Course Name	Python for Data Science
Course Code	BTCE403T
Course Credits	4
Semester	Even (IV)
Total Contact Hours	[L-T-P: 4-0-0=60]
Course Category	Professional Core
Prerequisites (Course Code/Background)	Basic Understanding of Programming Languages like C, C++

COURSE DESCRIPTION

This course provides a comprehensive introduction to Python programming, focusing on its role in data science. Topics include Python basics, data types, loops, conditional statements, functions, regular expressions, file handling, exception handling, and essential Python libraries for data science such as NumPy, Pandas, Matplotlib, and Scikit-learn. Students will also learn about data science concepts and web scraping using Beautiful Soup.

COURSE OUTCOMES (COs)

This course is designed to enable students to:

CO Number	CO statement	Bloom's Taxonomy Level
CO1	Recall Python features, setup IDEs, write basic programs, understand data types, variables, operators, and import modules.	1
CO2	Understand and differentiate looping (for, while) and conditional (if, if-else, if-elif) statements, use range() with for loop, and apply break, continue, and pass.	2
CO3	Explain and apply Python data types (set, dict, list, tuple, string), structures, and functions, including methods, slicing, and differences, as well as numerical, boolean types, and escape sequences.	2
CO4	Analyze regular expressions, understand RegEx functions, meta-characters, and the RegEx module, apply inheritance, constructors, destructors, and distinguish OOP from procedural programming.	3
CO5	Apply file handling, including types, modes, opening, closing, reading, appending, and using pickle, and exception handling, try-except, raise, assert, and finally clauses.	3

CO6	Evaluate Python essentials for data science, including an overview, the role of data scientists, library installation and usage.	4

Bloom's Taxonomy levels: 1-Remember;2-Understand;3-Apply;4-Analyze;5-Evaluate;6-Create.

COURSE RESOURCES:
TEXT BOOKS AND REFERENCE BOOKS:

7. Python Crash Course" by Eric Matthes
8. Automate the Boring Stuff with Python" by Al Sweigart
9. Learning Python" by Mark Lutz
10. Python Programming: An Introduction to Computer Science" by John Zelle
11. Think Python: How to Think Like a Computer Scientist" by Allen B. Downey
12. Python for Data Analysis" by Wes McKinney

ONLINE CONTENT [MOOC/ SWAYAM/ NPTEL/ WEBSITES]

1. www.w3schools.com/datascience/ds_python.asphttps://www.tutorialspoint.com/java/index.html
2. https://www.geeksforgeeks.org/data-science-tutorial/
3. https://www.python.org/
4. https://www.geeksforgeeks.org/python-programming-language/

OTHER RESOURCES REQUIRED

Software	Latest Python Version
Hardware	A Normal PC
Teaching Aids (Stereo models etc.)	LCD Projector, PC, Google classroom
Classroom Infrastructure (Audio/Video)	AV Support

OVERLAPPING OF CONTENT WITH OTHER COURSES

Course Name	Course Code	Department

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COURSE ARTICULATION MATRIX

Mapping of Expected Course Outcome(s) with Program Outcomes/Program Specific Outcomes

Correlation between COs and POs in the scale of 1 to 3; "--" indicates no correlation, 1 being the slight (low), 2 being moderate (medium) and 3 being substantial (high).

CO Number	PO Number												PSO Number		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	3	3	3	2	3	2	2	1	2	2
CO2	3	2	3	3	3	2	2	3	3	3	2	2	2	2	2
CO3	3	3	2	3	3	3	2	3	3	2	2	2	2	1	3
CO4	2	3	2	2	3	2	2	2	2	2	1	2	1	1	3
CO5	3	2	3	3	3	3	2	1	2	3	1	2	2	2	3
CO6	3	2	2	3	2	3	2	3	2	3	1	1	1	1	3
AVG	**2.8**	**2.3**	**2.3**	**2.8**	**2.6**	**2.6**	**2.1**	**2.5**	**2.3**	**2.6**	**1.5**	**1.8**	**1.5**	**1.5**	**2.6**

COURSE CONTENTS (UNIT WISE)

Unit No.	Contents	Contact Hours
1	**Introduction to Python Programming** Python Features, Python roles in Data Science, Introduction of Python, Installing Python IDEs – Python IDLE and Anaconda, Writing Your First Python Program, Data-types in Python, Token - variable, Keywords, Identifier, Literals, Rules for declaring variables, Introduction to operator and types of operator, Arithmetical operator, Relational Operator, Logical operator, Assignment Operator, Bitwise operator, Membership Operator, identity operator, Indentation, Taking User Input, Print(),Eval(),Type Casting Import different modules in python.	**10**
2	**Looping Statement and Conditional statement**	**10**

	Introduction to looping statements, Types of Loops – for loop and while loop, Range() with for loop, Nested loops, Introduction to conditional statement, Simple If, If else, If-elif, shorthand if, Break,continue,pass	
3	**Data Types, Data Structures and Functions in Python** Introduction to Set and Methods and frozen set, Dict and Methods, Accessing key and values in Dict, List, Methods and Slicing, Tuple, Methods and Slicing String, Methods and Slicing, Difference between Set, Dict, List, Tuples, Numerical, Boolean data type and Escape sequence character, Introduction to Function and types of Functions	**10**
4	**Regular Expression in Python** Introduction to Regular Expression, RegEx Function, MetaCharacters and Escape Sequence, RegEx Module, Function in Regular Expression, Math Object in Regular Expression, Inheritance and its type, Constructor and Destructors, In built class methods and attributes, Difference between OOPS and Procedure Programming	**10**
5	**File Handling and Exception Handling** Introduction to files and types of files, Modes of files, Opening and Closing text files , reading files and appending files, Introduction to pickle module, What is an exception?, Types of Error, Difference between syntax error and exception error, Built-in Exception, Raise Statement, Assert Statement, Try, Catch, Except, Finally clause in Python	**10**
6	**Python Essential for Data Science** Overview of Data Science ,Role of Data Scientist in Industry, Introduction to Data Analytics, Installing different library for Data Analytics using PIP and conda command, Introduction to Numpy, Numpy with array, arrays shape in Numpy, Numpy random, aggregate function, Slicing Array, Numpy Arithmetical operation, Introduction to Pandas and Series, Creating Time Series, Data Frames, Groupby in pandas, Concat, Join, Merge, Read CSV, Excel files in Pandas, Creating different charts using Matplotlib and Seaborn, Introduction to Scipy, Introduction to Scikit-learn, Introduction to Web scraping using Beautiful soup	**10**
	Total	**60**

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Course Name	Python for Data Science - Practical
Course Code	BTCE403P
Course Credits	1
Semester	Even (IV)
Total Contact Hours	[L-T-P: 0-0-2=30]
Course Category	Professional Core
Prerequisites (Course Code/Background)	Basic C and C++ programing

COURSE DESCRIPTION

This course provides a comprehensive introduction to Python programming, focusing on its role in data science. Topics include Python basics, data types, loops, conditional statements, functions, regular expressions, file handling, exception handling, and essential Python libraries for data science such as NumPy, Pandas, Matplotlib, and Scikit-learn. Students will also learn about data science concepts and web scraping using Beautiful Soup.

COURSE OUTCOMES (COs)

This course is designed to enable students to:

CO Number	CO statement	Bloom's Taxonomy Level
CO1	Recall Python features, setup IDEs, write basic programs, understand data types, variables, operators, and import modules.	1
CO2	Understand and differentiate looping (for, while) and conditional (if, if-else, if-elif) statements, use range() with for loop, and apply break, continue, and pass.	2
CO3	Explain and apply Python data types (set, dict, list, tuple, string), structures, and functions, including methods, slicing, and differences, as well as numerical, boolean types, and escape sequences.	2

CO4	Analyze regular expressions, understand RegEx functions, meta-characters, and the RegEx module, apply inheritance, constructors, destructors, and distinguish OOP from procedural programming.	3
CO5	Apply file handling, including types, modes, opening, closing, reading, appending, and using pickle, and exception handling, try-except, raise, assert, and finally clauses.	3
CO6	Evaluate Python essentials for data science, including an overview, the role of data scientists, library installation and usage.	4

Bloom's Taxonomy levels: 1-Remember;2-Understand;3-Apply;4-Analyze;5-Evaluate;6-Create.

COURSE RESOURCES:

TEXT BOOKS AND REFERENCE BOOKS:

1. Python Crash Course" by Eric Matthes
2. Automate the Boring Stuff with Python" by Al Sweigart
3. Learning Python" by Mark Lutz
4. Python Programming: An Introduction to Computer Science" by John Zelle
5. Think Python: How to Think Like a Computer Scientist" by Allen B. Downey
6. Python for Data Analysis" by Wes McKinney

ONLINE CONTENT [MOOC/ SWAYAM/ NPTEL/ WEBSITES]

1. www.w3schools.com/datascience/ds_python.asphttps://www.tutorialspoint.com/java/index.html
2. https://www.geeksforgeeks.org/data-science-tutorial/
3. https://www.python.org/
4. https://www.geeksforgeeks.org/python-programming-language/

OTHER RESOURCES REQUIRED

Software	Latest Python Version
Hardware	A Normal PC
Teaching Aids (Stereo models etc.)	LCD Projector, PC, Google classroom
Classroom Infrastructure (Audio/Video)	AV Support

OVERLAPPING OF CONTENT WITH OTHER COURSES

Course Name	Course Code	Department
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COURSE ARTICULATION MATRIX
Mapping of Expected Course Outcome(s) with Program Outcomes/Program Specific Outcomes

Correlation between COs and POs in the scale of 1 to 3; "--" indicates no correlation, 1 being the slight (low), 2 being moderate (medium) and 3 being substantial (high).

CO Number	PO Number												PSO Number		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	3	2	3	3	3	2	3	2	2	1	2	2
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CO3	3	3	2	3	3	3	2	3	3	2	2	2	2	1	3
CO4	2	3	2	2	3	2	2	2	2	2	1	2	1	1	3
CO5	3	2	3	3	3	3	2	1	2	3	1	2	2	2	3
CO6	3	2	2	3	2	3	2	3	2	3	1	1	1	1	3
AVG	**2.8**	**2.3**	**2.3**	**2.8**	**2.6**	**2.6**	**2.1**	**2.5**	**2.3**	**2.6**	**1.5**	**1.8**	**1.5**	**1.5**	**2.6**

COURSE CONTENTS (EXPERIMENT WISE)

Experiment No.	Details	Contact hours
1	Write a program to display your Name, Mobile number and email id using output statement print.	1
2	Write a program to read any number and display it square.	1
3	Write a program to read any two numbers and perform basic calculator	1

4	Write a program to read any year and check if it is leap year or not using shorthand if operator.	1
5	Write a program to read any year and check it is leap year using conditional statements.	1
6	Write a program to read any one number and display its square root.	1
7	Write a program to read any one positive number and display it square	1
8	Write a program to read any number check positive or negative or zero.	1
9	Write a program to read six subjects marks and calculate total marks, average marks and check every subject mark is greater than or equal to 40 then result will be "pass" otherwise "fail"	2
10	Write a program to display sum of first ten numbers using for loop	1
11	Write a program to triangle using nested loop	1
12	.Write a program to display following pattern: a) A A A A A A b) 1 1 2 1 2 3 c) * * * * * *	2
13	Write a program to create Fruit menu using function	1
14	Write a program to accept the name and salary of an employee and display using class and Object.	1
15	Write a program to illustrate of RegEx Functions using Regular Expression	1
16	Write a program Exception Handling in which we are using a try-catch statement to handle the arithmetic exception.	1
17	Write a program to create an empty file as abc.text and add data into that file. Also, Write a program to open abc.text file and read it.	1

18	Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be the input that to be written to the second file.	1
19	Write a program to illustrate of try, catch and finally block	1
20	Write a program to create, append, and remove list.	1
21	Write a program to demonstrate working with tuples.	1
22	Write a program to demonstrate working with dictionaries.	1
23	Write a program to demonstrate working with set.	1
24	Install Numpy, Pandas, Matplotlib, Scikit-learn, Keras using PIP Command	1
25	Create different charts like Pie charts, Histograms. Line Chart using Matplotlib and Seaborn	2
26	Write a program to demonstrate a) arrays b) array indexing such as slicing, integer array indexing and Boolean array indexing along with their basic operations in NumPy.	1
27	Read text file, CSV file and Excel file using Pandas	1
Total		**30**

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