



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Artificial Intelligence (AI) and Machine Learning

Subject Code : DI01071011

Subject Name : Python Programming

w.e.f. Academic Year:	2026-27
Semester:	1 st
Category of the Course:	PCC

Prerequisite:	Basic computer literacy, Logical Thinking and Basic Mathematics
Rationale:	Python is a simple, high-level and open-source programming language widely used in Artificial Intelligence, Machine Learning, Data Science and Automation. Due to its simple syntax and powerful libraries, Python is considered one of the best languages for beginners. This course introduces students to Python programming fundamentals and basic libraries useful for AI and ML applications.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Create and implement basic Python programs by utilizing suitable data types, constants, and literals.	Apply
02	Apply operators and control flow structures to design and implement solutions for the given problems.	Apply
03	Use Python data structures such as lists, tuples, sets and dictionaries.	Apply
04	Develop programs using functions, modules and file handling techniques.	Apply
05	Use basic Python libraries such as NumPy, Pandas and Matplotlib for simple data operations.	Apply

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE(E)	PA(M)	PA(I)	ESE(V)	
3	0	2	4	70	30	20	30	150



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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Introduction to Python Programming: Introduction to Programming, History and Features of Python, Applications of Python in AI, Machine Learning and Data Science, Installing Python and Python IDE, Structure of Python Program, Keywords and Identifiers, Variables and Data Types, Type Casting, Input and Output Functions (input(), print()), Literals and Constants. Program Solving practice on the above concept	09	20
2.	Operators and Control Flow Statements: Arithmetic Operators, Logical Operators, Comparison Operators, Assignment Operators, Bitwise Operators, Membership and Identity Operators, Operator Precedence, Concept of Indentation, Conditional Statements (if, if-else, if-elif-else), Looping Statements (while loop, for loop), range() function, break, continue and pass statements. Program Solving practice on the above concept	09	20
3.	Data Structure in Python: Lists: Defining Lists, accessing values in Lists, deleting values in Lists, updating values in Lists, Basic List operations, Built in List functions Tuples: Defining Tuples, accessing values in Tuples, deleting values in Tuples, updating values in Tuples, Basic Tuple operations, Built in Tuple functions Sets: Defining Sets, accessing values in Sets, deleting values in Sets, updating values in Sets, Basic Sets operations, Built in Sets functions Dictionaries: Defining Dictionary, accessing values in Dictionary, deleting values in Dictionary, updating values in Dictionary, Basic Dictionary operations, Built in Dictionary functions Program Solving practice on the above concept	09	20



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4.	Functions and File Handling Built-in Functions – Type/ Data Conversion functions- int(), float(), str(), bool(), list(), tuple(), dict(), set(), frozenset(), bytes(), bytearray(), complex(), math functions- abs(), round(), pow(), divmod(), sum(), min(), max() and String functions- len(), max(), min(), isalnum(), isalpha(), isdigit(), isidentifier(), islower(), isupper(), and isspace(), endswith(), startswith(), find(), rfind(), count(), capitalize(), lower(), upper(), title(), swapcase(), replace(), lstrip(),rstrip(), strip(), format(), center(), ljust(), rjust() File handling Functions- read(), readline(), readlines(), Writing functions: write(), append(), writelines() User defined Functions: Introduction to Python User defined Function, function definition, function calling, Passing parameters to a function and returning values from a function, Recursion, Scope of variables- Local variable and Global variable Program Solving practice on the above concept	09	20
5.	Python Libraries for AI/ML Modules: Introduction to python module, Writing Module, Importing Module , importing objects from module, Built-in Modules- Numeric and Mathematic module Packages: Introduction to Packages, Writing Packaging, Matplotlib Package:- plot(),show(), xlabel(), ylabel(),grid(),bar(), hist(), subplot(), pie(), savefig() Numpy Package:- Creating Numpy arrays, Array attributes (shape, ndim, size, dtype, itemsize), Array Initialization, indexing and Slicing, Array Operations, Basic Numpy math and statistic Function- np.sum(), np.min(), np.max(), np.mean(), np.std(), np.var(), np.dot(), np.cross(), np.matmul() Pandas: Introduction, creating DataFrame, reading CSV files, simple data analysis Program Solving practice on the above concept	09	20
Total		45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
12	16	42	0	0	0

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)



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References/Suggested Learning Resources:

(a) Books:

1. Charles Dierbach, "Introduction to Computer Science Using Python: A Computational Problem-Solving Focus", John Wiley & Sons (25 January 2013), ISBN-10: 0470555157, ISBN-13: 978-0470555156
2. John Zelle, "Python Programming: An Introduction to Computer Science", Franklin, Beedle & Associates Inc; Pap/Cdr edition (1 December 2003), ISBN-10 : 1590280288, ISBN-13 : 978-1887902991
3. Liang Y. Daniel, "Introduction to Programming Using Python", Pearson Education; First edition (26 February 2017), ISBN-10: 9332551847, ISBN-13: 978-9332551848
4. R. Nageswara Rao, "Core Python Programming", Dreamtech Press (1 September 2021), Delhi; ISBN-10: 9390457157, ISBN-13: 978-9390457151
5. Paul Barry, "Head First Python", Shroff/O'Reilly; Second edition (1 December 2016)., ISBN-10: 9789352134823, ISBN-13: 978-9352134823
6. Lutz M, "Learning Python", Shroff; Fifth edition (1 January 2013), ISBN-10:7301152519, ISBN-13:7301152519-799

(b) Open source software and website:

1. <https://www.python.org>
2. <https://www.learnpython.org>
3. <https://www.python-course.eu>
4. <https://nptel.ac.in>
5. <https://www.youtube.com>
6. <https://www.edx.org>
7. <https://www.coursera.org/in>
8. <https://www.udemy.com>
9. <https://www.programiz.com/python-programming/online-compiler/>
10. https://www.onlinegdb.com/online_python_compiler
11. <https://www.online-python.com>

Suggested Course Practical List:

1. Install and configure the Python environment. Run basic Python commands to verify the Python environment.
2. Design and Test Python program to read your name, contact number, email, and birth-date and print those details on the screen.
3. Design and Test Python Program to perform create access, update and delete operation on List, Tuple, Sets and Dictionary.
4. Design and Test Python Program to demonstrate use of conditional statements: if, if...else, if...elif...else statement.
5. Design and Test Python Program to demonstrate use of Operators: Arithmetic, Logical, Comparison, Assignment, Bitwise, Membership and Identity Operator.
6. Design and Test Python Program to demonstrate use of looping statement: while, for, and Nested loop.
7. Design and test a Python program using user defined function for given problem.
8. Design and Test Python Program to demonstrate use of math and string in-built functions.



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9. Design and Test Python Program to demonstrate use of built in modules and user defined modules.
10. Design and Test Python Program to demonstrate use of built in packages and user defined packages.
11. Design and Test Python Program to demonstrate use of string processing functions.
12. Design and Test Python Program to demonstrate use of basic file functions.

List of Laboratory/Learning Resources Required:

1. Computer with basic configuration with windows or unix os
2. Text Editor (VS Code, Sublime Text, Atom, Vim or any other editor) or Python IDE (IDLE, PyCharm, PyDev, Spyder or any other IDE)
3. Python Interpreter (Versions: 3.6.x or higher)
4. Jupyter Notebook (Optional)

Suggested Project List:

1. Create a basic calculator application to practice functions and control structures.
2. Develop a number-guessing game using loops and conditional statements.
3. Create a system for managing books, including features for adding, updating, and deleting records.
4. Create a program to plot sine and cosine waves using Matplotlib.
5. Use dictionaries and inheritance to manage employee details and calculate salaries.
6. Design an application to manage daily expenses, storing data in a file.
7. Create a program that uses modules to fetch and display weather data for a given location.

Suggested Activities for Students:

- a) <https://www.codechef.com/> , in this website very elementary programs are available, students are expected to solve those programs
- b) <https://code.org/>, an hour of coding event may be organized and students are encouraged to participate.
- c) Students are encouraged to register themselves in various MOOCs such as: Swayam, edx, Coursera, Udemy etc to further enhance their learning.
- d) Encourage students to participate in different coding competitions like Hackathon, online competitions on codechef etc.
- e) Encourage students to form a coding club at institute level.