

# ACXC163N - Recent Trends in Refrigeration and Air Conditioning Event

## Task 1: Cooling Load Calculator of a Building

### SCOPE & SITE Student

#### Objective:

Create a Python program that calculates the cooling load for a building based on user input.

### For other Students

#### Objective:

Create a program using any language that calculates the cooling load for a building based on user input.

### Instructions:

- • Area of the building (in square meters)
- • Number of occupants in the building
- • Type of building (residential, commercial, etc.)
- • Outdoor temperature (in Celsius)
- • Indoor desired temperature (in Celsius)
- • Based on the type of building, use the following formulae to calculate the cooling

load:

- • For residential buildings: Cooling Load =  $100 * \text{number of occupants}$
- • For commercial buildings: Cooling Load =  $150 * \text{number of occupants}$

#### Calculate the heat transfer due to conduction:

- Use the formula:  $Q_{\text{conduction}} = U * A * (T_{\text{outdoor}} - T_{\text{indoor}})$
- Assume U (Overall heat transfer coefficient) =  $30 \text{ W/m}^2\text{°C}$  for simplicity.

#### Calculate the sensible cooling load:

- → •Use the formula: Sensible Cooling Load =  $Q_{\text{conduction}} + \text{Cooling Load}$
- → •Display the final sensible cooling load to the user.
- → •Note: This assignment will assess your ability to take user inputs, apply basic mathematical calculations, and use conditional statements to determine the type of building and corresponding cooling load.

Interested students add additional features (Additionally, build a simple web page to display the results.) if you'd like to challenge yourself further.

### Web Page Creation:

- Using HTML, CSS, and JavaScript, create a simple web page to take user inputs for the cooling load calculator and display the results.

– Deployment:

Deploy the web page using a free hosting service such as GitHub Pages or Netlify.

– Submission:

Provide a GitHub repository link containing the Python code and web page files.

For validating the above use the above code by use the following values:

- • Area of the building (500 square meters)
- • Number of occupants in the building (10)
- • Type of building (residential,)
- • Outdoor temperature (45°C)

Github Repo Link : <https://github.com/KaarthikeyaK/CoolingLoadCalculatorEXC>

**Python Code :**

```
def calculate_cooling_load(area, numOccupants, buildingType,
outdoorTemp, indoorTemp):
    if buildingType.lower() == "residential":
        coolingLoad = 100 * numOccupants
    elif buildingType.lower() == "commercial":
        coolingLoad = 150 * numOccupants
    else:
        raise ValueError("Invalid building type. Supported types:
residential, commercial")

    uCoefficient = 30
    qConduction = uCoefficient * area * (outdoorTemp - indoorTemp)
    sensibleCoolingLoad = qConduction + coolingLoad

    return sensibleCoolingLoad

def main():
    try:
        area = float(input("Enter the area of the building (in
square meters): "))
        numOccupants = int(input("Enter the number of occupants in
the building: "))
```

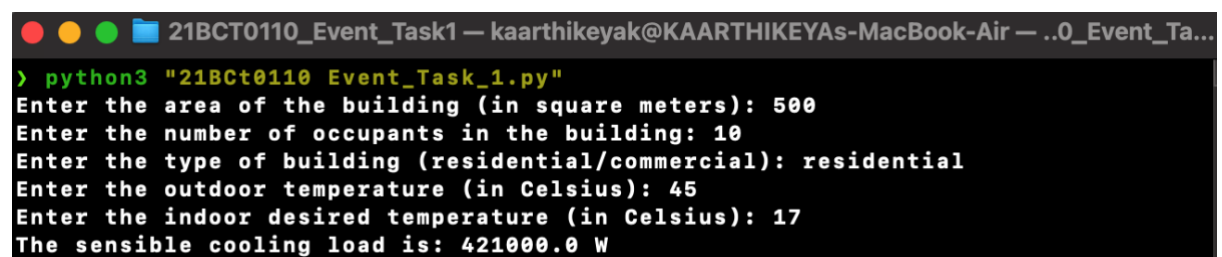
```

        buildingType = input("Enter the type of building
(residential/commercial): ")
        outdoorTemp = float(input("Enter the outdoor temperature (in
Celsius): "))
        indoorTemp = float(input("Enter the indoor desired
temperature (in Celsius): "))

        coolingLoad = calculate_cooling_load(area, numOccupants,
buildingType, outdoorTemp, indoorTemp)
        print(f"The sensible cooling load is: {coolingLoad} W")
    except ValueError as e:
        print(f"Error: {e}")

if __name__ == "__main__":
    main()

```



A terminal window titled "21BCT0110\_Event\_Task1 — kaarthikeyak@KAARTHIKEYAs-MacBook-Air — ..0\_Event\_Ta..." shows the execution of a Python script. The prompt is "> python3 '21BCT0110\_Event\_Task\_1.py'". The script prompts for five inputs: area (500), number of occupants (10), building type (residential), outdoor temperature (45), and indoor temperature (17). It then outputs "The sensible cooling load is: 421000.0 W".

```

> python3 "21BCT0110_Event_Task_1.py"
Enter the area of the building (in square meters): 500
Enter the number of occupants in the building: 10
Enter the type of building (residential/commercial): residential
Enter the outdoor temperature (in Celsius): 45
Enter the indoor desired temperature (in Celsius): 17
The sensible cooling load is: 421000.0 W

```

Web Page Code :

```

<!DOCTYPE html>
<html>
<head>
    <title>Cooling Load Calculator</title>
    <style>
        body {
            font-family: 'Segoe UI', Tahoma, Geneva, Verdana, sans-
serif;
            background-color: #f7f7f7;
            color: #333;
            line-height: 1.6;
            margin: 0;
            display: flex;
            justify-content: center;

```

```
        align-items: center;
        height: 100vh;
    }

    .container {
        max-width: 400px;
        padding: 20px;
        background-color: #fff;
        border-radius: 5px;
        box-shadow: 0 2px 4px rgba(0, 0, 0, 0.1);
    }

    h2 {
        margin-bottom: 20px;
        text-align: center;
        color: #007bff;
    }

    label {
        display: block;
        margin-bottom: 10px;
        font-weight: bold;
    }

    .input-row {
        display: flex;
        justify-content: space-between;
    }

    .input-field {
        width: calc(50% - 10px);
        margin-bottom: 20px;
        padding: 10px;
        border: 1px solid #ccc;
        border-radius: 5px;
    }

    select {
```

```
        width: 100%;
        margin-bottom: 20px;
        padding: 10px;
        border: 1px solid #ccc;
        border-radius: 5px;
    }

    button {
        width: 100%;
        padding: 12px 20px;
        background-color: #007bff;
        color: #fff;
        border: none;
        border-radius: 5px;
        cursor: pointer;
        transition: background-color 0.3s ease, transform 0.3s
ease;
    }

    button:hover {
        background-color: #0056b3;
    }

    button.clicked {
        background-color: #00cc66;
        transform: scale(1.05);
    }

    #result {
        margin-top: 20px;
        font-weight: bold;
        text-align: center;
        color: #007bff;
    }
</style>
</head>
<body>
    <div class="container">
```

```
<h2>Cooling Load Calculator by 21BCT0110 Kaarthikeya  
Kammula</h2>  
<div class="input-row">  
  <div class="input-field">  
    <label for="area">Area of the building (in square  
meters):</label>  
    <input type="number" id="area" required>  
  </div>  
  <div class="input-field">  
    <label for="num_occupants">Number of occupants in  
the building:</label>  
    <input type="number" id="num_occupants" required>  
  </div>  
</div>  
  
<label for="building_type">Type of building:</label>  
<select id="building_type" required>  
  <option value="residential">Residential</option>  
  <option value="commercial">Commercial</option>  
</select>  
  
<div class="input-row">  
  <div class="input-field">  
    <label for="outdoor_temp">Outdoor temperature (in  
Celsius):</label>  
    <input type="number" id="outdoor_temp" required>  
  </div>  
  <div class="input-field">  
    <label for="indoor_temp">Indoor desired temperature  
(in Celsius):</label>  
    <input type="number" id="indoor_temp" required>  
  </div>  
</div>  
  
<button id="calculateButton"  
onclick="calculateCoolingLoad()">Calculate</button>  
  
<div id="result"></div>
```

```
</div>

<script>
    function calculateCoolingLoad() {
        const area =
parseFloat(document.getElementById("area").value);
        const num_occupants =
parseFloat(document.getElementById("num_occupants").value);
        const building_type =
document.getElementById("building_type").value;
        const outdoor_temp =
parseFloat(document.getElementById("outdoor_temp").value);
        const indoor_temp =
parseFloat(document.getElementById("indoor_temp").value);

        const coolingLoad = building_type === "residential" ?
100 * num_occupants : 150 * num_occupants;
        const uCoefficient = 30;
        const qConduction = uCoefficient * area * (outdoor_temp
- indoor_temp);
        const sensibleCoolingLoad = qConduction + coolingLoad;

        const resultElement = document.getElementById("result");
        resultElement.innerText = `The sensible cooling load is:
${sensibleCoolingLoad} W`;

        const calculateButton =
document.getElementById("calculateButton");
        calculateButton.classList.add("clicked");
        setTimeout(() => {
            calculateButton.classList.remove("clicked");
        }, 300);
    }
</script>
</body>
</html>
```

## Cooling Load Calculator by 21BCT0110 Kaarthikeya Kammula

Area of the building  
(in square meters):

Number of occupants  
in the building:

Type of building:

Outdoor temperature  
(in Celsius):

Indoor desired  
temperature (in  
Celsius):

Calculate

The sensible cooling load is: 421000 W