Programme	BS Computational Statistics and Data Analytics	Course Code	CSTA-302	Credit Hours	3
Course Title	Programming with Python				

Course Introduction

This course provide a thorough introduction to Python programming covering essential concepts such as variables, conditionals, and iteration. Students learn to utilize Python's built-in data structures and functions, alongside practical applications in data analysis. The course extends to data analysis techniques using libraries like NumPy and Pandas, including data cleaning, visualization, and aggregation. Students also gain exposure to time series analysis and introductory modeling libraries, empowering them with skills for real-world data manipulation and interpretation.

Learning Outcomes

By the end of this course, students will be able to:

1. Master basic programming tools using Python.
2. use python as a machine learning platform

Course Content		Assignments/Readings
Week 1	**Unit – I** Introduction to Programming in Python: Overview of Python programming language, its features, and applications Advantages of Python for beginners and professionals alike	
	Unit – II Why Python? Exploring the reasons why Python has become one of the most popular programming languages Discussion on Python's simplicity, readability, and versatility	
Week 2	**Unit – III** Variables: Understanding variables and their role in storing data in Python	
	Unit – IV Declaring variables, variable naming conventions, and data types	
Week 3	**Unit – V** Numbers: Working with numeric data types in Python: integers, floating-point numbers, and complex numbers	
	Unit – VI Basic arithmetic operations and mathematical functions in Python	
Week 4	**Unit – VII** Strings & Arrays:	

	Introduction to string data type and string manipulation techniques in Python	
	Unit – VIII Overview of arrays in Python and basic array operations	
Week 5	**Unit – IX** Dictionaries: Understanding dictionary data type and its use for key-value mappings	
	Unit – X Manipulating dictionaries and accessing values using keys	
Week 6	**Unit – XI** Conditionals: Introduction to conditional statements (if-else) in Python for decision-making	
	Unit – XII Using logical operators for complex conditional expressions	
Week 7	**Unit – XIII** Iteration: Understanding iteration constructs (for loops, while loops) in Python for repetitive tasks Examples of iteration over lists, strings, arrays, and other data structures	
	Unit – XIV Python Language Basics: Exploring advanced Python language features such as list comprehensions, generators, and decorators	
Week 8	**Unit – XV** Development Environments: Introduction to popular Python development environments: VS Code and Jupyter Notebooks	
	Unit – XVI Setting up and configuring Python development environments for efficient coding	
Week 9	**Unit – XVII** Built-In Data Structures: Deep dive into Python's built-in data structures: lists, tuples, sets, and frozensets	
	Unit – XVIII Understanding the properties, methods, and use cases of each data structure	
Week 10	**Unit – XIX** Functions: Writing and defining functions in Python for code	

	reusability and modularity	
	Unit – XX Understanding function arguments, return values, and scope	
Week 11	**Unit – XXI** NumPy Basics: Arrays Computation: Introduction to NumPy library for numerical computing in Python	
	Unit – XXII Creating and manipulating NumPy arrays for efficient computation	
Week 12	**Unit – XXIII** Vectorized Computation: Understanding vectorized operations and broadcasting in NumPy arrays	
	Unit – XXIV Leveraging NumPy's vectorized computation capabilities for fast array processing	
Week 13	**Unit – XXV** Pandas: Data Loading and Storage: Introduction to Pandas library for data manipulation and analysis in Python	
	Unit – XXVI Loading data from various sources and formats into Pandas DataFrame	
Week 14	**Unit – XXVII** Data Cleaning and Preparation: Techniques for cleaning and preparing data in Pandas: handling missing values, duplicates, and outliers	
	Unit – XXVIII Preprocessing data for analysis and modeling tasks	
Week 15	**Unit – XXIX** Data Wrangling: Join, Combine, Reshape: Performing data wrangling operations in Pandas: merging, joining, concatenating, and reshaping data	
	Unit – XXX Plotting and Visualization: Introduction to data visualization using Pandas, Matplotlib, and Seaborn libraries	
Week 16	**Unit – XXXI** Data Aggregation and Group Operations: Performing data aggregation and group operations in Pandas for summarizing and analyzing data Using groupby() function for splitting, applying, and	

	combining data	
	Unit – XXXII Introduction to Modeling Libraries in Python: Overview of popular modeling libraries in Python such as Scikit-learn, TensorFlow, and PyTorch Understanding the capabilities and applications of each modeling library	

Textbooks and Reading Material

Text Book

1. Lee, K. D. (2011). *Python programming fundamentals*. London: Springer.

Suggested Readings

1. Lutz, M. (2001). *Programming python*. " O'Reilly Media, Inc.".
2. Zelle, J. M. (2004). *Python programming: an introduction to computer science*. Franklin, Beedle & Associates, Inc.

Teaching Learning Strategies

Class Lecture method, which includes seminars, discussions, assignments and projects. (Audio-visual tools are used where necessary)

Assignments: Types and Number with Calendar

According to the choice of respective teacher.

Assessment

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	It takes place at the mid-point of the semester.
2.	Formative Assessment	25%	It is continuous assessment. It includes: Classroom participation, attendance, assignments, and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.