

Model Syllabus for 4-Year UG Honours in B.Com.(ComputerApplications) as Major in consonance with Curriculum framework w.e.f. AY **2026-27**

COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No.of Hrs /Week	No. of Credits
II	IV	8	Advanced Accounting	5	4
		9	Cost and Management Accounting	5	4
		10	Data Science using Python	3	3
			Data Science using Python-Practical	2	1

SEMESTER-IV

COURSE 10: DATA SCIENCE USING PYTHON

Theory	Credits: 3	3 hrs/week
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Course Objectives:

1. To introduce students to the foundational concepts and significance of data science in modern business and technology contexts.
2. To develop proficiency in Python programming, focusing on data types, control structures, and core operations.
3. To equip students with skills in handling and manipulating structured and unstructured data using Python libraries.
4. To enable students to perform exploratory data analysis and data cleaning using tools like NumPy and Pandas.
5. To foster the ability to visualize data effectively using Python libraries such as Mat plot lib and Sea born.

Course Outcomes:

1. Understand the role of data science, its components, and its relationship with AI and machine learning.
2. Apply Python programming constructs such as strings, lists, tuples, sets, and dictionaries to solve basic data problems.
3. Demonstrate the ability to perform data manipulation and cleaning using NumPy and Pandas.
4. Conduct exploratory data analysis and extract insights from data sets using Python- based tools.
5. Create and customize data visualizations using Mat plot lib and Sea born to communicate analytical findings.

Unit-I: Introduction to Data Science

Importance of Data Science:Needfor Data Science,What is Data Science? Data Science process,Business Intelligence and Data Science, Categories of Data: Unstructured data,Structured data, Semi Structured data,Time series data, Sources of data: APIs, Web pages, Databases, Files, Taxonomy of types of data. Data Scientist: Responsibilities of a data scientist, Skills required for a data scientist, Programming and Analysis tools for Data Science.

Unit-II: Basic Python: Part-I

Features of Python,writing and executing python program,Indentation,Constants,Identifiers, Variables, Keywords,Data types,Input/Output,Operators. Conditional statements,Looping Statements. Strings: Definition, Positive, Negative indexing, String slicing, String Operations:Concatenation,Repetition,Membership(in,notin),Comparison,StringMethods:upper(), lower(),strip(), replace(), split(), join(),find(). Lists:Definition, Indexing,Slicing, Negative Indexing, Nested Lists, Modifying Lists: Updating, Inserting, Deleting elements, List Functions: len(),max(),min(),sorted(),Looping through Lists.

Unit-III : Basic Python: Part-II

Tuples : Definition, Indexing, Slicing, Nested tuples, Tuple Operations: Concatenation, repetition, membership testing, Tuple Methods: count(), index(). Sets: Definition, Accessing Set elements, Modifying Sets, Set Operations: Union, Intersection, difference, Symmetric Difference. Dictionaries: Definition, accessing elements, Modifying Dictionaries, Dictionary methods. Functions: User defined functions, built-in functions, lambda functions, recursive functions. Modules: math, random.

Unit-IV :Advance Python: Part-I

Exploratory Data Analysis: What is EDA, Steps involved in EDA, Python Libraries used in EDA. Numpy: Basics, Array Attributes, Slicing (1D, 2D and 3D), Numpy Array Iteration, Operations on Arrays: Concatenating Arrays, Reshaping Arrays, Splitting Arrays, Statistical Operations on Arrays. Pandas: Basics, Series, Data Frame, Comparison between Series and Data Frame. Reading data from various data sources into python Data Frame (Read from Excel Data Source, Read data from .csv file, Read data from Dictionaries). Data Cleaning: Handling missing values, Removing duplicates, Correcting Inconsistencies.

Unit-V :Advance Python: Part-II

Data visualization: Introduction to Data Visualization, Benefits of Data Visualization, Popular Python Data Visualization Libraries. Matplotlib: Introduction, Basic Plots: Line plot, Bar chart, pie chart, Histogram, Scatter plot, Plot Customization: Titles, labels and legends, Gridlines and ticks, Colors, markers, and line styles, Subplots and Layouts. Seaborn: Introduction, Comparison with matplotlib, Generating Plots: Heatmaps, Boxplots.

Text Books:

1. Kooper, Steven. *Data Science from Scratch*. 2nd Edition. O'Reilly Media, 2019.
2. Vasiliev, Yuli. *Python for Data Science: A Hands-On Introduction*. No Starch Press, 2022.
3. Acharya, Seema. *Reimagining Data Visualization Using Python*. Chapman & Hall/CRC, 2022.
4. VanderPlas, Jake. *Python Data Science Handbook: Essential Tools for Working with Data*. 2nd Edition. O'Reilly Media, 2022.

Reference Books:

1. *Data Science and Analytics with Python*. Chapman & Hall/CRC Data Mining and Knowledge Discovery Series, 2017.
2. Nelson, Daniel. *Data Visualization in Python*. Stack Abuse, 2020. Available via Stack Abuse.
3. McKinney, Wes. *Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython*. 2nd Edition. O'Reilly Media, 2017.

Online Resources:

1. <https://www.coursera.org/learn/python-data-science>
2. <https://www.mltut.com/best-free-resources-to-learn-python-for-data-science/>
3. <https://onlinecourses.swayam2.ac.in/>

Activities

1. Understanding Data Science, AI, and Machine Learning

Activity:

Conduct a group-based concept mapping session. Students collaborate to create a visual diagram showing connections among data science, AI, and machine learning. Each component (e.g., data analysis, modeling, tools like Python) is linked with explanations.

Evaluation Method:

Assess the concept map on a 10-point scale based on Completeness of topics (20%), Accuracy of relationships (40%), Clarity and organization (20%) and Group discussion and presentation (20%).

2. Applying Python Programming Constructs

Activity:

Give students a mini coding challenge: write a Python script to count word frequency in a paragraph using strings, lists, dictionaries, and sets.

Evaluation Method:

Evaluate on a 10-point scale on the basis of: Correct use of each construct (40%), Code readability and comments (20%), Output accuracy (30%) and Bonus for optimized solutions (10%).

3. Data Manipulation and Cleaning Using NumPy & Pandas

Activity:

Provide a messy dataset (e.g., with missing values, duplicates, incorrect formats). Ask students to clean and transform the data using NumPy and Pandas.

Evaluation Method:

Rubric includes: Identification of cleaning tasks (25%), Implementation correctness (40%), Use of appropriate functions and methods (20%), Final cleaned dataset quality (15%).

4. Exploratory Data Analysis and Insight Extraction

Activity:

Students choose a public dataset and perform an EDA process to uncover key trends and outliers. They document their observations in a Jupyter Notebook.

Evaluation Method:

Evaluated on: Depth of analysis (30%), Use of statistical summaries and visualizations (40%), Insightful interpretations (20%) and Notebook presentation quality (10%).

5. Creating Visualizations Using Matplotlib and Seaborn

Activity:

Assign a story-telling task: create a data dashboard using Matplotlib and Seaborn that explains a specific trend (e.g., COVID-19 cases, sales overtime).

Evaluation Method:

Evaluate on a 10-point scale on the basis of: Correct use of chart types (25%), Visual appeal and clarity (25%), Annotation and labelling (20%), Connection to the narrative (30%).

SEMESTER-IV
COURSE 10: DATA SCIENCE USING PYTHON

Practical	Credits: 1	2 hrs/week
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List of Experiments:

1. Write a Python program to demonstrate basic data types in python.
2. Write a Python program to illustrate arithmetic operators.
3. Write a Python program to find the maximum of three numbers.
3. Write a Python Program to find the sum of digits of a number.
4. Write a Python Program to check whether a given number is palindrome or not.
5. Write a Python program to check whether a given number is prime or not.
6. Write a Python program to calculate Simple Interest and Compound Interest.
6. Write a Python program to illustrate Strings and String methods.
7. Write a Python program to illustrate string slicing.
8. Create a list and perform the following methods.
 - a) append() b) extend() c) insert() d) pop() e) remove() f) clear
9. Create a list and perform the following functions. a) len() b) max() c) min() d) sorted()
10. Write a program to input numbers from the user. Store these numbers in a tuple. Print the maximum and minimum number from this tuple.
11. Create a dictionary and apply the following methods.
 - a) Print the dictionary items b) Access items c) Use get() d) Use get() e) Use len()
12. Write a Python program to find the factorial of a number using functions.
13. Write a Python program to find the factorial of a number using recursion.
14. Write a Python program to find the maximum of two numbers using lambda function.
15. Write a Python program to illustrate a *math* module.
16. Write a Python program to illustrate a *random* module.
17. Write a Python program to illustrate numpy array attributes: ndim, shape, size, dtype.
18. Write a Python program to illustrate numpy array statistical operations.
19. Write a python program to demonstrate Reading data from varied data sources into Pandas DataFrame.
 - a) Read Data from Excel Data Source and display.
 - b) Read Data from "iris.csv" into pandas DataFrame and display. [source: UCIML repository]
 - c) Load a Python Dictionary into a DataFrame.
20. Consider any Dirty Dataset for Data Cleaning [Source: Kaggle Dataset Repository] And perform the following.
 - a) Remove Rows that contain empty cells.
 - b) Clean Wrong Format.
 - c) Clean Wrong Data.
 - d) Remove Duplicates.
21. By using matplotlib generate Bar chart for revenue by product category.
22. By using matplotlib generate Pie chart for market share distribution of companies.
23. By using matplotlib generate Histogram for customer age distribution.
24. By using seaborn generate correlation Heatmap.
25. By using seaborn illustrate Boxplot.

Note: The list of experiments is not limited to those mentioned above. A comprehensive set of programming or software tool-based exercises may be developed by the respective faculty members.

MODEL QUESTION PAPER
SEMESTER – III
COURSE 10: Data Science Using Python
(w.e.f. 2026-27)

Time :3Hrs

Max Marks 75

SECTION - A

Answer any Five of the following

5 X 3= 15 Marks

1. Short answer question from Unit-1
2. Short answer question from Unit-1
3. Short answer question from Unit-2
4. Short answer question from Unit-2
5. Short answer question from Unit-3
6. Short answer question from Unit-3
7. Short answer question from Unit-4
8. Short answer question from Unit-4
9. Short answer question from Unit-5
10. Short answer question from Unit-5

SECTION - B

Answer Five of the following

5 X 12= 60 Marks

11. a) Essay question from Unit-I
OR
b) Essay question from Unit-I
12. a) Essay question from Unit-II
OR
b) Essay question from Unit-II
13. a) Essay question from Unit-III
OR
b) Essay question from Unit-III
14. a) Essay question from Unit-IV
OR
b) Essay question from Unit-IV
15. a) Essay question from Unit-V
OR
b) Essay question from Unit-V