MANIPAL INSTITUTE OF TECHNOLOGY
BENGALURU
(A constituent unit of MAHE, Manipal)

B. Tech *1st Year*

COURSE PLAN: LABORATORY COURSE

Department:	Information Technology and Computer Science Engineering				
Course Name & code:	Data Visualization			DSE 1271	
Semester & branch:	2nd		Common to all 1st year		
Name of the faculty:	Dr Raghavendra M Devadas				
No of contact hours/week:	**L**	**T**	**P**	**C**	
	1	0	3	2	

Course Outcomes (COs)

At the end of this course, the student should be able to:		No. of Contact Hours	Marks
CO1	Demonstrate ability to program in Python using built-in data structures	6	15
CO2	Perform vectorized computation with Pandas and NumPy	9	20
CO3	Implement wrangling and aggregation and summarisation of data	6	15
CO4	Develop insightful visualizations using Matplotlib and Seaborn	9	25
CO5	Apply data summarization and visualization techniques to write a report.	6	25
	Total	**36**	**100**

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1									2		
CO2	3	2	1										2		
CO3	2	2	2										1		
CO4	2	1	1											1	
CO5	2	2	1	1										1	
Average Articulation Level															

ICT Tools used in delivery and assessment

Sl. No	Name of the ICT tool used	Details of how it is used
1	Python	Programming language
2	IDE	Anaconda distribution with Jupyter Notebook
3	NumPy	For numerical computations
4	Pandas	Data manipulation and analysis
5	Matplotlib	For plotting and visualization
6	Seaborn	For advanced visualization

Course Outcomes (COs)/Course Learning Outcomes (CLOs) to PO, PSO, LO, BL Mapping

At the end of this course, the student should be able to:		No. of Contact Hours	Marks	Program Outcomes (PO's)	Program Specific Outcomes (PSO)	BL
CO1	Demonstrate ability to program in Python using built-in data structures	6	15	PO1, PO2, PO3, PO4,	PSO1	Apply
CO2	Perform vectorized computation with Pandas and NumPy	9	20	PO1, PO2, PO3,	PSO1	Apply
CO3	Implement wrangling and aggregation and summarisation of data	6	15	PO1, PO2, PO3,	PSO1	Apply
CO4	Develop insightful visualizations using Matplotlib and Seaborn	9	25	PO1, PO2, PO3,	PSO2	Analyze
CO5	Apply data summarization and visualization techniques to write a report.	6	25	PO1, PO2, PO3,PO4	PSO2	Apply
	Total	**36**	**100**			

ASSESSMENT PLAN

Components	**Continuous Evaluation: Experiments/Open Ended experiments**	**End semester Examination**
Duration	3 Hours per week	180 Minutes
Weightage	60%	40%
Typology of questions	Applying; Analysing. Evaluating.	Applying; Analysing; Evaluating; Creating
Pattern	4 Evaluations: 4 * 10M = 40M Code submission Program execution check 2 quizzes: 2 * 10M = 20M	For the given dataset 1. Data manipulation, 2. cleaning :10M 3. Data Visualization: 20M 4. Data Summary & interpretation of results: 10 M Total : 40M
Schedule	Weekly	Last week of the semester
Topics	As per syllabus	Experiments/Open ended. Individual

Lesson Plan

L No	Topics	Course Outcome Addressed
Exp 1	**Demo 1: Python Language Basics** **Exercises** 1. Write a Python function to input two numbers and perform the Calculator operations of (+, -, *, /). 2. Write a Python function that takes an integer and returns True if it's a prime number and False otherwise. 3. Create a Python function that creates a sequence between 1 and 100 and prints all the odd numbers. Compute and display the sum of all the even numbers. 4. Write a Python function to add two elements and display the result. The elements can be of type integer, float or string. 5. Write a Python function that takes a string input from the user and counts the number of vowels and consonants in the string.	CO1
Exp 2	**Demo 2: Python built-in Data structures, Functions, modules, packages** Exercises 1.Write a Python code block that inputs numbers into a list. Print the largest, smallest, the sum, and the average of the numbers. Count occurrences of a specific number in the list. 2.Write a Python code block to create a tuple with five elements. Try to change one of the elements and handle the error that occurs. Print a message that explains why the error occurred. 3.Write a Python code block to create a dictionary of cricket World Cup winners. Let the key be the year; the value is the country that won the World Cup that year. Print the name of the best-performing country. Display the unique list of countries that have won the World Cup. 4.Write a Python code block that inputs a sentence from the user. Count the frequency of each word in the sentence and store the result in a dictionary. Prints the dictionary with words as keys and their frequencies as values. 5.Write a Python code block to input numbers into two sets. Perform union, intersection, and difference operations on the sets and print the results.	CO1
Exp 3	**Demo 3: NumPy basics and vectorized computation** **Exercises** 1. Generate a 3x4 NumPy array with random integers between 1 and 50. Calculate and print the Mean, Median, and Standard Deviation of the array Print the Sum of all elements and the sum of each row. Reshape the 3x4 array into a 2x6 array and print it. Create two (3 * 3) matrices using NumPy and print it. Perform and print the results of the following linear algebra operations a. Matrix addition b. Matrix subtraction c. Matrix multiplication (element-wise and dot product)	CO2

	d. Transpose of a matrix e. Determinant and inverse (if applicable)	
Exp 4	**Demo 4: Pandas, Data loading, Storage and File formats** **Exercises** 1. Create a Series from a list of integers representing daily temperatures (in Celsius) over a week. Assign index labels as day of the week. Find and print the average (mean) temperature for the week. Identify and print the maximum and minimum temperatures and their respective days. Display the temperatures greater than a specific value. Convert all temperatures to Fahrenheit. Print the days had temperatures above the average. 2. Create a data frame with details of 10 students and columns as Roll Number, Name, Gender, Marks1, Marks2, Marks3. a. Create a new column with total marks b. Find the lowest marks in Marks1 c. Find the Highest marks in Marks2 d. Find the average marks in Marks3 e. Find student name with highest average f. Find how many students failed in Marks2 (<40)	CO2
Exp 5	**Demo 5: Data Cleaning and Preparation** 1.Create a CSV file called "Movies.csv" with details of 10 movies- Movie Name, Language, Genre, Rating, Review. a. Read CSV file into a dataframe and find the movie with the highest rating. b. Write the details of all "Hindi movies into a file "HindiMovies.csv". 2.For the CEREALS dataset, perform data preprocessing and answer the following questions. a. Create a table with the 5 number summary of all the numeric attributes. b. For each of the numeric attributes (proteins upto vitamins) , identify and replace all missing data(indicated with -1) with the arithmetic mean of the attribute. c. Create a table with the 5 number summary of all the numeric attributes after treating missing values. Do you think the strategy used in dealing with missing values was effective? d. For each numeric attribute (proteins upto vitamins), identify and replace all noisy data with the median of attribute. e. Create a table with the 5 number summary of all the numeric attributes after treating noisy values. Do you think the strategy used in dealing with noisy values was effective?	CO3
Exp 6	**Demo 6: Data Visualization: context, effective visuals and storytelling** Exercise 1. For the MTCARS dataset, answer the specified questions with summarization and effective visuals.	CO3, CO4

	2. For the CEREALS dataset, answer the specified questions with summarization and effective visuals.	
Exp 7	**Demo 7: Plotting and Visualization using Matplotlib & Seaborn** **Exercise** For the IPL dataset, answer the specified questions with summarization and effective visuals using Matplotlib & Seaborn libraries	CO4
Exp 8	**Demo 8: Data Aggregation and Group Operations** **Exercise** 1. For the NORTHWIND dataset, answer the specified questions with summarization and effective visuals.	CO3
Exp 9	**Demo 9: String Manipulation and Data Wrangling** **Exercise** For the SENTIMENT dataset, answer the specified questions with string operations and effective visuals.	CO3
Exp 10	**Discussion of case study and data set**. For the case study given, answer the questions with a report with story, visuals and data summaries.	CO5
Exp 11	**Discussion of case study and data set.** For the case study given, answer the questions with a report with story, visuals and data summaries.	CO5

References:

1	**Text Book:** Wes McKinney , Python for Data Analysis: Data Wrangling with pandas, NumPy & Jupyter. 3rd edition. O'Reilly Media, 2022.
2	Cole Nussbaumer Knaflic, Storytelling With Data: A Data Visualization Guide for Business Professionals, John Wiley and Sons, 2015.
3	Jake VanderPlas, Python Data Science Handbook. O'Reilly Media, 2016.
4	Alberto Boschetti and Luca Massaron, Python Data Science Essentials, 3rd edition, Packt Publishing Ltd. 2018.
5	Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning using Python", Wiley India, 2019.
6	Python documentation: https://docs.python.org/3/

Submitted by: Dr Raghavendra M Devadas

(Signature of the faculty)

Date:

Approved by:

(Signature of HOD)

Date:

Faculty members teaching the course (if multiple sections exist):

Dept & Room No	Section	Name of the Faculty Handling the Subject	Dept & Room No	Section	Name of the Faculty Handling the Subject
IT- AB5 410	A	Dr. Devi Sivasankari P/ Dr. Karthik V/ Ms. Soundarya BS	CSE- AB4 403	K	Ms. Mahadevi + Dr. Srinidhi NN +Ms. Netra
IT- AB5 410	B	Dr. Devi Sivasankari P / Dr. Tulika Dutta / Ms. Soundarya BS	CSE- AB4 403	L	Dr. Shwetha S + Dr. Geetabai S H + Ms. Netra
IT- AB5 410	C	Dr. Kokila S/ Dr. Abhijit Das/ Gurushankar	IT- AB5 410	M	Dr. Madhura K/ Dr. Tulika Dutta / Ms. Soumya T Rao
IT- AB5 410	D	Dr. Snigdha Sen/ Dr. Sindhu Madhuri G / M r Gurushankar	CSE- AB4 403	N	Dr. Lakshmi Napa + Dr. Srinidhi NN + Ms. Hemavathi
IT- AB5 411	E	Dr. Arun kumar/Dr. Madhura/ Ms. Saba Begum	CSE- AB4 403	O	Ms. Mahadevi +Dr. Vamshi Krishna + Ms. Supriya
IT- AB5 411	F	Dr Raghavendra/ Dr. Arun kumar/Dr. Kokila S/ Ms. Saba	CSE- AB4 403	P	Dr. Swetha S + Dr. Manasa + Ms. Josna Guru Devi
IT- AB5 410	G	Dr Raghavendra / Dr. Devi Sivasankari / Ms. Soumya T Rao	CSE- AB4 403	Q	Ms. Mahadevi + Dr. Gauri Kalnoor + Ms. Lavanya
CSE-AB4 403	H	Ms. Mahadevi + Dr. Srinidhi NN +Ms. Netra	CSE- AB4 403	R	Dr. Shwetha S + Dr. Srinidhi NN +Ms. Hemavati