

Capstone Project: Campus Energy-Use Dashboard

This document contains the completed capstone assignment for the course **Programming for Problem Solving using Python**. It covers all required tasks: data ingestion, aggregation, OOP modeling, visualization logic, and summary export methodology.

Task 1: Data Ingestion and Validation

- Used pandas to load multiple CSV files from a /data/ folder.
- Implemented exception handling for missing/corrupt files.
- Added metadata (building name, month) extracted from filenames.
- Produced a merged DataFrame: df_combined.

Task 2: Core Aggregation Logic

- Implemented daily and weekly totals using groupby and resample.
- Created building-wise summary tables (mean, min, max, total kWh).
- Stored outputs in dictionaries and DataFrames.

Task 3: Object-Oriented Modeling

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<b>Classes Implemented:</b>

class MeterReading:
    def __init__(self, timestamp, kwh):
        self.timestamp = timestamp
        self.kwh = kwh

class Building:
    def __init__(self, name):
        self.name = name
        self.meter_readings = []

    def add_reading(self, reading):
        self.meter_readings.append(reading)

    def total_consumption(self):
        return sum(r.kwh for r in self.meter_readings)

class BuildingManager:
    def __init__(self):
        self.buildings = {}

    def add_building(self, building):
        self.buildings[building.name] = building

- OOP used to organize consumption data per building.
```

Task 4: Visualization Plan (Matplotlib)

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Generated:
- Line chart: Daily consumption trend.
- Bar chart: Weekly average usage by building.
- Scatter plot: Peak-hour consumption analysis.
All charts arranged using plt.subplots() and exported as dashboard.png.
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Task 5: Persistence & Summary

- Exported cleaned data to cleaned_energy_data.csv.
- Exported building summary to building_summary.csv.
- Generated summary.txt describing:

- * Total campus consumption
- * Highest-consuming building
- * Peak load timing
- * Weekly & daily patterns