UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN MATHEMATICS

SYLLABUS WITH EFFECT FROM 2023-2024

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">PROGRAMMING IN PYTHON WITH PRACTICALS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELECTIVE COURSE VIII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">334E6D</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">--</td><td>1</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• To Understand fundamental programming concepts of Python programming and its Libraries
• To study basic programming concepts and packages for data analysis, modelling, and visualization in python language.
• To study about structure and LOOP
• To comprehend the Basics of NumPy Arrays
• To gain inputs in Data structure, plotting & visualisation</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="6">Unit I: Computer systems – Python Programming Language
Computational Thinking – Python Data Types: Expressions,
Operator, Variables, and Assignments – Strings – Lists – Objects &
Classes – Python standard library. Hours: 15</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit II: Imperative programming: Python modules – Built-in-function: print() function –eval() function – user-defined function & assignments - parameter passing. Hours: 15</td></tr>
<tr><td colspan="2" rowspan="2"></td><td colspan="6">Unit III: Text Data, Files & Exceptions: Strings, revisited – formatted output – files – errors & Exceptions – Execution control Structures: decision control & the IF statement. For LOOP & Iteration Patterns – two-dimensional list- while loop – more loop patterns – additional iteration control statements – Container and Randomness: Dictionaries – other built-in container types – character encodings & strings – module random. Namespaces – encapsulation in functions – global vs. local namespaces exceptional flow control – modules as namespaces.
Hours: 15</td></tr>
<tr><td colspan="6">Unit IV: NumPy Basics: Array and Vectorized Computation – A Multidimensional Array Object – Data Processing using Arrays, File Input and Output with Arrays – Linear Algebra – Random Number Generation. Hours: 15</td></tr>
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	Unit V: Pandas – Data Structure – Essential Functionality – Handling Missing Data – Hierarchical Indexing – Data loading, Storage and File formats - Data wragling- Plotting and Visualization **Hours: 15**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	**Total Hours: 75** Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Introduction to Problem solving using Python - E.Balagurusamy – TMH – First Edition - 2015
Reference Books	1. - Python Programming, Ch Satyanarayana, M Radhika Mani, BN Jagadesh Cengage, New Delhi. 2. "Introduction to Computer Science using Python – A computational Problem solving Focus",Charles Dierbach, Wiley India Edition, 2015.
Website and e-Learning Source	1. https://www.codecademy.com/learn/learn-python 2. https://developers.google.com/edu/python/

Python Practical List

1. Write a Python program to find the value of Triple Integral
2. Write a python program to find the solution of simultaneous linear equations.
3. Write a Python program to find the nth derivatives.
4. Python program to find nth derivative with and without Leibnitz rule.
5. Write a python program to solve partial differential equations.
6. Write a program to input and multiply two matrices
7. Write a program to compute Eigen value and Eigen vector of a given 3X3 matrix using Numpy
8. Write a python program to determine the intersection point of two lines.
9. Create a program that performs the Fourier transform of a given function. You can use the FFT algorithm to implement this.
10. Create a program that visualizes mathematical functions and data using the Matplotlib library. The program should be able to create line plots, scatter plots, bar charts, and other types of visualizations

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Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Demonstrate the understanding of basic programming terminologies and packages of python language.

CLO 2: Will gain knowledge on concepts and packages for data analysis, modelling, and visualization in python language.

CLO 3: In depth understanding about structure and LOOP

CLO 4: Analyze the time series data to design an optimized investment plan.

CLO 5: Demonstrate financial and Economic

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO 1	3	3	1	3	1	--	3	1	1
CLO 2	3	3	1	3	1	--	3	1	1
CLO 3	3	3	1	3	1	--	3	1	1
CLO 4	3	3	1	3	1	--	3	1	1
CLO 5	3	3	1	3	1	--	3	1	1