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 \* number of occupants
* •  For commercial buildings: Cooling Load = 150 \* number of occupants Calculate the heat transfer due to conduction:

¬ Use the formula: Q\_conduction = U \* A \* (T\_outdoor - T\_indoor)  
¬ Assume U (Overall heat transfer coefficient) = 30 W/m2°C for simplicity.

Calculate the sensible cooling load:

* ¬  Use the formula: Sensible Cooling Load = Q\_conduction + 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 screenshot of a computer

Description automatically generated**

**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: 100**vh**;

}

.container {

max-width: 400**px**;

padding: 20**px**;

background-color: #fff;

border-radius: 5**px**;

box-shadow: 0 2**px** 4**px** rgba(0, 0, 0, 0.1);

}

**h2** {

margin-bottom: 20**px**;

text-align: center;

color: #007bff;

}

**label** {

display: block;

margin-bottom: 10**px**;

font-weight: bold;

}

.input-row {

display: flex;

justify-content: space-between;

}

.input-field {

width: calc(50**%** **-** 10**px**);

margin-bottom: 20**px**;

padding: 10**px**;

border: 1**px** solid #ccc;

border-radius: 5**px**;

}

**select** {

width: 100**%**;

margin-bottom: 20**px**;

padding: 10**px**;

border: 1**px** solid #ccc;

border-radius: 5**px**;

}

**button** {

width: 100**%**;

padding: 12**px** 20**px**;

background-color: #007bff;

color: #fff;

border: none;

border-radius: 5**px**;

cursor: pointer;

transition: background-color 0.3**s** ease, transform 0.3**s** ease;

}

**button**:hover {

background-color: #0056b3;

}

**button**.clicked {

background-color: #00cc66;

transform: scale(1.05);

}

#result {

margin-top: 20**px**;

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 **=** parseInt(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**>

**A screenshot of a calculator

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