. • Implementation of Power BI 	17

Module 3 – AI & ML	<ul style="list-style-type: none"> • What is Artificial Intelligence • Basics concept of Artificial Intelligence • Necessity of Learning AI • Application of AI • Examples of AI • Why Python for AI • Application of Artificial Intelligence • Machine Learning • Supervised Learning • Unsupervised Learning • Introduction to machine learning. • Supervised machine learning • Unsupervised machine learning • Study of various machine learning algorithms including Classification, Regression, • KNN, K Means, • Logistic Regression, • Support Vector Machines (SVM), • Decision Tree • Naïve Bayes • Ensemble Methods, Random Forest etc 	26
Module 4 – Deep Learning	<ul style="list-style-type: none"> • Introduction to Deep Learning • Implementation of NLP • Open CV • Spam Detection, Sentiment Analysis • Implementation of Tensor Flow and Keras 	30
Module5-Mini Project	<ul style="list-style-type: none"> • Mini Projects 	04

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8. Reference Books/Study Material

1. Python Programming-A modular Approach (with Graphics, database, Mobile and Web Applications by Sheetal Taneja and Naveen Kumar, Pearson.
2. Beginning Programming with Python Dummies by John Paul Meuller.
3. Machine Learning an algorithmic Perspective by Stephen Marshland
4. Introduction to Machine Learning with python by Andreas CMuller, Sarah Guido.

9. Practical Assignments

Assignment 1. Create a numpy array with following columns: hindi, English, science, math and commerce with data type int32.

- i. Insert atleast 10 rows in the above array.
- ii. Display size and shape of the array.
- iii. Print sum of each column.
- iv. Print maximum element from each column.
- v. Print sum of 1, 4, 5 row.

Assignment2.

1. Create two array of size (3,3) and print their sum and multiplication.
2. Create an array of size 10 and calculate square root and standard deviation.
3. Print size and dimension of above arrays.

Assignment 3.

1. Write a Python program to create and display a series of data using Pandas module.
2. Create a pandas series of 10 elements and specify their index as 101 to 110.
3. Print bottom 5 elements of the series created in question 2.
4. Insert 3 new elements in above series on index 111, 112 and 113.
5. Delete the elements at index-103, 104, 107, 111 in above list.

Assignment4.

Write a Pandas program to create and display a Data Frame from a specified dictionary data which has the index labels. Sample Python dictionary data and list labels:

1. exam_data={'name':['Ankita','Dia','Kapil','Jayesh','Esha','Mayank','Ravi','Lata','Kamal','Jatin'],
2. 'score':[12.5, 9, 16.5, 15.9, 20, 14.5, 17.5, 8, 19],
3. 'attempts':[1, 3, 2, 3, 2, 3, 1, 1, 2, 1],
4. 'qualify':['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}

AI and ML using Python**Assignment5.**

Create a data frame using dictionary.

1. Dictionary('id':[P101,P102,P103,P104,P105], 'Price':[256,340,540,260, 470])
2. Print the price of product id– p102.
3. Print values of Price column.
4. Rename the column id to Product_Id and Price to Base_Price.

Assignment6.

Create a new data frame with three columns– Product_Name, Cost, Sales.

1. Add 10 values in data frame.
2. Add a new column named quantity with 10 values.
3. Add a new column named: Profit and total_profit and fill values.
4. Insert a new column named location after Product_Name column with 10 cities.

(New Delhi, Lucknow, Kolkata, Lucknow, New Delhi, Bengaluru, Chennai, Chennai, Kolkata, Bengaluru)

Assignment7.

Solve sample Machine Learning Regression problem.

Assignment8.

Solve sample Machine Learning classification problem.

AI and ML using Python**10. Sample Questions**

Q1 Who is known as Father of Artificial Intelligence ?

- a) Alan Turing
- b) Charls Babbage
- c) John Mccarthy
- d) None of the Above

Q2 Which of the following is the common language for Artificial Intelligence?

- a) Python
- b) Java
- c) Lisp
- d) PHP

Q3 What is Artificial Intelligence?

- a) Putting your intelligence into Computer
- b) Programming with your own intelligence
- c) Making a Machine intelligent
- d) Playing a Game

Q4 Which of the following is the advantage of AI?

- a) Faster decision
- b) 24/7 Support
- c) Reduce the Risk
- d) All of the above

Q5 Which of the following is the branch of Artificial Intelligence?

- a) Machine Learning
- b) Cyber forensics
- c) Full-Stack Developer
- d) Network Design

Q6 Identify the type of learning in which labeled training data is used.

- a) Reinforcement learning
- b) Supervised Learning
- c) Unsupervised Learning
- d) None of the above

Q7 What is the term known as on which the machine learning algorithms build a model based on sample data?

- a) Data Training
- b) Training Data
- c) Transfer Data
- d) None of the above

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Q8 Which one of the following statement is true for machine learning?

- a) In Machine learning Input data along with the out put is fed in to the machine.
- b) We would feed input data along with well written and tested program into machine to generate output
- c) In traditional programming input data along with the output is fed in to the machine.
- d) None of the above

Q9 In _____ we do prediction in the format of number or continuous value

- a) Classification
- b) Regression
- c) Cluster
- d) Association

Q10 Among the following option identify the one which is not a type of learning

- a) Semi Unsupervised Learning
- b) Supervised Learning
- c) Unsupervised learning
- d) None of the above