Year: B. Tech III (Semester V)

Subject Name: Advanced Python Programming **Subject Code**: BTCO15502
Type of course: Open Elective -1
Prerequisite (if any): Programming for Problem Solving
List of Courses where this course will be prerequisite: Machine Learning

Rationale: Python is a general-purpose programming language which is used in almost all fields today. It is one of the most popular and in-demand programming language because it is extremely simple, powerful and easy to learn.

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	2	4	60	25	15	30	20	150

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Content	Total Hrs
1	Python Basics : Functions - Decorators, Generators, Higher order functions, Inline functions, Magic Functions, Exception handling and assertions, File handling	8
2	Classes and Object-Oriented Programming : Classes, Inheritance, Encapsulation and Information Hiding, Abstract Data Types	12
3	Graphics and GUI Programming : Graphics using Turtle, GUI using Tkinter - Canvases, Basic widgets, Other GUI Library- PyQt	12
4	Python Libraries: Numpy - Creating arrays using Numpy, attributes of an array, viewing and copying arrays, working with multi-dimensional arrays; Pandas - Series and Dataframes; Statistical modeling including classification and regression using Scikit-Learn; Creating different 2D plots using Matplotlib	15
5	Data Science using Python: Develop a data science application using linear regression or multi regression model using the data science pipeline	5

Suggested Specification table with Marks (Theory): (For B.Tech only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level

10	20	20	05	05	--

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

Sr No	Title of book /article	Author(s)	Publisher and details like ISBN	Publication Edition
1	Core Python Programming	R. Nageswara Rao (Author)	Dreamtech Press 978-9386052308	Latest Edition
2	Python for Data Analysis, Data Wrangling with Pandas, NumPy, and IPython	Wes McKinney	O'Reilly	
3	Python Programming	Michael Urban and Joel Murach	O'Reilly	
4	Python for Data Science and Visualization -Beginners to Pro	Udemy	Udemy	

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Implement python programs using functions, files handling and exception handling for solving computational problems.	25%
CO-2	Design a GUI based solution using python for real time application development.	25%
CO-3	Demonstrate statistical analysis of data using various python libraries	25%
CO-4	Implement real-world data science applications using various common Python libraries	25%

List of Open learning website:

1. https://onlinecourses.nptel.ac.in/noc19_cs41/preview
2. https://onlinecourses.nptel.ac.in/noc21_cs21/preview
3. https://www.coursera.org/specializations/python
4. https://www.coursera.org/specializations/python-3-programming

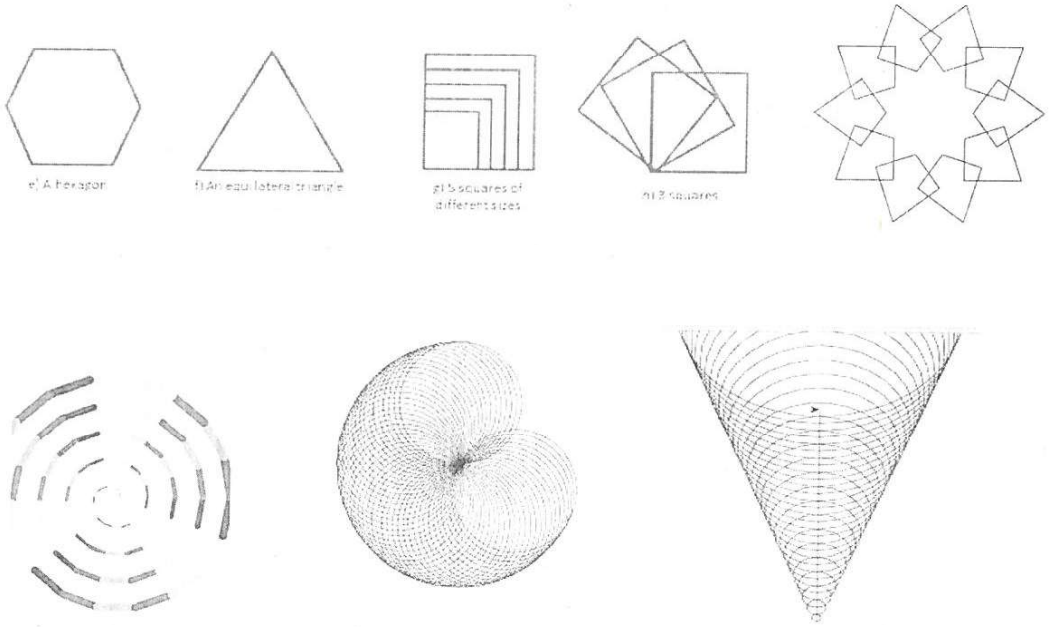
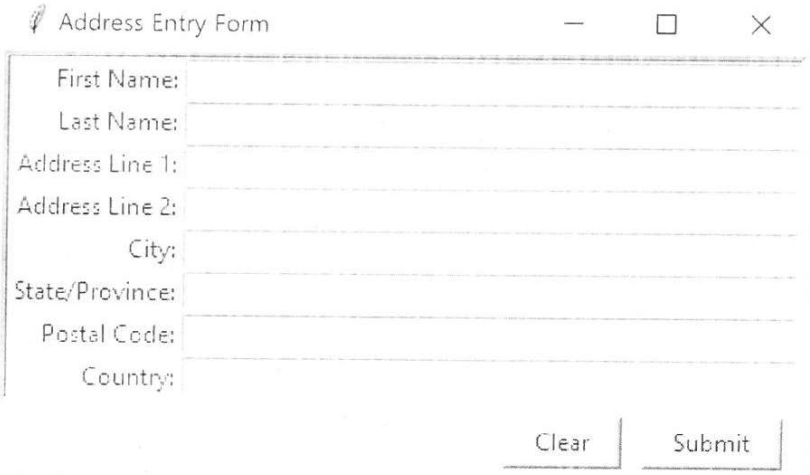
List of Open Source Software:

1. Anaconda
2. Jupyter notebook, Spider
3. Google Colab

FOR LAB SESSIONS:

List of Experiments:

Sr. No.	Practicals
1	Do the following. a. Practice python programming for different data types and operators. b. Practice python programs with conditional statements and loops. c. Create lists in Python and apply various list methods to understand their working.
2	Create a dictionary and do as directed. a. apply various dictionary methods and learn their functioning b. Sort elements of dictionary using Lambda function c. Create ordered dictionary
3	Do the following using functions in python. a. Create a function in python and practice different ways of passing actual arguments in a function. b. Write a program to develop an anonymous function (Lambda function). Use lambda functions with filter(), map() and reduce() functions.
4	Learn working with text files and binary files in Python. Apply various methods available to deal with text files and binary files to understand their functioning.
5	Do the following using exception handling in python. a. Use exception handling to handle the following exceptions i. Zero Division ii. Overflow Error iii. Value Error b. Write a function to compute 5/0 and use try/except to catch the exceptions. c. Write a function that explicitly raises an IndexError exception when called. Then write another function inside the try/except statement to catch errors.
6	Do the following graphics using Turtle library in Python.

	
7	Design a simple address entry form GUI to update the details of the person. On submit, all the details must be saved in a file. On clear, all the text fields must get cleared to null. 
8	Create single and multidimensional arrays using different functions available in the numpy library. Print attributes of the array created by you.
9	Write a program to create and display a DataFrame from the following specified dictionary data which has the index labels. Apply various pandas functions to manipulate the data frame. Data are as follows.

	exam_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'], 'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19], 'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1], 'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}
10	Implement various regression models.
11	Implement various classification models.
12	Demonstrate data Visualization in python using matplotlib.
13	Build predictive machine learning model using Data Science Pipeline.