



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Mechatronics Engineering

Subject Code : DI04020041

Subject Name : Programming in Python

w. e. f. Academic Year:	2025-26
Semester:	4 th
Category of the Course:	Professional Elective - II

Prerequisite:-	Basic computer skills, including the ability to write basic statements and expressions.
Rationale:	Computer programming skills are now becoming part of basic education as these skills are increasing of vital importance for future job and career prospects. The Python programming language is one of the most popular programming languages worldwide. The course emphasizes the use of python programming in multiple domains. Python is a modern language for writing compact codes specifically for programming Server-side web apps, Data Analytics and Machine Learning, an important Artificial Intelligence domain. Furthermore, Python has gained popularity in scientific computing, production tools and game programming. This course focuses on developing python programming to do a variety of programming tasks where the students are encouraged to develop basic applications using different open-source tools. At the end of the course, the student will be developing adequate basic programming skills using python language.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Understand basic problem-solving techniques using algorithms, flowcharts, and pseudocode.	R / U / A
02	Explain fundamentals of Python programming including syntax, data types, operators, and program structure.	R / U / A
03	Apply flow control statements for decision making and repetition in Python programs.	R / U / A
04	Develop modular programs using functions and Python standard library modules.	R / U / A
05	Implement appropriate Python data structures such as strings, lists, sets, tuples, and dictionaries to solve programming problems.	R / U / A



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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)	
03	00	02	04	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Basic Concepts and Problem Solving using Flowchart and Algorithm	04	11
2.	Fundamentals of Python Programming	12	26
3.	Flow of Control	8	20
4.	Functions and Python Standard Library	10	20
5.	Python Data Structures	11	23
Total		45	100

Suggested Specification Table with Marks (Theory):

Sr.No	Unit Title	Teaching Hours	Distribution of Theory Marks (in %)						Total Marks
			R	U	A	N	E	C	
1.	Basic Concepts and Problem Solving using Flowchart and Algorithm	04	4	2	2				8
2.	Fundamentals of Python Programming	12	6	8	4				18
3.	Flow of Control	8	2	4	8				14
4.	Functions and Python Standard Library	10	4	4	6				14
5.	Python Data Structures	11	4	6	6				16
		45	20	24	26				70
			28%	34%	38%				100%



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

COURSE DETAILS:-

Unit No.	Topics and Sub-topics	No. of Hours	% Weightage
Unit – I Basic Concepts and Problem Solving using Flowchart and Algorithm	1.1 Introduction, Steps for problem-solving, Algorithm and its characteristics, Importance of algorithm. 1.2 Symbolic representation of a flowchart, Importance and Limitations of flowchart, Flow of control 1.3 Problem solving using pseudocode	04	11
Unit– II Fundamentals Of Python Programming	2.1 Fundamentals of python, key features of Python, Common Applications of python programming 2.2 Python Installation 2.3 Basic structure of python program, Python Comments, Keywords, identifiers, variables, Data types, and Operators. 2.4 Type Conversion: Need, Built in conversion etc.	12	26
Unit– III Flow of Control	3.1 Introduction to Flow of Control 3.2 Selection If statement Elif statement Nested if statement 3.3 Repetition For loop While loop Nested loop 3.4 Break and Continue Statements	8	20
Unit-IV Functions and Python Standard Library	4.1 Introduction to Functions • User Defined Functions • Arguments and Parameters 4.2 Scope of a Variable • Global Variable • Local Variable 4.3 Python Standard Library • Built-in functions • Input or output - input() , print() • Mathematical Functions - abs(), divmod(), max(), min(), pow(), sum()	10	20



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	● Module - math, random, statistics		
Unit-V Python Data Structures	5.1 Introduction to Strings 5.2 String Methods and Built-in Functions 5.3 Introduction to Lists and List Operations 5.4 List Methods and Built-in Functions 5.5 Introduction to Set, Tuple and Dictionary	11	23

SUGGESTED PRACTICAL EXERCISES:-

The following practical outcomes (PrOs) are the sub-components of the COs. Some of the PrOs marked '*' are compulsory, as they are crucial for that particular CO at the 'Precision Level' of Dave's Taxonomy related to 'Psychomotor Domain'.

Sr. No.	Practical Outcomes (PrOs)	Unit	Approx. Hrs. required
1.	Study of problem-solving steps and algorithm development. Write algorithms for simple problems (addition, average, largest number). Draw flowcharts for basic problems using standard symbols. Convert given algorithms and flowcharts into pseudocode.	I	04*
2.	Study of Python environment, installation, and execution of Python programs.	II	02
3.	Write a Python program to display "Hello World" and basic output formatting.	II	02
4.	Write Python programs using variables, keywords, identifiers, and data types.	II	02
5.	Write Python programs demonstrating arithmetic, relational, and logical operators.	II	02
6.	Write Python programs demonstrating type conversion (implicit and explicit).	II	02
7.	Write a Python program using if statement.	III	02
8.	Write a Python program using if-else statement.	III	02
9.	Write a Python program using nested if statement.	III	02
10.	Write Python programs using for loop.	III	02



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11.	Write Python programs using while loop.	III	02
12.	Write Python programs using nested loops.	III	02
13.	Write Python programs demonstrating break and continue statements.	III	02
14.	Write a Python program to define and call a user-defined function.	IV	02
15.	Write Python programs using functions with arguments and return values.	IV	02
16.	Write Python programs demonstrating global and local variables.	IV	02
17.	Write Python programs using built-in functions input() and print().	IV	02
18.	Write Python programs using mathematical functions such as abs(), max(), min(), pow(), and sum().	IV	02
19.	Write Python programs using standard library modules math, random, and statistics.	IV	02
20.	Write Python programs demonstrating string operations.	V	02
21.	Write Python programs using string methods and built-in functions.	V	02
22.	Write Python programs demonstrating list creation and list operations.	V	02
23.	Write Python programs demonstrating set creation and set operations.	V	02
24.	Write Python programs using tuple creation, accessing, and slicing.	V	02
25.	Write Python programs demonstrating dictionary creation and basic operations.	V	02
*	Suggested to cover 3 to 4 programs from Unit II, III, IV and V from the given above list.		
Total (Hours)			30

NOTES:-

I. More Practical Exercises can be designed and offered by the concerned course teacher to develop the industry-relevant skills/outcomes to match the COs. The above table is only a representative list.



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II. It is compulsory to prepare log book/continuous records of exercises. It is also required to get each exercise recorded in log book/continuous records, checked and duly dated signed by teacher. CA component of practical marks is dependent on continuous and timely evaluation of exercises.

III. Term work report must not include any photocopy/ies, printed manual/pages, litho, etc. It must be hand written / hand drawn by student only.

- Brief details of industry visited.
- Type, location, products, rough layout, human resource, etc., of industry.
- Details, description and broad specifications of machineries/processes observed.
- Safety norms and precautions observed.
- Student's own observation on industrial environment, productivity concepts, quality consciousness and quality standards, cost effectiveness, culture and attitude.
- Any other details/ observations asked by accompanying faculty.

IV. For practical ESE part, students are to be assessed for competencies achieved. They should be assigned the necessary data and should be given any one experience to perform. The following are some sample 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above-listed Practical Exercises of this course required, which are embedded in the COs and, ultimately, the competency.

➤ SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

In the subject Programming in Python for Mechatronics Engineering, instructors shall emphasize the thorough understanding of fundamental concepts, principles, and practical applications. To facilitate this, simple illustrative problems should be presented in class, complemented by structured tutorial exercises designed to progressively develop students' comprehension of core principles. Classroom instruction shall, wherever feasible, be reinforced through live demonstrations and hands-on laboratory sessions utilizing various Python IDEs and code editors.

8. References/Suggested Learning Resources:

(a) Books:

Sr. No	Title of Book	Author	Publication
1	Learn Programming in Python with Cody Jackson	Cody Jackson	Packt Publishing, 2018, ISBN : 9781789531947
2	Python Basics: A Practical Introduction to Python 3	David Amos, Dan Bader et. al.	Real Python, 2021 ISBN : 9781775093329



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3	Introduction to Problem Solving with Python	E. Balagurusamy	Mc Graw Hill India, New Delhi ISBN: 9789352602582
4	Beginning Python	James Payne	Wiley, 2010 ISBN: 9780470414637
5	Think Python	Allen Downey	O'Reilly, USA, 2016, ISBN : 978-9352134755

(b) Open source software and website:

1. www.python.org
2. www.learnpython.org
3. www.hackr.io/tutorials/learn-python
4. www.sololearn.com/learning/1073
5. www.nptel.iitm.ac.in
6. https://www.w3schools.com/python/python_intro.asp
7. <https://www.geeksforgeeks.org/python-programming-language-tutorial/>

9. MAJOR EQUIPMENT / INSTRUMENTS AND SOFTWARE REQUIRED

Sr. No.	Equipment Name with Broad Specifications	PrO. No.
1	Computer system with operating system: Windows 7 or higher Ver., macOS, and Linux, with 4GB or higher RAM, Python versions:2.7.X, 3.6.X	All
2	Python IDEs and Code Editors Open Source : IDLE, Jupyter	2 to 25

10. Suggested Project List & Student Activities:

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be **individually** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should **not exceed three**. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro- project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain a dated work diary consisting of individual contributions in the project work and give a seminar presentation of it before submission. The total duration of the micro project should not be less



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than **16 (sixteen) student engagement hours** during the course. The student ought to submit a micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects is given here. This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

Case Study 1: Compare three various tools functionality for python programming in the Mechatronics domain

Case Study 2: List out features of latest python version and compare with older two different versions.

Case Study 3: Study math and random module of python and explain real life usage with examples. List their importance in Information Communication Technology

Case Study : Practice logic building using scratch tool available free and online by mit
