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Education for the Future – Electromobility, Future Transport, Sustainable Transport

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Student Assignment: Energy Audit of a School Building Using a Thermal Camera

Purpose

In this assignment, you will use a thermal camera, sensor data, and your own observations to investigate how energy is used in a building and identify opportunities for improving energy efficiency.

The task combines practical work, data collection, analysis, and problem-solving, and is suitable for both Electrical Engineering and Computer Technology students and General Studies students.

Learning Objectives

After completing this assignment, you will be able to:

- explain how thermal cameras detect heat and temperature differences
- use thermal images to identify heat loss and energy-related issues
- interpret temperature and motion data from sensors
- analyze and present findings using graphs and charts
- propose measures to reduce energy consumption
- reflect on how technology can contribute to smart and sustainable buildings

Part 1: Select an Area

Choose one area of the school building to investigate:

☐ Classroom
☐ Workshop
☐ Office
☐ Corridor
☐ Entrance Hall
☐ Stairwell
☐ Other: _____

Selected Area: _____

Part 2: Expected Use of the Area

Describe how the area is normally used.

Number of people using the area: _____

Typical hours of use during the day: _____

Expected heating requirements: _____

Part 3: Investigation Using a Thermal Camera

Use the thermal camera to identify temperature differences.

Take thermal images of:

☐ Windows
☐ Doors
☐ Walls
☐ Ceiling
☐ Radiators or other heat sources
☐ Ventilation ducts
☐ Electrical installations (Electrical Engineering students)
☐ Machines/equipment (Workshop areas)

Record Your Observations

Observation	What does the thermal image show?
Possible heat loss	
Cold areas	
Warm areas	
Thermal bridge detected?	
Other findings	

Part 4: Analysis of Sensor Data

Use information from sensors installed in the building.

Record:

- Indoor temperature
- Outdoor temperature
- Occupancy/movement in the room
- Any additional measurements

Measurement	Value

Indoor temperature	
Outdoor temperature	
Temperature difference	
Room occupancy/movement	

Additional observations:

Part 5: Data Processing

Create one of the following:

☐ Temperature graph

☐ Histogram of temperature measurements

☐ Comparison of indoor and outdoor temperatures

☐ Graph showing the relationship between temperature and room occupancy

Attach the graph or include it in your report.

Part 6: Interpretation of Results

Write a short analysis (100–200 words).

Reflect on the following questions:

1. What did you discover?
2. Does the thermal imaging indicate heat loss?
3. Is the room being used as the sensor data suggests?
4. Is energy being used efficiently?
5. What relationship do you observe between temperature and room usage?

Analysis

Part 7: Suggestions for Improvement

Propose at least 2–3 measures that could reduce energy consumption.

Measure 1: _____

Measure 2: _____

Measure 3: _____

Part 8: Subject-Specific Extension

Electrical Engineering and Computer Technology

Use the thermal camera to inspect electrical installations.

- Identify components with unusually high temperatures.
- Explain possible causes.
- Discuss how thermal imaging can be used for preventive maintenance.
- Assess any potential safety concerns.

Additional Questions

- What happens if a circuit or component becomes overloaded?
- How can thermal imaging help prevent faults and fires?

General Studies

Investigate the relationship between energy consumption, sustainability, and climate.

- Evaluate how heat loss affects energy use.
- Calculate potential energy savings if one of your proposed measures is implemented.
- Discuss how smart buildings can contribute to the UN Sustainable Development Goals.

Additional Questions

- How can technology help society reduce energy consumption?
- What role do energy-efficient buildings play in the green transition?

Reflection

How can thermal imaging, sensor technology, and data analysis contribute to the development of smarter and more sustainable buildings?