

CS6103E Software Systems Laboratory

Monsoon Semester (2025-26)

1st Year M.Tech CSE/CS(IS)

Python Programming

The objective is to learn the following:

- Basic data structures like lists, dictionary and tuples.
- Fundamental Programming concepts like loops and conditional logic.
- Creating user defined functions and handling csv and text files.
- Working with pandas.

Submission date: On or before 13.11.2025 (11:59 pm)

Mode of submission: as a single .py file named as per the format

P2_<FIRST NAME>_<ROLLNO>.py (e.g. P2_saritha_m240064CS.py)

1. The shared CSV file, viz. “world_population.csv”, contains human population from 8 different timelines in all the different countries across the globe. Read data present in file into a dataframe and write python scripts performing following tasks (For each function mentioned below create separate functions):

- i. Find the 3 most populated countries and 3 least populated countries in the year 2022. (Create 2 separate functions – one for most populated 3 countries and one for least populated 3 countries).
- ii. Find the rate of population growth between 2000 and 2022 for each country. Store this information in a new column - “New_Growth_Rate”. Formula: $(\text{population in 2022} - \text{population in 2000}) / \text{population in 2000}$
- iii. Find the population of each continent in the year 2022. Then sort according to increasing order of population.
- iv. You are required to classify countries based on their population size in the year 2022 into four categories and store the result in a new column named Category_2022:

Using a **for** loop, iterate through each row of the DataFrame and perform the following steps:

- (a) Read the population value for the year **2022**.
- (b) If the value is missing or invalid, assign the label '**Missing**'.
- (c) Otherwise, assign categories as per the population range below:
- **Small:** population < 10,000,000
 - **Medium:** $10,000,000 \leq \text{population} \leq 100,000,000$
 - **Large:** $100,000,000 < \text{population} \leq 500,000,000$
 - **Mega:** population > 500,000,000
- (d) Store the final results in a new column named **Category_2022** in the same DataFrame.
- (e) Print the first 10 rows of the DataFrame showing the columns:
['Country', '2022', 'Category_2022']
- 2.** Write a Python program using Pandas to read a continent name and a year from the user, and then display the population details for that selection. The program should first prompt the user to enter a continent name (for example, Asia, Europe, or Africa) and a year (for example, 2000, 2010, or 2022). It should validate whether the entered continent exists in the dataset and whether the entered year is available as a column in the DataFrame. If either input is invalid, the program must display an appropriate error message and terminate gracefully. If both inputs are valid, the program should filter the DataFrame to include only the countries belonging to the specified continent for the selected year. Calculate the total population of the continent for that year by summing the populations of all its countries. Finally, the program should display the results in a clear, tabular format showing each country's name and its population for the entered year, followed by a final row displaying the total population of the entire continent for that year.

Sample Output:

```
Enter Continent Name (e.g., Asia, Europe, Africa): Asia
Enter Year (e.g., 2000, 2010, 2022): 2022
```

Country	2022
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China	1,426,000,000
India	1,417,000,000
Indonesia	276,000,000
Pakistan	240,000,000
Bangladesh	171,000,000
Japan	125,000,000
Philippines	115,000,000

Vietnam	100,000,000
Turkey	86,000,000
Iran	85,000,000
Thailand	71,000,000
Myanmar	55,000,000
South Korea	52,000,000
Iraq	43,000,000
Afghanistan	42,000,000
Saudi Arabia	36,000,000
Uzbekistan	35,000,000
Nepal	30,000,000
Malaysia	33,000,000
Yemen	33,000,000
Sri Lanka	21,000,000
Kazakhstan	19,000,000
Cambodia	17,000,000
Jordan	11,000,000
Laos	7,000,000
Mongolia	3,400,000
Bhutan	780,000
Maldives	520,000
Brunei	450,000
Timor-Leste	1,400,000

Total Population of Asia in 2022: 4,780,550,000
