ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ
VISVESVARAYA TECHNOLOGICAL UNIVERSITY - BELAGAVI

BANGALORE INSTITUTE OF TECHNOLOGY

K.R.ROAD, V.V. PURA, BENGALURU -560 004

Department of Information Science and Engineering

BCS358D

Data Visualization with Python Laboratory Record

III- Semester

USN	
NAME	
SECTION	
BATCH	

BANGALORE INSTITUTE OF TECHNOLOGY

K.R.ROAD, V.V. PURA, BENGALURU -560 004

Department of Information Science and Engineering

LABORATORY CERTIFICATE

This is to certify that Ms. / Mr. ……bearing USN……..…….. Of III semester, Information Science & Engineering branch has satisfactorily completed the practical of **Data Visualization with Python Laboratory (BCS358D)** prescribed by the **Visvesvaraya Technological University** for the academic year 2024 - 2025.

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Signature of Batch In-Charge **Signature of the HOD**

BANGALORE INSTITUTE OF TECHNOLOGY

VISION:

Establish and develop the Institute as the Centre of higher learning, ever abreast with expanding horizon of knowledge in the field of Engineering and Technology with entrepreneurial thinking, leadership excellence for life-long success and solve societal problems.

MISSION:

- Provide high quality education in the Engineering disciplines from the undergraduate through doctoral levels with creative academic and professional programs.
- Develop the Institute as a leader in Science, Engineering, Technology, Management and Research and apply knowledge for the benefit of society.
- Establish mutual beneficial partnerships with Industry, Alumni, Local, State and Central Governments by Public Service Assistance and Collaborative Research.
- Inculcate personality development through sports, cultural and extracurricular activities and engage in social, economic and professional challenges.

Bangalore Institute of Technology

K. R. Road, V. V. Pura, Bengaluru- 560004

Department of Information Science and Engineering

VISION:

Empower every student to be innovative, creative and productive in the field of Information Technology by imparting quality technical education, developing skills and inculcating human values.

MISSION:

M1	To evolve continually as a Centre of Excellence in offering quality Information Technology **Education**.
M2	To nurture the students to meet the global competency in industry for **Employment**.
M3	To promote collaboration with industry and academia for constructive interaction to empower **Entrepreneurship.**
M4	To provide reliable, contemporary and integrated technology to support and facilitate **Teaching, Learning, Research and Service.**

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO-1	Uplift the students through Information Technology **Education.**
PEO-2	Provide exposure to emerging technologies and train them to **Employable** in multi-disciplinary industries.
PEO-3	Motivate them to become good professional Engineers and **Entrepreneur.**
PEO-4	Inspire them to prepare for **Higher Learning and Research.**

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO-1	To provide our graduates **with Core Competence in Information Processing and Management.**
PSO-2	To provide our graduates with Higher Learning in **Computing Skills.**

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Bangalore Institute of Technology

K. R. Road, V.V. Pura, Bengaluru 560004

Department of Information Science and Engineering

DATA VISUALIZATION WITH PYTHON LABORATORY (BCS358D)

PRE-REQUISITES:

Python programming concepts.

COURSE LEARNING OBJECTIVES (CLO)

This laboratory course enables students to get practical experience in design, develop, implement, analyze and evaluation/testing of

CLO 1: Demonstrate the use of IDLE or PyCharm IDE to create Python Applications.

CLO 2: Using Python programming language to develop programs for solving real-world problems.

CLO 3: Implement of Matplotlib for drawing different Plots.

CLO 4: Demonstrate working with Seaborn, Bokeh.

CLO 5: Working with Plotly for 3D, Time Series and Maps.

COURSE OUTCOMES (CO)

On the completion of this laboratory course, the students will be able to:

CO 1: Understand the functionality of Python libraries such as Matplotlib, Seaborn, Bokeh, and Plotly for data visualization

CO 2: Apply Python programming constructs to solve the problems using development environments like IDLE or PyCharm.

CO 3: Analyse visualizations using Matplotlib, Seaborn, Bokeh, and Plotly for data plotting, time series analysis, and mapping.

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BCS358D	CO1	1											
	CO2	3				2							2
	CO3	2	2										2

		PSO1	PSO2
BCS358D	CO1	1	1
	CO2	1	2
	CO3	1	2

DATA VISUALIZATION WITH PYTHON LABORATORY

Subject Code: BCS358D **CIE Marks: 50**
Hours/Week: 0:0:2:0 **Exam Hours: 03**
Total Hours: 24

List of Programs

Sl. No.	Name of Experiment (Part-A)
1.	a) Write a python program to find the best of two test average marks out of three test's marks accepted from the user. b) Develop a Python program to check whether a given number is palindrome or not and also count the number of occurrences of each digit in the input number.
2.	a) Defined as a function F as Fn = Fn-1 + Fn-2. Write a Python program which accepts a value for N (where N >0) as input and pass this value to the function. Display suitable error message if the condition for input value is not followed. b) Develop a python program to convert binary to decimal, octal to hexadecimal using functions.
3.	a) Write a Python program that accepts a sentence and find the number of words, digits, uppercase letters and lowercase letters. 03092022 b) Write a Python program to find the string similarity between two given strings Sample Output: Original string: Python Exercises Python Exercises Similarity between two said strings: 1.0 Sample Output: Original string: Python Exercises Python Exercises Similarity between two said strings: 0.967741935483871
4.	a) Write a Python program to Demonstrate how to Draw a Bar Plot using Matplotlib.. b) Write a Python program to Demonstrate how to Draw a Scatter Plot using Matplotlib.
5.	a) Write a Python program to Demonstrate how to Draw a Histogram Plot using Matplotlib. b) Write a Python program to Demonstrate how to Draw a Pie Chart using Matplotlib.
6.	a) Write a Python program to illustrate Linear Plotting using Matplotlib. b) Write a Python program to illustrate liner plotting with line formatting using Matplotlib.
7.	a) Write a Python program which explains uses of customizing seaborn plots with Aesthetic functions.
8.	Write a Python program to explain working with bokeh line graph using Annotations and Legends. a) Write a Python program for plotting different types of plots using Bokeh.
9.	a) Write a Python program to draw 3D Plots using Plotly Libraries.
10.	a) Write a Python program to draw Time Series using Plotly Libraries. b) Write a Python program for creating Maps using Plotly Libraries.

DATA VISUALIZATION WITH PYTHON LABORATORY

Subject Code: BCS358D **CIE Marks: 50**
Hours/Week: 0:0:2:0 **Total Hours: 24**

Evaluation Criteria

Lab Write-up and Execution rubrics for Daily Conduction (Max: 30 marks)

	Task	Good	Average
a.	Write-up **(10 Marks) CO1**	Detailed knowledge of python concepts to solve the given problem statement using Python **(10 Marks)**	Moderate knowledge of python concepts to solve the given problem statement using python **(7 Marks)**
b.	Execution **(15 Marks) CO2**	Execution of program using the Python programming concepts with appropriate examples. **(15 Marks)**	Partial execution of program usingthe python programming concepts with appropriate examples. **(10 Marks)**
c.	Record **(5 Marks) CO1**	Documentation of the program with all possible results. **(5 Marks)**	Documentation of the program with partial results. **(3 Marks)**

Lab Write-up and Execution rubrics for Internals (Max: 50 marks)

	Task	Good	Average
a.	Write up **(10 Marks) CO1**	Detailed knowledge of python concepts to solve the given problem statement using python **(10 Marks)**	Moderate knowledge ofpython concepts to solve the given problemstatement using python **(7 Marks)**
b.	Execution **(15 Marks) CO2**	Execution of program using the python programming concepts with appropriate examples. **(15 Marks)**	Partial execution of program using the python programming concepts With appropriate examples. **(10 Marks)**
c.	Procedural Knowledge / Interpretation **(10 Marks) CO3**	Appropriate visualizations, uses correct syntax and provides clear interpretation. **(10 Marks)**	Minor issues in visualizations, syntax and interpretation. **(7 Marks)**
d.	Result **(5 Marks) CO2**	Analysis of python programming techniques for different results **(5 Marks)**	Partial analysis of algorithm techniques **(3 Marks)**
e.	Viva Voce **(10 Marks) CO2**	Complete understanding of both practical and theoretical concepts. **(10 Marks)**	Partial understanding of both practical and theoretical concepts. **(7 Marks)**

DATA VISUALIZATION WITH PYTHON LABORATORY

Subject Code: BCS358D **CIE Marks: 50**
Hours/Week: 0:0:2:0 **Total Hours: 24**

Lesson Planning / Schedule of Experiments

Sl. No	Name of Experiment	WEEK
1	Sample Programs	Week1
2	a. To find the best of two test average marks out of three test's marks. b. To check whether a given number is palindrome or not and alsocount the number of occurrences of each digit in the input number.	Week2
3	a. Defined as a function F as Fn = Fn-1 + Fn-2. Write a Python program which accepts a value for N (where N >0) as input and pass this value to the function. b. Program to convert binary to decimal, octal to hexadecimal using functions	Week3
4	a) Write a Python program that accepts a sentence and find the number of words, digits, uppercase letters and lowercase letters. 03092022 b) Write a Python program to find the string similarity between two given strings Sample Output: Sample Output: Original string: Original string: Python Exercises Python Exercises Python Exercises Python Exercises Similarity between two said strings: Similarity between two said strings: 1.0 0.967741935483871	Week4
5	a. Demonstrate how to Draw a Bar Plot using Matplotlib b. Demonstrate how to Draw a Pie Chart using Matplotlib	Week5
6	a. Demonstrate how to draw a Histogram Plot using Matplotlib. b. Demonstrate how to draw a Pie Chart using Matplotlib.	Week6
7	**LAB TEST - 1**	Week7
8	a. Illustrate Linear Plotting using Matplotlib. b. Illustrate liner plotting with line formatting using Matplotlib.	Week8
9	a. Program which explains uses of customizing seaborn plots with Aesthetic functions.	Week9
10	Program to explain working with bokeh line graph using Annotations and Legends. a. Program for plotting different types of plots using Bokeh.	Week10
11	Program to draw 3D Plots using Plotly Libraries.	Week11
12	a. Python program to draw Time Series using Plotly Libraries. b. Program for creating Maps using Plotly Libraries.	Week12
13	**LAB TEST - 2**	Week13

DATA VISUALIZATION WITH PYTHON LABORATORY

Subject Code: BCS358D **CIE Marks: 50**
Hours/Week: 0:0:2 **Total Hours: 24**

INDEX

Sl. No	Contents	Page No.	Date of execution	Date of Submission	Marks(30)			Total Marks	Staff Signature
					Write-up CO1 (10 Marks)	Execution CO2 (15 Marks)	Record CO1 (5 Marks)		
1	Best of two test average marks out of three test's marks								
	Palindrome								
2	Function F as Fn = Fn-1 + Fn-2								
	Binary to Decimal, Octal to Hexadecimal								
3	Find the number of words, digits, uppercase letters and lowercase letters.								
	Find the string similarity between two given strings								
4	Bar Plot using Matplotlib								
	Pie Chart using Matplotlib								
5	Histogram Plot using Matplotlib								
	Pie Chart using Matplotlib								
6	Linear Plotting using Matplotlib								
	Liner plotting with line formatting using Matplotlib.								
7	Customizing seaborn plots with Aesthetic functions.								
8	Different types of plots using Bokeh.								
9	3D Plots using Plotly Libraries.								
10	Time Series using Plotly Libraries.								
	Creating Maps using Plotly Libraries.								
Final Daily Conduction Marks : _____/30 Marks									**Signature**

LAB INTERNAL MARKS						
TEST-I (50 Marks)	Write up (10 Marks) CO1	Execution (15 Marks) CO2	Procedural Knowledge / Interpretation (10 Marks) CO3	Result (5 Marks) CO2	Viva Voce (10 Marks) CO2	**Marks**
TEST-II (50 Marks)	Write up (10 Marks) CO1	Execution (15 Marks) CO2	Procedural Knowledge / Interpretation (10 Marks) CO3	Result (5 Marks) CO2	Viva Voce (10 Marks) CO2	**Marks**
					Total Marks	
					Final Test Marks : ____/20 Marks (100 Scaled down to 20)	**Signature**

Final IA Marks		
Daily Conduction	Max-30	
Lab Internal Marks	Max-20	
TOTAL	**Max-50**	
Signature of the faculty		

DATE:

Program: 1

a. Write a python program to find the best of two test average marks out of three test'smarks accepted from the user.

b. Develop a Python program to check whether a given number is palindrome or notand also count the number of occurrences of each digit in the input number.

CONCEPTS TO BE KNOW

Python fundamentals, data types, operators, flow control and exception handling

DESCRIPTION

BEST OF TWO TEST AVERAGE MARKS: **SOURCE CODE**

OUTPUT

PALINDROME: SOURCE CODE

PALINDROME: SOURCE CODE

OUTPUT

DATE:

Program: 2

a. Defined as a function F as Fn = Fn-1 + Fn-2. Write a Python program which accepts a value for N (where N >0) as input and pass this value to the function. Display suitable error message if the condition for input value is not followed.

b. Develop a python program to convert binary to decimal, octal to hexadecimal using functions.

CONCEPTS TO BE KNOW

Creation of functions, passing parameters and return values

DESCRIPTION

FUNCTION F AS FN = FN-1 + FN-2: SOURCE CODE

OUTPUT

BINARY TO DECIMAL, OCTAL TO HEXADECIMAL: SOURCE CODE

BINARY TO DECIMAL, OCTAL TO HEXADECIMAL: SOURCE CODE

OUTPUT

DATE:

Program: 3

a. Write a Python program that accepts a sentence and find the number of words, digits, uppercase letters and lowercase letters. 03092022

b. Write a Python program to find the string similarity between two given strings

Sample Output:	Sample Output:
Original string:	Original string:
Python Exercises	Python Exercises
Python Exercises	Python Exercises
Similarity between two said strings:	Similarity between two said strings:
1.0	0.967741935483871

CONCEPTS TO BE KNOW

Manipulation of strings using string methods

DESCRIPTION

NUMBER OF WORDS, DIGITS, UPPERCASE LETTERS AND LOWERCASE LETTERS: SOURCE CODE

OUTPUT

STRING SIMILARITY BETWEEN TWO GIVEN STRINGS: **SOURCE CODE**

OUTPUT

DATE:

Program: 4

a. Write a Python program to demonstrate how to draw a Bar Plot using Matplotlib

b. Write a Python program to demonstrate how to draw a Scatter Plot using Matplotlib

CONCEPTS TO BE KNOW

Matplotlib, Bar Plot & Scatter Plot

DESCRIPTION

BAR PLOT USING MATPLOTLIB: SOURCE CODE

OUTPUT

SCATTER PLOT USING MATPLOTLIB: SOURCE CODE

OUTPUT

DATE:

Program: 5

a. Write a Python program to demonstrate how to draw a Histogram Plot using Matplotlib

b. Write a Python program to demonstrate how to draw a Pie Chart using Matplotlib

CONCEPTS TO BE KNOW

Histogram Plot & Pie Chart

DESCRIPTION

HISTOGRAM PLOT USING MATPLOTLIB: SOURCE CODE

OUTPUT

PIE CHART USING MATPLOTLIB: SOURCE CODE

OUTPUT

DATE:

Program: 6

a. Write a Python program to illustrate Linear Plotting using Matplotlib.

b. Write a Python program to illustrate liner plotting with line formatting using Matplotlib.

CONCEPTS TO BE KNOW

Linear Plot

LINEAR PLOTTING USING MATPLOTLIB: SOURCE CODE

OUTPUT

LINER PLOTTING WITH LINE FORMATTING USING MATPLOTLIB:

SOURCE CODE

OUTPUT

DATE:

Program: 7

Write a Python program which explains uses of customizing seaborn plots with Aesthetic functions.

CONCEPTS TO BE KNOW

Seaborn & Aesthetic Functions

DESCRIPTION

SEABORN PLOTS WITH AESTHETIC FUNCTIONS. :
SOURCE CODE

OUTPUT

DATE:

Program: 8

a. Write a Python program to explain working with bokeh line graph using Annotations and Legends.

b. Write a Python program for plotting different types of plots using Bokeh

CONCEPTS TO BE KNOW

Bokeh, Annotations & Legends

DESCRIPTION

BOKEH LINE GRAPH USING ANNOTATIONS AND LEGENDS. : SOURCE CODE

OUTPUT

DIFFERENT TYPES OF PLOTS USING BOKEH. : SOURCE CODE

DIFFERENT TYPES OF PLOTS USING BOKEH. : SOURCE CODE

OUTPUT

DATE:

Program: 9

a. Write a Python program to draw 3D Plots using Plotly Libraries.

CONCEPTS TO BE KNOW

Ploty Libraries

DESCRIPTION

3D PLOTS USING PLOTLY LIBRARIES: SOURCE CODE

OUTPUT

DATE:

Program: 10

a. Write a Python program to draw Time Series using Plotly Libraries.

b. Write a Python program for creating Maps using Plotly Libraries

CONCEPTS TO BE KNOW

Time Series & Maps

DESCRIPTION

TIME SERIES USING PLOTLY LIBRARIES: SOURCE CODE

OUTPUT

CREATING MAPS USING PLOTLY LIBRARIES: SOURCE CODE

OUTPUT