Advanced Python Programming

Course Code	23CS6401	**Year**	II	**Semester**	II
Course Category	Honors	**Branch**	CSE	**Course Type**	Integrated
Credits	4	**L-T-P**	3-0-2	**Prerequisites**	Python Programming
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand basic Python programming concepts and their applications to solve problems.	**L2**
CO2	Apply functional programming techniques for efficient data manipulation and implement JSON/XML parsing.	**L3**
CO3	Apply NumPy and Pandas Libraries to perform advanced numerical computations.	**L3**
CO4	Apply threading concepts to manage threads and networking techniques to build client-server applications.	**L3**
CO5	Analyze relevant Python libraries for machine learning tasks.	**L4**

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	Overview of Python, Functional Programming- Lambda Functions, Map, Filter, Reduce, Iterators, Generators, List Comprehension, JSON AND XML with Python, Regular Expressions operations	**CO1, CO2**
II	Numpy Basics-Creating ndarrays, Datatypes, Indexing, Universal Functions, Array oriented Programming with arrays, File Input and output with arrays.	**CO1, CO3**
III	Introducing Pandas Data structures, Essential functionality -Indexing, Selection, Filtering, Summarizing Descriptive statistics, Data Cleaning and Preparation, Data Wrangling: join, Combine and Reshape.	**CO1, CO3**
IV	Multithreading Networks & Client/server Programming: Threads and Processes, Readers and Writers Problem, Networks Clients and Servers.	**CO1, CO4**
V	Python Libraries – Tensorflow- Creating and manipulating Tensors, Keras – Model creation, Defining Layers, Model Training, Data preprocessing.	**CO1, CO5**

Expt. No.	Experiment Details	Mapped CO
1.	Develop a program to calculate the square of even numbers in a list and sum them using map, filter, and reduce.	**CO1, CO2**
2.	Develop a program to save data into a JSON and XML file, read it back, and modify it.	**CO1, CO2**
3.	Develop a program for the following i) To Validate Email Addresses ii) To Extract Dates from a Text iii) to Replace Multiple Spaces with a Single Space iv) To Extract Phone Numbers from a String v) Find All Words Starting with a Specific Letter	**CO1, CO2**
4.	Develop a Python program that demonstrates a wide range of NumPy operations, including array creation, reshaping, indexing, slicing, mathematical operations, aggregation, concatenation, splitting, and working with structured arrays.	**CO1,CO3**
5.	Develop a Pandas program that demonstrates various operations including creating DataFrames, data selection, indexing, data cleaning, grouping, aggregation, string operations, and visualization.	**CO1,CO3**
6.	Develop a basic Python program to establish a connection between a client and server using TCP and UDP.	**CO1,CO4**
7.	Develop a Python program to demonstrate the use of threading and synchronization with a shared resource.	**CO1,CO5**
8.	Develop a program to demonstrate Multithreading.	**CO1,CO5**
9.	Develop a program for dataset loading, data preprocessing, defining a model, training, evaluating, saving, and loading the model using TensorFlow and keras libraries.	**CO1,CO5**

Learning Resources
Text Books
1. Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython 2nd Edition, O'Reilly Media. 2. Kenneth Lambert, “Fundamentals of Python: First Programs”, Cengage Learning, 2019 3. “ Introduction to Python Programming”, Gowrishankar. S, Veena A, CRC Press, 2019,Taylor and Francis Group
References Text Book
1. Modern Python Standard Library Cookbook, Alessandro Molina, 2018, Packt. 2. The Python Library Reference: Release 3.6.4 - Book 1 of 2, Guido Van Rossum, Python Development Team, 2018, 12th Media Services.
e-Resources and other Digital Material
1. https://media.oiipdf.com/pdf/21fee97b-17fd-4581-8eed-5d3fcdd0c86a.pdf 2. https://docs.python.org/3/library/index.html 3. https://github.com/lanzhiwang/python3-standard-library-example/tree/master/source 4. https://github.com/packtpublishing/modern-python-standard-library-cookbook