GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Post Graduate Diploma in Data Science

Level: PG Diploma

Branch: Data Science

Subject Code : DS01080041

Subject Name : Python for Data Science

w. e. f. Academic Year:	2025-26
Semester:	1
Category of the Course:	Compulsory

Prerequisite:	Programming concepts, Statistical and numerical methods
Rationale:	To write compact codes specifically for programming in Data Analytics, AI and scientific computing. To understand and use various constructs available in python language. To understand and apply various functions on file data.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Select and apply the appropriate data structures available in Python programming language in solving computational problems.	N
02	Work on data stored in text files.	E
03	Design applications applying various operations for data cleansing and transformation.	R
04	Use various data visualization tools for effective interpretations and insights of data.	U
05	Perform data Wrangling with Scikit-learn applying exploratory data analysis.	A

**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
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
2	0	6	5	70	30	0	50	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Introduction To Python** History of Python, Installation and Working with Python, Understanding Python variables, Python basic Operators, Understanding python blocks, Applications of Python, Introduction to anaconda, python variable declaration, Keywords, Indents in Python, Python input/output operations	6	10
2.	**Python for Data Science** Discovering the match between data science and python, Defining the Sexiest Job of the 21st Century, Considering the emergence of data science, Outlining the core competencies of a data scientist, Linking data science, big data, and AI , Understanding the role of programming, Creating the Data Science Pipeline, Preparing the data, Performing exploratory data analysis, Learning from data, Visualizing, Obtaining insights and data products, Understanding Python's Role in Data Science, Considering the shifting profile of data scientists, Working with a multipurpose, simple, and efficient language, Learning to Use Python Fast ,Loading data, Training a model, Viewing a result	6	10
3.	**Python Data Types** Declaring and using Numeric data types: int, float, complex, Using string data type and string operations, Defining list and list slicing, Use of Tuple data type, Set, Dictionary (characteristics and methods)	4	10
4.	**Python Program Flow Control** Conditional blocks using if, else and elif, Simple for loops in python, For loop using ranges, string, list and dictionaries, Use of while loops in python, Loop manipulation using pass, continue, break and else, Programming using Python conditional and loops block	4	20
5.	**Python Functions, Modules And Packages**	6	20

	Organizing python codes using functions, Variable argument function, Organizing python projects into modules, Importing own module as well as external modules, Understanding Packages, Powerful Lamda function in python, Programming using functions, modules and external packages		
6.	**Python String, List And Dictionary Manipulations** Building blocks of python programs, Understanding string in build methods, List manipulation using in build methods, Dictionary manipulation, Programming using string, list and dictionary in build functions	6	10
7.	**Python File Operation** Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations, Compressing Files with the zipfile Module	6	10
8.	**Python Exception Handling and Web Scrapping** Avoiding code break using exception handling, Safe guarding file operation using exception handling, Handling and helping developer with error code, Programming using Exception handling, Downloading Files from the Web with the requests Module.	4	10
	Total	**42**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	**20**	**20**	**10**	**20**	**20**

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

References/Suggested Learning Resources:

(a) Books:

1. Core Python Programming by Dr. R. Nageswara Rao DreamTech, Second edition
2. Core Python Programming by Wesley J. Chun
   Prentice Hall PTR, Second Edition, ISBN-13: 978-0132269933, ISBN-10: 0132269937
3. Data Structures and Algorithms in Python
   by Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser Wiley
4. Fundamentals of Python – First Programs by Kenneth A. Lambert
   CENGAGE Publication, ISBN-13: 978-1111822705, ISBN-10: 1111822700
5. Python for data science for dummies by John Paul Mueller, Luca Massaron 2nd Edition, Wiley
6. Wesley J Chun, "Core Python Applications Programming", 3rd Edition,
   Pearson Education India, 2015. ISBN-13: 978-9332555365.

(b) Open source software and website:

1. https://pandas.pydata.org/?utm_source=chatgpt.com
2. https://pytorch.org/?utm_source=chatgpt.com
3. https://code.visualstudio.com/?utm_source=chatgpt.com
4. https://www.kaggle.com/?utm_source=chatgpt.com
5. www.anaconda.com
6. www.python.org
7. www.w3schools.com
8. https://www.learnpython.org/

Suggested Course Practical List: **(at least 10 practical are to be performed by students. These practical should cover majority of all topics of syllabus.)**
This is the suggested list of practical but it may not be limited only to this list.

1. Print "Hello World" message.
2. Find maximum from 3 given numbers.
3. Print sum of all numbers within given range.
4. Print all prime numbers within given range.
5. Print largest odd number from 10 entered numbers.
6. a. Develop a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks and percentage with suitable messages.
   b. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.
7. Print sum of all decimal numbers from entered a string of numbers separated by comma.
8. Write a function that demonstrates the use of positional arguments, keyword arguments and default parameters.
9. Write a function that manipulate given strings by user.
10. Print series of fibonacci numbers upto a given limit using recursion.
11. Print binary equivalent of given decimal number using recursion.
12. Print LCM and GCD of 2 numbers using recursion.
13. Write a function that demonstrates scope of variable in nested functions.
14. Check a given string is palindrome or not using recursion.
15. Reverse the given string using recursion.
16. A program which calculates square root of decimal number using recursive function and also displays number of times function called.
17. An interactive program where one module asks numbers from user and second module performs at least six arithmetic operations on them.
18. Develop a program to sort the contents of a text file and write the sorted contents into a separate text file. [Hint: Use string methods strip(), len(), list methods sort(), append(), and file methods open(),readlines(), and write()].
19. A program to count the number of words, number of lines, occurrence of particular word, occurrence of particular character, number of blank spaces in a text file.
20. A program to read a string from the user and append it into a file.
21. A program to copy the contents of one file into another.

22. A program to read a text file and print all the numbers present in the text file.

23. A program to append the contents of one file to another file.
24. A program to read a file and capitalize the first letter of every word in the file.

25. A program to read the contents of a file in reverse order.
26. A program to sort all even numbers and then all odd numbers in given list.
27. A function that takes 2 lists as an argument and returns true if both contains same elements not necessarily in same order.
28. A function that reads the words in words.txt and stores them as keys in a dictionary. It doesn't matter what the values are. Then you can use the in operator as a fast way to check whether a string is in the dictionary.

29. A function that takes a list as an argument and returns first & last even number. If only one even number exists or no even number exists, exception is raised.

30. Illustrate the working of scraping websites with CSV.

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