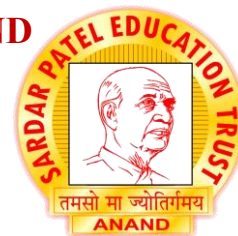




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Revised Syllabus as per NEP 2020 with effect from the Academic Year 2026-2027

Master of Science (Data Science)

Semester – I

Course Code	PGN1CMDS01	Title of the Course	Programming in Python
Total Credits	04	Hours per Week	04 Hours / Week

Course Learning Outcomes (CLOs)

CLO 1	Explain Python programming fundamentals, data structures, control structures, functions and built-in utilities.
CLO 2	Apply NumPy and SciPy for numerical computing, array operations and mathematical analysis.
CLO 3	Perform data manipulation, cleaning, aggregation and analysis using Pandas.
CLO 4	Create meaningful visualizations using Matplotlib for exploratory data analysis.

Course Content

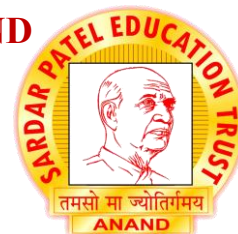
Unit No.	Description	Weightage (%)
1.	Python Language Basics, Built in Data Structure, Function - Python Introduction, advantages of python over data science. - Python Installation, Interpreter, IDEs (PyCharm) and Text Editors - Data structure and sequences (Tuple, List Dict, Set, Built in Sequences Functions) - Python basic Programming (conditionals, loops) - Functions : Local, Scope, Lamda Function - Built in Functions	25%
2.	Introduction and Basics of Numpy, Scipy - Numpyndarrays (Creation, Datatypes, Arithmetics with ndarray) - Universal Functions (UFances), ScipyFuctions - Aggregations between ndarrays - Sorting Arrays (K-Nearest Neighbors example) - Linear Algebra, Pseudorandom Number Generation - Basic Indexing and Slicing with ndarray	25%
3.	Data manipulation with Pandas - Introduction of Pandas Data Structures (Series, Data Frames, Index) - Data Indexing and Selection - Arithmetic and Data Alignment	25%



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	• Concatenate, append, merge and join of combining Datasets • Aggregation and Grouping • Pivot tables, Pandas String Operations	
4.	Visualization with Matplotlib • General Introduction about Matplotlib basics • Line Plots, Scatter Plots, Visualizing Errors • Histogram, Binnings and Density • Customizing Plot, Color bars, Ticks • Multiple Subplots • Three Dimensional Plotting in Matplotlib	25%

Teaching – Learning Methodology

The course would be taught / learnt through ICT (e.g. Power Point Presentation, Audio-Visual Presentation), Lectures, Quizzes, Assignments, Case Study and Browsing E- Resources & Practical Learning.

Examination Evaluation Pattern

Sr. No.	Particulars	Weightage (%)
01	Continuous and Comprehensive Evaluation (CCE) (Formative Assessment)	50%
02	Semester End Evaluation (SEE) (Summative Assessment)	50%
	TOTAL	100%

Specifications for CCE and SEE

Sr. No.	Details of the Evaluation Pattern	Marks
01	Continuous and Comprehensive Evaluation (CCE) (Formative Assessment)	
	A Assignments	10
	B Multiple Choice Questions	05
	C Attendance	05
	D Written Examination (01 Hour)	30
	(Formative Assessment) (A + B + C + D)	50 Marks
02	Semester End Evaluation (SEE) (Summative Assessment)	
	E Written Examination (02 Hours)	50 Marks
	TOTAL(For 04 Credit Courses)	100 Marks

Rubrics – Based Assessment for Assignments (10 Marks)

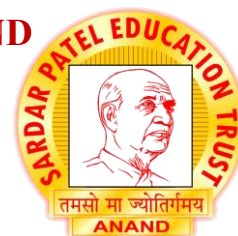
Excellent	09 – 10 Marks	Correct logic and syntax, accurate execution/output, well-structured code, excellent conceptual understanding, proper use of unit-specific tools/functions
Good	07 – 08 Marks	Minor syntax or logical errors, good conceptual clarity, mostly



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		correct program/output, proper use of constructs with few mistakes
Average	05 – 06 Marks	Basic understanding of concepts, some logical/syntax errors, partially correct program/output
Basic	03 – 04 Marks	Limited conceptual clarity, noticeable logical/syntax errors, incomplete or partially working solution
Poor	01 – 02 Marks	Inadequate understanding, incorrect logic, major syntax errors, program does not execute properly
Below Poor	Zero Marks / NA	Irrelevant answer or not attempted

Note:

- Assignments may be taken in forms of written project, computerized and online suggested courses / certificates as per the decision made by the respective faculties of the courses.

Rubrics – Based Assessment for Multiple Choice Questions (05 Marks)

05 Multiple Choice Questions – 01 Mark Each (05 Marks)

Excellent	01 Mark	The chosen option is correct, no errors in response
Below Poor	Zero Marks / NA	Chosen option is incorrect, completely irrelevant, multiple options chosen / Not Attempted

Rubrics – Based Assessment for Attendance (05 Marks)

As per the Rules and Regulations provided by the Academic Section of Sardar Patel University, Vallabh Vidyanagar, for the students studying in all departments and colleges.

Reference No.: E – 3 / 3127; dated: 07-03-2024.

<https://www.spuvvn.edu/orbit-cdn/uploads/circulars/Circular-NEP-InternalExamMarks-March-April24.pdf>

Excellent	05 Marks	More than 90% (Minimum 54 Hours for 04 Credits Courses)
Good	04 Marks	80% - 89% (48 to 53 Hours for 04 Credit Courses)
Average	03 Marks	70% - 79% (42 to 47 Hours for 04 Credit Courses)
Poor	Zero / NA	Less than 70% (Less than 42 Hours) (NOT ELIGIBLE TO APPEAR FOR EXAM)

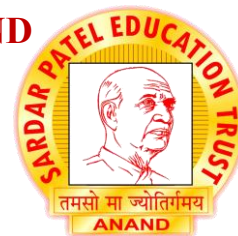
Note:

- Students with below 70% of attendance must submit their written application to their respective class coordinators with genuine reasons and evidence (in case of working or medical emergencies). Students must **not** pursue dual degree programmes that clash with the college's timings.



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Rubrics – Based Assessment for Mid-Semester Examination (30 Marks)		
Any Two Unit or 50% of The Syllabus - 15 Marks Each Question		
Excellent	13 – 15 Marks	Accurate, error-free, logically presented, timely submission
Good	10 – 12 Marks	Minor errors and good conceptual clarity
Average	07 – 09 Marks	Basic understanding or partially correct
Basic	04 – 06 Marks	Limited clarity, noticeable mistakes, incomplete content
Poor	01 – 03 Marks	Inadequate conceptual clarity, incorrect content
Below Poor	Zero Marks / NA	Content is irrelevant / Not Attempted / Not Submitted
Note: Written Examination questions will be based on various levels of Revised Bloom's Taxonomy.		

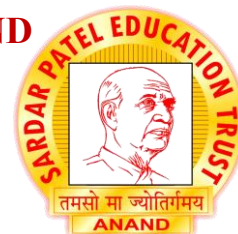
Rubrics – Based Evaluation Pattern for End-Semester Examination (50 Marks)		
06 Multiple Choice Questions – 01 Mark Each (06 Marks)		
Excellent	01 Mark	The chosen option is correct, no errors in response
Below Poor	Zero Marks / NA	Chosen option is incorrect, completely irrelevant, multiple options chosen / Not Attempted
Short Question (12 Marks) – 6 Question from all Units		
Excellent	02 Marks	Demonstrates accurate understanding of concepts related to questions. Provides correct calculations, appropriate formulas, and clear explanations with complete answers.
Good	01 Mark	Shows partial understanding of concepts with some correct steps or explanations. Minor errors or incomplete answers may be present.
Poor	00 Mark	Incorrect, irrelevant, or no response provided.
UNIT I - 08 Marks Each Question		
Excellent	06 – 08 Marks	Correctly applies Python fundamentals including variables, data types, operators, conditionals, loops, data structures (list, tuple, dictionary, set), and functions. Demonstrates strong logical thinking and accurate program execution.
Good	04 – 06 Marks	Understands Python basics and programming constructs with minor mistakes. Most programs are logically correct.
Average	03 – 04 Marks	Shows moderate understanding of Python syntax and concepts but lacks completeness or accuracy.



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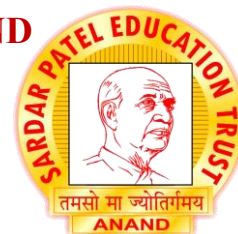
Basic	02 – 03 Marks	Demonstrates basic awareness of Python concepts but cannot effectively implement programs.
Poor	01 – 02 Marks	Shows minimal understanding and writes largely incorrect programs.
Below Poor	Zero Marks / NA	No attempt or completely irrelevant response.
UNIT II - 08 Marks Each Question		
Excellent	06 – 08 Marks	Correctly applies arrays, indexing, slicing, arithmetic operations, aggregations, sorting, linear algebra, random number generation, and scientific functions. Demonstrates strong analytical and numerical computation skills.
Good	04 – 06 Marks	Understands array operations and scientific computing concepts with minor mistakes. Most outputs are correct.
Average	03 – 04 Marks	Shows moderate understanding of NumPy/SciPy concepts but lacks accuracy in implementation.
Basic	02 – 03 Marks	Demonstrates basic awareness of arrays and operations but struggles in practical application.
Poor	01 – 02 Marks	Shows minimal understanding and provides incorrect solutions.
Below Poor	Zero Marks / NA	No attempt or completely irrelevant response.
UNIT III - 08 Marks Each Question		
Excellent	06 – 08 Marks	Correctly applies Series, DataFrames, indexing, selection, merging, joining, grouping, aggregation, pivot tables, and string operations. Demonstrates strong data analysis and manipulation skills.
Good	04 – 06 Marks	Understands data structures and manipulation concepts with minor mistakes. Most operations are correct.
Average	03 – 04 Marks	Shows moderate understanding of data handling concepts but lacks completeness or accuracy.
Basic	02 – 03 Marks	Demonstrates basic awareness of data manipulation but cannot apply concepts effectively.
Poor	01 – 02 Marks	Shows minimal understanding and provides largely incorrect solutions.
Below Poor	Zero Marks / NA	No attempt or completely irrelevant response.
UNIT IV - 08 Marks Each Question		



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Excellent	06 – 08 Marks	Correctly creates and customizes line plots, scatter plots, histograms, subplots, 3D plots, labels, ticks, and visual elements. Demonstrates strong visualization and interpretation skills.
Good	04 – 06 Marks	Understands plotting and visualization concepts with minor mistakes. Most graphs are meaningful and correct.
Average	03 – 04 Marks	Shows moderate understanding of visualization concepts but lacks clarity or accuracy.
Basic	02 – 03 Marks	Demonstrates basic awareness of plotting concepts but struggles to generate meaningful graphs.
Poor	01 – 02 Marks	Shows minimal understanding and produces incorrect or unclear visualizations.
Below Poor	Zero Marks / NA	No attempt or completely irrelevant response.

Note:

- Multiple Choice Questions of 10 Marks will be based on various levels of Revised Bloom's Taxonomy.
- Written Examination questions will be based on various levels of Revised Bloom's Taxonomy.

PLO – CLO Mapping								
Programming in Python								
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8
CLO 1	3	2	1	1	0	0	0	2
CLO 2	3	3	2	2	1	0	0	2
CLO 3	3	3	3	2	2	1	0	2
CLO 4	3	3	3	3	3	1	1	3

Note:

High: **03**; Moderate: **02**; Low: **01**; No Mapping: **00**

Suggested References and E-Resources for Further Reading
- Python Data Science Handbook: Essential Tools for Working with Data — Jake VanderPlas (2016) - Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython (2nd Edition) — Wes McKinney (2017) - Learning Python (4th Edition) — Mark Lutz (2009) https://www.w3schools.com/datascience/ds_python.asp https://www.geeksforgeeks.org/data-science-with-python-tutorial/
