BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
WORK INTEGRATED LEARNING PROGRAMMES
COURSE HANDOUT

Part A: Content Design

Course Title	Python Fundamentals for Data Science
Course No(s)	AIMLCPFDS/DSECLPFDS
Credit Units	**NO CREDITS; This is an audit course**
Course Author	Pravin S Pawar (2019)
Version No	2.0
Minor Edits	Parthasarathy P D (2021)

Course Description

The goal of the course is to introduce students to Python programming using hands on instruction. It will show how to install Python and use the Jupyter notebook and other IDE's (Integrated Development Environment) for writing programs. It is intended for students with little or no programming background.

Course Objectives

No	Objective
CO1	Introduce students with fundamental programming concepts of Python
CO2	Enable students to solve data problems using Python
CO3	Enable students to understand the role of python in Data Science

Textbook(s)/Reference(s):

No	Author(s), Title, Edition, Publishing House
T1	Charles Severance: Python for Everybody, Exploring Data in Python 3, CreativeCommons, 2016
T2	Jake VanderPlas: Python Data Science Handbook, Essential Tools for Working withData, O'Reilly Media, 2016
R1	Edouard Duchesnay: Statistics and Machine Learning in Python Release 0.2, 2018
R2	Wes McKinney: Python for Data Analysis, Agile Tools for Real World Data, O'ReillyMedia, 2013

Part B: Modular Content Structure

Session	Topics	Reference
	Saturday, Nov 9, 2024 and Sunday, Nov 10, 2024	
	Introduction and eLearn walkthrough	
1	**Python Basics**	
1.1	**Setting up Python Environments**	**Python Documentation**
	Anaconda Distribution Spyder IDE Jupyter Notebooks Input / Output with Python	
1.2	**Getting familiarity with basic code constructs**	**T1 : Ch 2, Class Notes**
	Package imports Data Types & Type Casting Variables, Expressions & Statements	
2	**Python Data Structures**	
2.1	**Immutable Data Structures**	**T1 : Ch 6, 10, Class Notes**
	Immutable Data Structures Strings Operations on String Familiarity with Tuples	
2.2	**Mutable Data Structures**	**T1 : Ch 8, 9, Class Notes**
	List List operations Familiarity with Sets Dictionary operations	
3	**Python Programming Constructs**	
3.1	**Expressions, Operations, and Decision Structures**	**T1 : Ch 2, 3, Class Notes**
	Boolean Expressions and Logical Operators Conditional and Alternative execution Chained and Nested execution Catching Exceptions with try and except	
3.2	**Iterative Executions**	**T1 : Ch 5, Class Notes**
	While loops Infinite loops, break, continue For loops	
Self-Study	*Object Oriented Features supported by Python*	

Saturday, Nov 16, 2024 and Sunday Nov 17, 2024		
4	**Functions and Files**	
4.1	**Functions**	**T1 : Ch 4, Class Notes**
	Functions calls	
	Built in Functions	
	Custom Functions	
	Parameters and Arguments	
4.2	**Files**	**T1 : Ch 7, Class Notes**
	Opening files	
	Reading files	
	Operation on content of files	
	Writing files	
5	**SciPy Ecosystem**	**SciPy Documentation**
	Familiarity with SciPy Ecosystem	
	NumPy Library	
	SciPy Library	
	Matplotlib	
	Library	
5.1	**Multidimensional Arrays with NumPy**	**T2: Ch 2, Class Notes**
	Basics of NumPy Arrays	
	Computation on NumPy Arrays	
	Aggregations	
	Structured Arrays	
5.2	**Data Exploration with Pandas**	**Pandas Documentation**
	Pandas Objects	
	Data Indexing and Selection	
	Reading files with Pandas	
	Dataset Merges	
5.3	**Data Exploration with Pandas II**	**T2 : Ch 3, Class Notes**
	Data Cleaning	
	Data Transformation	
	Data Filtering	
	Aggregation and grouping	
6	**Data Visualizations**	
6.1	**Visualizations with Matplotlib**	**Documentation, Class Notes**
	Basic Plotting	
	Life cycle of a Plot	
	Subplots	
	Plotting visuals	

6.2	**Visualizations with Seaborn**	**Documentation, Class Notes**
	Visualizing statistical relations Plots for univariate and multivariate analysis Visualizing distributions Linear relationships with plots	
	Recorded Videos for future use	
Basic Machine Learning Examples with Python		
	Introducing Machine Learning Familiarity with Scikit-learn library Linear Regression - Handcoding Linear Regression – with Scikit-learn	**Scikit-learn documentation T2 : Ch 5, Class Notes**

Additional Reading

1. **Python 3.* documentation**
2. **Numpy Documentation**
3. **Pandas Documentation**
4. **Matplotlib documentation**
5. **seaborn: statistical data visualization documentation**
6. **Scikit-learn documentation**

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