Integrated MCA II Semester - 4

Subject Name: Python Programming– Practical **Subject Code:**IMCA13406

Type of course: Professional Core Course

Prerequisite: Basic understanding of programming concepts, including variables, expressions, data types, and control flow.

List of Courses where this course will be prerequisite:

- Data Analytics
- Machine learning
- Data Visualization
- Internet of Things.
- Artificial Intelligence

Rationale:

A Python lab sheet program is to provide students with practical, hands-on experience in coding, reinforcing the theoretical concepts they learn in class. It helps students gain confidence in problem-solving, debugging, and writing Python code by applying it to real-world scenarios. By working through structured lab exercises, students develop a deeper understanding of Python's core concepts, such as control flow, data structures, and file handling, preparing them for more advanced topics like data science, machine learning, and software development. This experiential learning is essential for mastering programming skills.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks		Practical Marks		Total
L	T	P	C	TEE	CAT	TEP	CAP	
0	0	4	2	-	-	30	20	50

CAT: Continuous Assessment Theory comprised of CA1 and CA2 **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) **CAP:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

List of Practicals:

Sr. No	Problem Statement
1	Write a program to find whether a number is a prime number.
2	Write a program to print m raise to power n, where m and n are read from the user.
3	Write a menu driven program to perform the following operations on strings using string built in functions. Find the frequency of a character in a string. Replace a character by another character in a string. Remove the first occurrence of a character from a string. Remove all occurrences of a character from a string.
4	Write a program that accepts two strings and returns the indices of all the occurrences of the second string in the first string as a list. If the second string is not present in the first string, then it should return -1
5	Python program to check eligibility to vote in an election.
6	Program to print the square of a number, unless it is more than 120.
7	Check in the range from 0 – 9 if the item's value is divisible by 2.
8	Write a program to print the summation of the following series up to n terms: 1-2+3-4+5-6+7.....n
9	Program to print the multiples of 3 and their sum(in the range 10 to 30).
10	Check the five numbers from 0 to 9. If y is divisible by 2, then even is appended to the obj list. If not, odd is appended.
11	Consider a tuple t1= (1,2,5,7,9,2,4,6,8,10). Write a program to perform following operations: a. Print contents of t1 in 2 separate lines such that half values come on one line and other half in the next line. b. Print all even values of t1 as another tuple t2. c. Concatenate a tuple t2= (11,13,15) witht1. d. Return maximum and minimum value from t1..
12	Write a program which will find all such numbers which are divisible by 7 but are not a multiple of 5, between 2000 and 3200 (both included).

13	Python Program to Move all Zeros present in List to the End
14	Python Program to Find the Minimum Difference Between the Index of Two Given Elements Present in List
15	Python Program to Find the Minimum Index of a Repeating Element in List
16	Python Program to Left Rotate a List by R Time.
17	Python Program to Put Even and Odd elements in a List into Two Different Lists
18	Python Program to Replace Every List Element by Multiplication of Previous and Next
19	Python Program to Break a List into Chunks of Size N.
20	**List Comprehension** Write a list comprehension to create a list where an element is a tuple of 3 elements x, y and z. The value of x is between 1 to 4. The value of y is between 2 to 5 The value of z is between 5 to 8. Also, list should contain only those tuples as element where x + y > z Write a list comprehension to make a list from the following list names with all the strings starting with 'c'. names = ['Ch','Dh','Eh','cb','Tb','Td'] create a new list using list comprehension from the range 1 to 100 such that the new list contains the square of the number and the square should be even numbers. convert kilometers into feet using list comprehension. kilometer = [37.2, 39.5, 27.3, 17.8] create a transpose of the matrix using list comprehension. matrix = [[10,11,12],[13,14,15],[16,17,18]] Create a new list from cars where the new list will have all the cars except "Maruti". Replace "Maruti" with Mahindra. cars = ["Toyota", "Hyundai", "Maruti", "Tesla", "Tata", "Honda"]

21	**Numpy** Using the Numpy module, write a menu driven program to do the following. Create an array filled with 1's. Generate arrays of random numbers. Find maximum and minimum values from an array Dot product of 2 arrays. Reshape a 1-D array to 2-D array. Extract specific rows, columns, and elements from arrays. Add a scalar to a 2D array. Generate arrays of random numbers.
22	**Dictionary** Create a dictionary with the employee details and retrieve the value upon giving the keys. Create a dictionary and find the sum of values. Create a dictionary from the keyboard and display the elements. Create a dictionary with cricket player's names and scores in a match. Also retrieve runs by entering the player's name. Show the usage of for loop to retrieve elements of dictionaries. Find the number of occurrences of each letter in a string using dictionary Sort the elements of a dictionary based on a key or values.(use lambda function) Convert the elements of two lists into a key-value pair of dictionaries. convert string into key value pair and store them into a dictionary
23	Write a program to find city of given person, have some user with their city in dictionary, the user will enter name to find his/her city, the program should print name of the city and if the user is not found it should use user-defined exception and give message that the user doesn't exist.
24	Write a function that takes a list and returns a new list with distinct elements from the first list.
25	Write Function to find the largest item from a given list.
26	Write a function to accept variable length arguments and return the sum of all the arguments.
27	Write A Program To Pass function as a parameter. Hint: write a function, which returns a string 'How are you?' Pass this function, as a parameter to another function that prints Hi, How are you?

28	Write a function that takes a sentence as input from the user and calculates the frequency of each letter. Use a variable of dictionary type to maintain the count.
29	Write a Python function named print_key_value_pairs that accepts a variable number of keyword arguments and prints their key-value pairs on the console. Implement the function print_key_value_pairs that takes any number of keyword arguments. Inside the function, iterate through the key-value pairs of the provided keyword arguments and print them in the format "key: value".
30	Implement a function called display_employee_info with the following requirements: Create a function named display_employee_info that takes the employee's name, position, department, and salary as inputs. Make sure to set default values for the position, department, and salary parameters. Write the function to return a formatted string containing the employee's information.
31	Write a function to accept a list and return sum and average to the elements of the list. Create a list by taking input at one time using a delimiter.
32	Write a recursive function to calculate power of a given number. Input number and power, call the function and print the result.
33	Write a recursive function to calculate the sum of even numbers. Input n call the recursive function and print the result.
34	**lambda function:** Write a lambda function to find the modulo of a given number. Write a lambda function to calculate the square of a given number. Write a lambda function to concatenate two strings. Write a lambda function to find the square root of a number.

35	**Regular Expressions** Create a regular expression to retrieve all words starting with 'a' in a given string. Create a regular expression to retrieve all words starting with a numeric digit. Create a regular expression to retrieve all words having 5 characters length. Create a regular expression to retrieve all words having length of at least 4 characters. Create a regular expression to retrieve all words having length of 3 or 4 or 5 characters. Create a regular expression to retrieve only single digits from a string. Create a regular expression to retrieve the last word of a string, if it starts with t. Create a regular expression to retrieve the phone number of a person from a string. Create a regular expression to retrieve birth date from a string. Create a regular expression to search whether a given string is starting with 'He'. Create a regular expression to search for a word at the ending of a string by ignoring the case. Create a regular expression to retrieve the timing s either 'am' or 'pm'.
	File and Exception Handling:
36	Write a program to open a file content.txt in read mode and read the content of the file.
37	Write a function that reads a file file1 and copies only alternative lines to another file file2. Alternative lines copied should be the odd numbered lines.
38	Write a program to open a file content.txt in write mode and write data, the file should take input until it finds @ character.
39	Consider a student object with id, name, and percentage and create a class. Import this class and use pickle to dump several objects in a file namedStudent.dat. No. of objects should be taken as input. Read content from Student.dat using pickle.
40	Write a program to search for city names in the binary file named cities.bin and display the record number that contains the city name. Write a program to update or modify a record in a binary file (cities.bin). Write a program to delete a specific record from a binary file. (cities.bin). Write a program to randomly access a record from a binary file (cities.bin)

41	Write a program to create a phone book with names and phone numbers. Store data in a binary file named Phonebook.dat. Write a menu driven program to access data from Phonebook.dat. Menu Should be To display all the entries To display Phone numbers Modify an entry Exit
42	Write a Python program to handle a ZeroDivisionError exception when dividing a number by zero.
43	Write a program that reads a list of integers from the user and throws an exception if any numbers are duplicates.
44	Write a program to enter a specific number say n, the program should not terminate until the user enters specific number n. It should generate exception TooSmallValue if the value < n and generate exception TooLargeValue if value > n.
45	Write a program to accept positive digits. Define a user-defined exception to check whether the value given is a valid positive digit or not. If the value is not numeric the exception Not_Suitable_value_exceptions should be triggered and handled.
46	Write a user-defined exception to generate a message if the balance of the given user is less than 2000 INR in his bank account. Use a dictionary to maintain account data with username and balance.
47	Write a program, which accepts marks of a student (between 0 to 100) and checks whether it is within the range or not. If it is within the range then it displays "marks entered successfully", if not then it throws the exception of user defined class "MarksOutOfRangeException"
48	Write a program to generate TypeError, NameError, and ZeroDivision error and handle.

	Data Visualization:
49	**openCV** Read and Display an Image Convert an Image to Grayscale Image Resizing and Cropping Apply Gaussian Blur Edge Detection using Canny Drawing Shapes on Images Capture Video from Webcam Face Detection using Haar Cascades **CGAL** Basic Geometric Operations - Create and print points, lines, and segments. Compute the convex hull of a set of 2D points Perform Delaunay triangulation on a set of points. Compute the Voronoi diagram from Delaunay triangulation. Create a polygon and compute its area. Generate a 2D mesh and visualize it.
50	Write a program that makes use of a function to display sine, cosine, polynomial and exponential curves.
51	Take as input in the months and profits made by a company ABC over a year. Represent this data using a line plot. Generated line plot must include X axis label name = Month Number and Y axis label name = Total profit.

Suggested Specification Table with Marks (Practical):

%Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	20	60	0	0	0

Legends: R: Remembrance, U: Understanding; A: Application, N: Analyze, 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 the above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Introduction to Python Programming	Venkatesh, Nagaraju Y	Khanna Publishing House	2021	1st edition
2	Introduction to Computing & Problem Solving With Python	Jeeva Jose	Khanna Publishing House	2023	2nd edition
3	Python Programming a Modular approach	Sheetal Taneja & Naveen Kumar	A Modular approach with Graphics, Database, Mobile and Web applications	2017	1st edition
4	Think Python	Allen Downey	O'Reilly	2015	2nd edition
5	An introduction to Python for absolute beginners	Bob Dowling, Cambridge Univ.	Khanna Publishing House	-	1st edition
6	Introduction to Computation and Programming using Python	John Guttag	PHI India.	2016	3rd edition

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % Weightage
CO-1	Implement basic Python syntax, keywords, data types, and operators through hands-on exercises	10
CO-2	Develop programs utilizing decision-making and looping constructs to control execution flow	10
CO-3	Manipulate and process data effectively using Python's built-in data structures like strings, lists, tuples, and dictionaries	30
CO-4	Design modular and reusable programs by implementing user-defined functions and lambda expressions	20
CO-5	Perform file handling operations to store and retrieve data efficiently	10
CO-6	Apply exception handling techniques to create error-free and robust Python programs	10
CO-7	Utilize Python libraries such as Matplotlib, Pandas, CGAL, and OpenCV for real-time data visualization, computational geometry, and analysis	10

Mapping with POs:

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	2	1	0	0	0	0	0	1	0	0
CO-2	3	3	2	2	0	0	0	0	0	1	0	0
CO-3	3	3	3	2	0	0	1	0	0	1	0	0
CO-4	3	3	3	3	0	0	1	0	0	1	0	0
CO-5	3	3	2	2	3	0	1	0	0	1	0	0
CO-6	3	3	3	3	3	3	1	0	0	1	0	0
CO-7	3	3	3	3	3	3	3	0	1	2	1	2
Rationale*												