ANNEX 1 – FITXES PROJECTES I ACTIVITATS
FITXES ACTIVITATS AULA:

<table>
<thead>
<tr>
<th>WORKSHEET:</th>
<th>ACTIVITY:</th>
<th>INITIAL DEBATE – CLIMATE CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>ESTIMATED</td>
<td>We are going to look at two different videos about the climate change and sustainability.</td>
</tr>
<tr>
<td></td>
<td>TIME:</td>
<td>You will have to complete this worksheet in order to organize your own ideas and opinions and be able to start a general debate with the other students of the class.</td>
</tr>
<tr>
<td></td>
<td>RESOURCES:</td>
<td>PRESENTATION:</td>
</tr>
<tr>
<td></td>
<td>DEBATE</td>
<td>❖ Hang out this page</td>
</tr>
<tr>
<td></td>
<td></td>
<td>❖ Participate in the general debate</td>
</tr>
</tbody>
</table>

VIDEO 1 – CLIMATE CHANGE ADVERT

1. What is the father explaining to the little girl?

2. Do you agree with that?

3. Are they talking about the future or the past?

4. Which do you think is going to be the ending of this story?
**WORKSHEET:** 02  
**ACTIVITY:** DESPERTAFERRO ARTICLE

<table>
<thead>
<tr>
<th>ESTIMATED TIME:</th>
<th>80’</th>
</tr>
</thead>
</table>

You will be given an article in Catalan about the first Spanish solar car, the **DESPERTAFERRO**.  
You have to read the article and try to extract the main idea about the text given.  
After you read the article, you will have to make a brief summary in English and answer the questions below.

<table>
<thead>
<tr>
<th>RESOURCES:</th>
<th>ARTICLE</th>
</tr>
</thead>
</table>

**PRESENTATION:**  
- Hang out the summary.  
- Hang out this worksheet.

---


1. What type of vehicle is the **DESPERTAFERRO**? How does it work?

2. Who designed the **DESPERTAFERRO**?

3. They participate in a solar car race, when and where happened?

4. What differences have you noticed between this solar car and a normal fuel car?
WORKSHEET: 03

ACTIVITY:

THE HOOVER DAM

ESTIMATED TIME:

60' VIDEO - classwork
30' ACTIVITIES - homework

RESOURCES:

VIDEO REPORT

PRESENTATION:

Hang out this worksheet.

NATIONAL GEOGRAPHIC – MEGASTRUCTURES – THE HOOVER DAM

http://www.youtube.com/watch?v=8TR8YrGXql0

1. What kind of energy source does the Hoover Dam produce?

2. When was the Hoover Dam build? Where is it located?

3. On which river is the Hoover Dam? What did they do with the river while the construction of the dam?

4. Is the Hoover Dam still working?

5. How does the Hoover Dam generate power?

6. What are the advantages and drawbacks of the dams?
We are going to see two little videos. One is about good practices for efficient energy saving. The other one is an explanation video about different types of sustainable vehicles. Look at them and answer these questions.

1. What do you think we could do to reduce the climate change and protect our planet?

2. Think about three things that you consider you could change in your way of life in order to reduce the energy impact.

3. What kind of vehicles does the video talk about?

4. What are the resemblances and the differences between those vehicles?

5. What are the advantages and drawbacks of these types of vehicles?
WORKSHEET: 05

ACTIVITY: FINAL DEBATE - SUSTAINABILITY

ESTIMATED TIME: 30’ VIDEO

RESOURCES: DEBATE

First of all, try to answer this two questions before watching the video. Afterwards we will see the video prepared, and start a debate about sustainability, society and energy. It is a good time to show what you have learned during this term and to express your personal opinion to the other students in the class.

PRESENTATION:
- Hang out this page
- Participate in the general debate

1. What does sustainability mean?

2. What do you think society can do to improve sustainability?

Sustainability explained through animation

http://www.youtube.com/watch?v=B5NiTN0chj0
FITXA SORTIDA:

<table>
<thead>
<tr>
<th>WORK PROJECT:</th>
<th>ACTIVITY:</th>
<th>E(CO) PROJECT</th>
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<tbody>
<tr>
<td>01</td>
<td></td>
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<tr>
<td>ESTIMATED TIME:</td>
<td>On May 17, the ETSAV Arquitecture University presented a new 100% sustainable house. It is in construction out of the university and there will be an exhibition for the next two weeks, so we will go and visit it. Before you go there, you will have to make the research mentioned below. Afterwards you will have to make a little project about the visit. You have all the specifications needed underneath.</td>
<td></td>
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<tr>
<td>4 h</td>
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<tr>
<td>RESOURCES: OUT-OF-SCHOOL VISIT</td>
<td>Hang out the project</td>
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</table>

BEFORE WE GO:

- E(CO) PROJECT is a prototype of sustainable and low cost house made by a group of students of ETSAV Arquitecture University, in Sant Cugat del Vallès.
- They will participate for second time in the Solar Decathlon Europe 2012 edition, an international competition of energy self-sufficient housing.
- Make some research about this project and about the Solar Decathlon Europe competition.
- When did they first participate in this competition? Which was the prototype?

DURING THE VISIT:

- Take notes of the explanation your teacher gives you.
- Take some photos; they may help you for your future project.

THE PROJECT:

- You have done research about the sustainable house and you have gone to visit it, so you are now prepared to star your project.
- The project will have to follow these points:
  - INTRODUCTION
  - ETSAV STUDENT’S SUSTAINABLE HOUSES PROJECTS
  - SOLAR DECATHLON EUROPE COMPETITION
  - E(CO) PROJECT:
    - House characteristics
    - Which energy sources does this house use?
- How does this house work?
- What are the difference between this project and the first one?
- Advantages and drawbacks
  - GALLERY
    - Include some photos and draws
  - CONCLUSION AND PERSONAL OPINION
In this project, we are going to work in groups of 4/5 students in order to design, create and build a little car toy powered by solar energy. Students need to have prior knowledge on using basic hand tools and have an essential understanding of electronic circuits.

- Memory of the project
- Car prototype
- Oral and audio visual presentation of the project
- Final solar car race

MAIN OBJECTIVES

- Be able to design and build their own solar car toy
- Learn how to work in groups
- Understand the process of transforming solar energy into electric power.
- Understand a real example.

CONTENT:

- Work in groups in a cooperatively way.
- Learn how to share tasks and organize
- Design a car toy powered by solar energy
- Draw the sketch of the design
- Build a solar toy with materials that are available
- Knowing how to make a rational use of the materials
- Work with photovoltaic cells and electric circuits
ASSESSMENT'S CRITERIA:

AC1 - Know and apply the methods of cooperative work
AC2 - Design and build the solar car
AC3 – Define and explain the process of transforming solar energy into electric power.
AC4 - Use the multimedia resources to present the memory of the project
AC5 - Properly use of the grammatical structures and the vocabulary purchased in English language to express and communicate the decisions taken.

ESTIMATED TIME:

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<tr>
<th>SESSION</th>
<th>DURATION</th>
<th>PLANNING – PUPIL ACTIVITY</th>
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<td>1</td>
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<td>Introduction to the activity.</td>
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<td></td>
<td>Start to think and draw the sketch of the car design</td>
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<tr>
<td></td>
<td></td>
<td>Inspection of the available materials to build the car</td>
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<td>Work in the Memory of the project</td>
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<td>2</td>
<td>1 h</td>
<td>Continue to work in the design</td>
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<tr>
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<td></td>
<td>Start to make the car chassis</td>
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<tr>
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<td></td>
<td>Work in the Memory of the project</td>
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<tr>
<td>3</td>
<td>1 h</td>
<td>Continue building the car chassis</td>
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<tr>
<td></td>
<td></td>
<td>Start with the driveshaft and the electric circuit</td>
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<tr>
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<td>Work in the Memory of the project</td>
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<tr>
<td>4</td>
<td>1 h</td>
<td>Continue with the driveshaft and the electric circuit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Start to assemble the photovoltaic cells</td>
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<tr>
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<td></td>
<td>Work in the Memory of the project</td>
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<tr>
<td>5</td>
<td>1 h</td>
<td>Continue to assemble the photovoltaic cells</td>
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<tr>
<td></td>
<td></td>
<td>Finish the final details</td>
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<tr>
<td></td>
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<td>Work in the Memory of the project</td>
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<tr>
<td>6</td>
<td>1 h</td>
<td>Oral and audiovisual presentation of the projects</td>
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<tr>
<td></td>
<td></td>
<td>Final solar car race</td>
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</tbody>
</table>
MEMORY OF THE PROJECT:

1. INTRODUCTION
2. WHAT IS THE SOLAR ENERGY?
3. SOLAR CAR TOY
   a. FIRST IDEAS
   b. SKETCH OF THE DESIGN
   c. DAILY PLANNING
   d. MATERIALS
   e. TOOLS
   f. FINAL PROTOTYPE
4. UNFORESEEN AND DIFFICULTIES
5. WHAT COULD I DO BETTER NOW?
6. CONCLUSIONS
ANNEX 2 – UNIT 6 “ENERGY AND TECHNOLOGY”

STUDENT’S GUIDE
UNIT 6

ENERGY AND TECHNOLOGY

1. SUSTAINABLE TRANSPORT

1.1 WHAT IS SUSTAINABLE TRANSPORT?

Every day we move around our city, our village or even travel long distances. Think about how usually you do it. Do you go by car, cycling or for example, using public transportation?

**LET’S TALK ABOUT IT!**

- Discuss this question with your partner and try to think about the environmental impact they produce
- Make notes about the relevant things
- Compare your answers with the rest of the class
- Make sure your spelling is correct!

Transport has significant economic, social and environmental impacts, according to for between 20% and 25% of world energy consumption and carbon dioxide emissions. Transport emission is also one of the major contributors to local air pollution.

Therefore, society and transport are changing to become more sustainable.

*Sustainable transport* refers to any means of transport with low impact of the environment.

The European Union Council of Ministers of Transport defines a sustainable transportation system as one that:

- Allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations.
- Is affordable, operates efficiently, offers a choice of transport mode, and supports a vibrant economy.
- Limits emissions and waste within the planet’s ability to absorb them, minimizes the consumption of non-renewable resources, reuses and recycles its components, and minimizes the use of land and production of noise.

**WHAT DOES THIS MEAN?**

- Underline the words you don’t know.
- Try to separate the principal sentence in different and individual sentences
- Translate each sentence so that is easier to understand
1.2 DIFFERENT SOLUTIONS FOR THE SAME PROBLEM

We need to improve sustainable mobility; this includes:

- Changing people and the way that they live
- Changing technology
- Changing prices

**LET’S TALK ABOUT IT!**

- Discuss in class these three points.
- Do you think society has to change the way we live?
- Has your city changed lately to improve sustainable transport?

1.2.1 CLEAN VEHICLES

We do have now some alternatives to traditional fuel transports. Here we give you some alternatives that exist nowadays.

**HYBRID VEHICLES**

A hybrid vehicle is a vehicle that uses two or more distinct power sources to move the vehicle. The most common hybrid vehicles are the hybrid electric vehicles (HEV’S), which combine an internal-combustion engine and one or more electric motors.

**ELECTRIC VEHICLES**

An electric vehicle (EV), also referred to as an electric drive vehicle, uses one or more electric motors for propulsion. Three main types of electric powered vehicles exist:

- Those that are directly powered from an external power station
- Those that are powered by stored electricity originally from an external power source
- Those that are powered by an on-board electrical generation

We can find different electric vehicles such as electric powered cars, trains, airplanes, lorries, boats, motorcycles and scooters.

**TAKE A LOOK!**

- Have you noticed if you can recharge your car on-street in your city?
- Look if your city has public charging stations in the streets.

**HYDROGEN VEHICLES**

A hydrogen vehicle is a vehicle that uses as its on-board fuel for motive power.

Hydrogen fuel does not occur naturally on Earth and thus is not an energy source, but is an energy carrier. Currently, it is most frequently made from methane or other fossil fuels. However, it can be produced from a
wide range of sources (such as wind, solar, or nuclear) that are intermittent, to diffuse or too cumbersome to directly propel a vehicle.

**SOLAR VEHICLES**

A solar vehicle is an electric vehicle powered completely or significantly by direct solar energy. Usually, photovoltaic (PV) cells contained in solar panels convert the sun's energy directly into electric energy.

The term "solar vehicle" usually implies that solar energy is used to power all or part of a vehicle's propulsion.

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### 1.2.2 PUBLIC TRANSPORTATION

Public transportation is a shared passenger transportation service, and it is generally regarded as significantly more energy-efficient than other forms of travel.

The most common public transports are buses, trains and trams.

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### 1.2.3 NON-MOTORIZED TRANSPORT

Nowadays, cities are working for increasing the mobility by non-motorized transport, such as the bicycles.

**LET'S WRITE ABOUT IT!**

- Write an essay about the advantages and drawbacks of the transports above
- Write your essay in 150-200 words.

**USEFUL LANGUAGE FOR ESSAYS**

- It is probably true to say that...
- On one hand....and on the other hand...
- It is also the case that....
- In conclusion...

---

### 1.3 ACTIVITIES

1. Explain your everyday way to school. What could you do to make it more sustainable?
2. Vehicle's pollution contributes to improve the climate change. Make some research about it.
3. Fill the gaps: Sustainable transport....
a. Allows the basic _______ and development ___ of individuals, companies and society to be met safely in a manner consistent with human and_______health.

b. Is__________, operates ________, offers a choice of ________mode, and supports a vibrant economy. __

c. Limits __________ and ________within the planet’s ability to absorb them, minimizes the of non-renewable resources, ________and ________its components, and __________the use of land and production of noise.

4. Match the columns:

| Solar vehicle | Non-motorized vehicle powered by human force. |
| Hybrid vehicle | Vehicle using one or more electric motors for propulsion |
| Bicycle | Vehicle that uses as its on-board fuel for motive power. This fuel does not occur naturally on Earth, but can be produced from a wide range of sources. |
| Electric vehicle | It is an electric vehicle powered completely or significantly by direct solar energy. |
| Tram | Vehicle that uses two or more distinct power sources to move the vehicle |
| Hydrogen bus | It is a shared passenger transportation service, which are significantly more energy efficient than other forms of travel. |
2. HOME AUTOMATION

2.1 WHAT IS HOME AUTOMATION?

**LET’S TALK ABOUT IT!**

- Home automation is also known as SMART HOMES. What does SMART mean?
- Do you know what is Home Automation?
- Discuss the answer with the rest of the class.

Home automation is the automated or remote control of appliances and equipment at home.

Therefore, a home automation allows a better quality of life through technology providing a reduction in domestic work, increased welfare and safety of its habitants and a rationalization of the different energy consumption.

Automated controls can be used to turn equipment on or off or adjust the operating settings at a pre-determined times, on-site or remotely, or can be set to adjust the operation of equipment in response to changes in the home environment, for example temperature.

**WHAT DOES THIS MEAN?**

- Underline the words you don’t know.
- Try to separate the principal sentence in different and individual sentences
- Translate each sentence so that is easier to understand

2.2 APPLICATIONS OF HOME AUTOMATION

Home automation allows humans to have a better quality of life increasing comfort, security and the same time obtaining costs and energy savings. The term covers a range of applications.
2.3 WELFARE AND COMFORT

Home automation can be designed to increase your welfare and comfort by controlling several things making your lives much easier, comfortable and enjoyable.

How is it possible?

HEATING AND COOLING

Having the perfect temperature in your home will make you feel much more comfortable. You can design your home automated systems to help you regulate your home temperature.

You can program to switch on and off your heating and cooling automatically whenever you want, or even wherever you want.

You can also control to regulate the temperature and make it switch on and off in an exact temperature given.

LIGHTS

Home automation let you play with your lights, even though you are at home or our home.

You can control the general closure and decide if you want to close all the lights system, for example, if you are out on holidays.

Light's control allows you to regulate your lights according to the ambient light, using strong or weak light to illuminate your rooms.

AUTOMATED SYSTEMS

Use controls to operate appliances and equipment only when they are needed, planning your automation system.

You can consider how opening and closing blinds, awnings, windows and vents can assist passive heating, cooling and natural lighting.

You can also explore how switching on and off fans and heat shifters might reduce the need for cooling or heating.

Automated appliances and equipment can make your life easier, for example, you can program the irrigation of your garden to switch on automatically every day. Alternatively, you may want to have freshly brewed coffee by programming your coffee maker before you have your breakfast.

MANAGEMENT OF MULTIMEDIA ENTERTAINMENT

This category includes audio, video and entertainment multimedia switching and distribution. Multiple audio or video sources can be selected and distributed to one or more rooms and can be linked with lighting and blinds to provide mood settings.
IT'S TIME TO RESEARCH!

- Look for information about home automation applied for increasing our welfare and comfort.
- Take the device that has interested most and write about it.

2.4 SAFETY

Home automation allows your homes to become safer. They become safer preventing your homes from thieves and from possible emergencies.

SENSORS

Sensors, which operate the home equipment in response to changes in the home environment. We can have different types of sensors:

- Motion sensors: react with the movement
- Heat sensors: react with high temperature
- Pressure sensors: react with pressure changes
- Temperature sensor: for regulating temperature
- Sensors for doors and windows: magnetic contact of doors and windows
- Sensors for broken glass

DETECTORS

Detectors can prevent us from unexpected emergencies. We can have different types of detectors:

- Fire detectors: detect when a fire starts and they are connected with the central alarm.
- Flee gas detectors: detect when there is gas in a room and they are connected with the central alarm.
- Water leaks: detect when there is water running in the floor. They are usually situated in the bottom of the floor.

ACCESS TO SECURITY CAMERAS

You can have security cameras all around the home, or even out the house, just to control if everything is correct.

Home automation allows you to control these cameras and look them when and where you want through your computer, smartphone…
MEDICAL ASSISTANCE

It focuses on making it possible for the elderly and disabled to remain at home, safe and comfortable. Home automation is becoming a viable option for the elderly and disabled who would prefer to stay in the comfort of their homes rather than move to a healthcare facility by means of medical alert and attention, sensors, control by cameras or phone calls.

2.5 COMMUNICATION MANAGEMENT

Home automation communication management refers to the control of all the devices, connections and communication systems of the house.

As the number of controllable devices in the home rises, interconnection and communication becomes a useful and desirable feature. For example, a furnace can send an alert message when it needs cleaning or a refrigerator when it needs service. Rooms will become “intelligent” and will send signals to the controller when someone enters. If no one is supposed to be home and the alarm system is set, the system could call the owner, or the neighbours, or an emergency number.

They also control intercoms. An intercom system allows communication via a microphone and loud speaker between multiple rooms.

You can integrate the intercom to the telephone, or of the video door entry system to the television set, allowing the residents to view the door camera automatically.

2.6 OPTIMIZATION OF ENERGY RESOURCES

Home automation systems can only improve the energy efficiency of your home if they are designed for this purpose.

Operating automated systems use energy, so the automated systems will only lead to energy savings if they save more energy than they use.

Priority should first be given to designing an energy efficient home and installing high energy efficient appliances and lighting.

<table>
<thead>
<tr>
<th>LET'S THINK ABOUT IT!</th>
</tr>
</thead>
<tbody>
<tr>
<td>We can try to save energy without home automation.</td>
</tr>
<tr>
<td>Think about five things you do at home for saving energy.</td>
</tr>
<tr>
<td>Then write them and explain what are the advantages of doing them.</td>
</tr>
</tbody>
</table>

HEATING AND COOLING

A well designed automation system can:

1. Improve passive solar heating and passive cooling through the control of blinds, awnings, windows, vents and fans.
2. Control heaters and air conditioners so they are only used when and where they are needed and are used to achieve a desired temperature.

Design your home to make the best use of solar energy and natural ventilation for passive heating and cooling.

Use temperature sensors in different rooms to control heating and cooling.

Consider how better temperature and the timing of use can minimize the energy used in heaters and air conditioners/coolers.

**LIGHT**

Automate lights so they operated only when needed and switch themselves off when rooms are vacant. This can be done through motion sensors and timers.

Use motion sensors to switch on external lights when needed, or lights when entering the home, rather than leaving lights on.

Use motion sensors, light sensors and timing controls to switch off lights when they are no longer needed.

Give priority to rooms that often have lights left on unnecessarily, like bathrooms, pantries and toilets.

**ENERGY DEMAND**

In the near future, home automation systems may be linked to the electricity utility in a number of ways. The utility may communicate variations in electricity prices to a ‘smart’ electricity meter, that will interface with the home automation controller.

Nowadays, the price of electricity changes according to the time of day.

Therefore, you can program your appliances and equipment with timers to be able to switch on and off in time slots required.

So, thanks to home automation, householders can then program appliances to reduce power or switch off altogether during high price periods.

**LET'S WRITE ABOUT IT!**

- Write an essay about the advantages and drawbacks of home automation.
- Write your essay in 150-200 words.

**USEFUL LANGUAGE FOR ESSAYS**

- It is probably true to say that...
- On one hand… and on the other hand…
- It is also the case that…
- In conclusion…

2.7 SYSTEM DEVICES

We need different types of devices with different functions for Home Automation to work:
SENSORS

A sensor is a device that reacts to stimulus such as noise, temperature, pressure, etc... and it is able to capture and transmit in the form of an electrical signal to another device that performs the action.

CONTROLERS

Devices where the automation transactions are entered to start, modify or finish the operation of an automated system.

INTERFACES

An electrical circuit linking one device, as a computer, with another one.

ACTUATORS

Element that performs the action.
2.8 DO THESE THINGS REALLY EXIST?

**EXAMPLES**

- Integrated cooling and heating enabled to optimise energy use through pre-determined scheduling or temperature controls.
- Smart meters let you view electricity, gas and water consumption in real time.
- Touchscreen control unit brings together heating, cooling, blinds, lighting, and more into one unified control system.
- Smart sensors detect temperature and light levels.
- Automated blind controls can be set to open or close based on times or light and heat levels.

**Whole House Control**

- **Motion Detection:** Serves a dual purpose: Security, and automatic lighting.
- **Pool & Spa:** Control filters, timers and heating.
- **Vehicle Detection:** Announce visitors, turn on lights, and switch TV to View driveway.
- **Lighting:** Architectural quality lighting control, passive security for the "lived in" look.
- **Irrigation:** Control watering by zone, time and moisture sensors for maximum water conservation.
- **Security:** UL-listed Security provides secure remote password changes, and service personnel access.
- **Heating & Cooling:** Be comfortable at home, save energy when you're away with smart energy management.
- **Multi Room Audio & Video:** Control audio & video from any room in the house.
- **Internet Control:** View and manage your home from anywhere in the world via the web. Receive e-mail on the home's status.
- **Telephone Control:** Be notified by phone of your home's security, temp and system status. Call in on any phone to make remote adjustments.
2.9 ACTIVITIES

1. What does home automation means? Try to explain it with your words instead of copying just the definition above.

2. Home Automation allows a better quality of life through technology. Put two examples of each:
   a. Reduction in domestic work:
   b. Increased welfare and security:
   c. Rationalization of the energy consumption:

3. Fill the gaps:
   a. Automated controls can be used to ________ equipment ___ or ____. ___
   b. ________ the operating settings at pre-determined ______. ___
   c. Can be ___ to adjust the operation __________ of in response to in the ______ environment.

4. Match the columns:

   Temperature sensor  Listen to a different type of music in each room
   External motion sensor  Advise us when we have had a problem with the water installation.
   Water leak detector  Central Automation  Allows us to talk between different rooms.
   Timer appliances  Turns on/off the heating in a pre-determined temperature.
   Music stereo  Advise us when there is someone outside our house.
   Intercoms  Let us program, for example, a coffee maker, at a pre-determined time.
5. There are 10 devices written below. Try to find them all. Remember they can be in any direction.

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6. Imagine you are installing a home automation system. Which would be your first system to install? Explain all the process including the classification of its devices.
ANNEX 3– UNIT 6 “ENERGY AND TECHNOLOGY”

TEACHER’S GUIDE
UNIT 6
ENERGY AND TECHNOLOGY

TEACHER’S GUIDE

MAIN OBJECTIVES

✓ Recognize and value the importance of the use and the saving of energy in the societies and current habits.
✓ Value the importance of the utilization of renewable energetic resources.
✓ Know the new technological applications used to favour the energetic saving.
✓ Learn how a Home Automation system work and which applications has in the field of the energetic saving.
✓ Express and communicate the decisions taken
✓ Work in a autonomous way, responsable and creative in the decisions taken, during the execution of the work, showing a dialogant attitude and respect the teamwork.
✓ Improve the knowledge of English language through the learning about the technology.

CONTENTS

✓ Analysis of the new technologies applied to the energetic saving.
✓ Introduction to Home Automation. Characterization, uses and applications.
✓ Analysis of the applications of energetic saving through home Automation.
✓ Analysis of real cases of technological objects that use sources of renewable and sustainable energy.
✓ Explanation of the different sustainable transport's typologies.
✓ Estimation of the advantages and drawbacks of the sustainable transports.

ASSESSMENT CRITERIA

Know and apply the methods of energy efficiency of the renewable energies in a House
Identify and define the basic elements within a home automation system.
Identify and explain the different typologies of sustainable transport.
Use the multimedia resources to present the work
Explain and reflect on the different ways to save energy in the daily uses
Use properly the grammatical structures and the vocabulary purchased in English language to express and communicate the decisions taken.
1. SUSTAINABLE TRANSPORT

1.1 WHAT IS SUSTAINABLE TRANSPORT?

Every day we move around our city, our village or even travel long distances. Think about how you usually do it. Do you go by car, cycling or for example, using public transportation?

**LET’S TALK ABOUT IT!**

- Discuss this question with your partner and try to think about the environmental impact they produce
- Make notes about the relevant things
- Compare your answers with the rest of the class

**TAGS FOR HELPING**

- How do you come to school?
- Could you come in a more sustainable way?
- If all of us come to school by car, what do you think it will happen?
- Do you know what the climate change is?

- Make sure your spelling is correct!

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Transport has significant economic, social and environmental impacts, according for between 20% and 25% of world energy consumption and carbon dioxide emissions. Transport emission is also one of the major contributors to local air pollution.

Therefore, society and transport are changing to become more sustainable.

**Sustainable transport** refers to any means of transport with low impact on the environment.

**ADDITIONAL INFORMATION**

- There is an interesting video about the way people uses energy and transport nowadays that could help for introducing the unit.

  [http://www.youtube.com/watch?v=_s9dxc_JVIY](http://www.youtube.com/watch?v=_s9dxc_JVIY)

The European Union Council of Ministers of Transport defines a sustainable transportation system as one that:

- Allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations.

- Is affordable, operates efficiently, offers a choice of transport mode, and supports a vibrant economy.

- Limits emissions and waste within the planet’s ability to absorb them, minimizes the consumption of non-renewable resources, reuses and recycles its components, and minimizes the use of land and production of noise.
WHAT DOES THIS MEAN?

- Underline the words you don’t know.
- Try to separate the principal sentence in different and individual sentences
- Translate each sentence so that is easier to understand

WHAT DOES THIS MEAN – TEACHER’S GUIDE

- Allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health
- It promotes equity within and between successive generations.
- It is affordable, operates efficiently, offers a choice of transport mode.
- It supports a vibrant economy.
- It limits emissions and waste within the planet’s ability to absorb them.
- It minimizes the consumption of non-renewable resources.
- It reuses and recycles its components.
- It minimizes the use of land and production of noise.

1.2 DIFFERENT SOLUTIONS FOR THE SAME PROBLEM

We need to improve sustainable mobility, this includes:

- Changing people and the way that they live
- Changing technology
- Changing prices

LET’S TALK ABOUT IT! | TAGS FOR HELPING

- Discuss in class these three points.
- Do you think society has to change the way we live?
- Has your city changed lately to improve sustainable transport?
- How can technology help us improving sustainability?
- How do you think your habits would have to change for being more sustainable?
- Do you think people cares about it?
1.2.1 CLEAN VEHICLES

We do have now some alternatives to traditional fuel transports.
Here we give you some alternatives that exist nowadays.

HYBRID VEHICLES

A hybrid vehicle is a vehicle that uses two or more distinct power sources to move the vehicle. The most common hybrid vehicles are the hybrid electric vehicles (HEV'S), which combine an internal combustion engine and one or more electric motors.

ELECTRIC VEHICLES

An electric vehicle (EV), also referred to as an electric drive vehicle, uses one or more electric motors for propulsion. Three main types of electric vehicles exist:

✓ Those that are directly powered from an external power station
✓ Those that are powered by stored electricity originally from an external power source
✓ Those that are powered by an on-board electrical generation

We can find different electric vehicles such as electric cars, trains, airplanes, lorries, boats, motorcycles and scooters.

ADDITIONAL INFORMATION

❖ There is an interesting video with hybrid and electric vehicles explanation.
❖ http://www.youtube.com/watch?v=ErgnGhZ4f94

TAKE A LOOK!

❖ Have you noticed if you can recharge your car on-street in your city?
❖ Look if your city has public charging stations in the streets.

HYDROGEN VEHICLES

A hydrogen vehicle is a vehicle that uses as its on-board fuel for motive power.

Hydrogen fuel does not occur naturally on Earth and thus is not an energy source, but is an energy carrier. Currently, it is most frequently made from methane or other fossil fuels. However, it can be produced from a wide range of sources (such as wind, solar, or nuclear) that are intermittent, too diffuse or too cumbersome to directly propel vehicle

SOLAR VEHICLES

A solar vehicle is an electric vehicle powered completely or significantly by direct solar energy. Usually, photovoltaic (PV) cells contained in solar panels convert the sun's energy directly into electric energy.

The term "solar vehicle" usually implies that solar energy is used to power all or part of a vehicle's propulsion.
1.2.2 PUBLIC TRANSPORTATION

Public transportation is a shared passenger transportation service and it is generally regarded as significantly more energy efficient than other forms of travel.

The most common public transports are buses, trains and trams.

1.2.3 NON-MOTORISED TRANSPORT

Nowadays cities are working for increasing the mobility by non-motorised transport, such as the bicycles.

LET'S WRITE ABOUT IT!

- Write an essay about the advantages and drawbacks of the transports above
- Write your essay in 150-200 words.

USEFUL LANGUAGE FOR ESSAYS

- It is probably true to say that...
- On one hand...and on the other hand...
- It is also the case that....
- In conclusion...

1.3 ACTIVITIES

7. Explain your everyday way to school. What could you do to make it more sustainable?
   - Short writing about the everyday way to school. Look for grammatical and spelling mistakes.
   - It is important the use of new vocabulary and expressions.

8. Vehicles pollution contributes to improve the climate change. Make some research about it.
   - Individual research for each student.
   - Important not to copy exactly but to understand what they are looking for.

9. Fill the gaps: Sustainable transport....
   a. Allows the basic access and development needs of individuals, companies and society to be met safely in a manner consistent with human and health.
   b. Is affordable, operates efficiently, offers a choice of transport mode, and supports a vibrant economy.
c. Limits emissions and waste within the planet’s ability to absorb them, minimizes the consumptions of non-renewable resources, reuses and recycles its components, and minimizes the use of land and production of noise.

10. Match the columns:

| Solar vehicle | It is an electric vehicle powered completely or significantly by direct solar energy. |
| Hybrid vehicle | Vehicle that uses two or more distinct power sources to move the vehicle |
| Bicycle | Non-motorized vehicle powered by human force. |
| Electric vehicle | Vehicle using one or more electric motors for propulsion |
| Tram | It is a shared passenger transportation service, which are significantly more energy efficient than other forms of travel. |
| Hydrogen bus | Vehicle that uses hydrogen as its on-board fuel for motive power. This fuel does not occur naturally on Earth, but it can be produced from a wide range of sources. |
2. HOME AUTOMATION

2.1 WHAT IS HOME AUTOMATION?

LET’S TALK ABOUT IT!  

- Home automation is also known as SMART HOMES. What does SMART mean?
- Do you know what is Home Automation?
- Discuss the answer with the rest of the class.

TAGS FOR HELPING

- What is the difference between doing something manually and being done automatically?
- Do you think home automation helps us in our daily tasks?
- What if someday switches off the energy?

Home automation is the automated or remote control of appliances and equipment at home. Therefore a home automation allows a better quality of life through technology providing a reduction in domestic work, increased welfare and safety of its habitants and a rationalization of the different energy consumption.

Automated controls can be used to turn equipment on or off or adjust the operating settings at predetermined times, on-site or remotely, or can be set to adjust the operation of equipment in response to changes in the home environment, for ex temperature.

WHAT DOES THIS MEAN?

- Underline the words you don’t know.
- Try to separate the principal sentence in different and individual sentences
- Translate each sentence so that is easier to understand

WHAT DOES THIS MEAN – TEACHER’S GUIDE

- Therefore a home automation allows a better quality of life through technology.
- It provides a reduction in domestic work.
- It increases welfare and safety of its habitants.
- And provides a rationalization of the different energy consumption.
- Automated controls can be used to turn equipment on or off.
- Or can be used to adjust the operating settings at pre-determined times, on-site or remotely.
- Or can be set to adjust the operation of equipment in response to changes in the home environment, for ex temperature.
2.2 APPLICATIONS OF HOME AUTOMATION

Home automation allows humans to have a better quality of life increasing comfort, security and the same time obtaining costs and energy savings. The term covers a range of applications.


ADDITIONAL INFORMATION

- There is an interesting video about home automation.
- [http://news.bbc.co.uk/2/hi/7348940.stm](http://news.bbc.co.uk/2/hi/7348940.stm)

2.3 WELFARE AND COMFORT

Home automation can be designed to increase your welfare and comfort by controlling several things making your lives much easier, comfortable and enjoyable.

How is it possible?

HEATING AND COOLING

Having the perfect temperature in your home will make you feel much more comfortable. You can design your home automated systems to help you regulate your home temperature.

You can program to switch on and off your heating and cooling automatically whenever you want, or even wherever you want.

You can also control and make it switch on and off in an exact temperature given.
LIGHTS

Home automation let you play with your lights, even though you are at home or out home.

You can control the general closure and decide if you want to close all the lights system, for example, if you are out on holidays.

Lights control allows you to regulate your lights according to the ambient light, using strong or weak light to illuminate your rooms.

AUTOMATED SYSTEMS

Use controls to operate appliances and equipment only when they are needed, planning your automation system.

You can consider how opening and closing blinds, awnings, windows and vents can assist passive heating, cooling and natural lighting.

You can also explore how switching on and off fans and heat shifters might reduce the need for cooling or heating.

Automated appliances and equipment can make your life easier, for example, you can program the irrigation of your garden to switch on automatically every day. Or you may want to have freshly brewed coffee by programing your coffee maker before you have your breakfast.

MANAGEMENT OF MULTIMEDIA ENTERTAINMENT

This category includes audio, video and entertainment multimedia switching and distribution. Multiple audio or video sources can be selected and distributed to one or more rooms and can be linked with lighting and blinds to provide mood settings.

IT’S TIME TO RESEARCH!

- Look for information about home automation applied for increasing our welfare and comfort.
- Take the device that has interested you most and write about it.

2.4 SAFETY

Home automation allows your homes to become safer. They become safer preventing your homes from thieves and from possible emergencies.

SENSORS

Sensors, which operate the home equipment in response to changes in the home environment: We can have different types of sensors:
- Motion sensors: react with the movement
- Heat sensors: react with high temperature
- Pressure sensors: react with pressure changes
- Temperature sensor: for regulating temperature
- Sensors for doors and windows: magnetic contact of doors and windows
- Sensors for broken glass

**DETECTORS**

Detectors can prevent us from unexpected emergencies. We can have different types of detectors:

- Fire detectors: detect when a fire starts and they are connected with the central alarm.
- Flee gas detectors: detect when there is gas in a room and they are connected with the central alarm.
- Water leaks: detect when there is water running in the floor. They are usually situated in the bottom of the floor.

**ACCESS TO SECURITY CAMERAS**

You can have security cameras all around the home, or even out the house, just to control if everything is correct.

Home automation allows you to control these cameras and look them when and where you want through your computer, smartphone…

**MEDICAL ASSISTANCE**

It focuses on making it possible for the elderly and disabled to remain at home, safe and comfortable. Home automation is becoming a viable option for the elderly and disabled who would prefer to stay in the comfort of their homes rather than move to a healthcare facility by means of medical alert and attention, sensors, control by cameras or phone calls.

**2.5 COMMUNICATION MANAGEMENT**

Home automation communication management refers to the control of all the devices, connexions and communication systems of the house.

As the number of controllable devices in the home rises, interconnection and communication becomes a useful and desirable feature. For example, a furnace can send an alert message when it needs cleaning, or a refrigerator when it needs service. Rooms will become "intelligent" and will send signals to the controller...
when someone enters. If no one is supposed to be home and the alarm system is set, the system could call the owner, or the neighbours, or an emergency number.

They also control intercoms. An intercom system allows communication via a microphone and loudspeaker between multiple rooms.

You can integrate the intercom to the telephone, or of the video door entry system to the television set, allowing the residents to view the door camera automatically.

2.6 OPTIMIZATION OF ENERGY RESOURCES

Home automation systems can only improve the energy efficiency of your home if they are designed for this purpose.

Operating automated systems use energy, so the automated systems will only lead to energy savings if they save more energy than they use.

Priority should first be given to designing an energy efficient home and installing high energy efficient appliances and lighting.

LET’S THINK ABOUT IT!  |  TEACHER’S GUIDE
---|---
- We can try to save energy without home automation.
- Think about five things you do at home for saving energy.
- Then write them and explain what are the advantages of doing them.
- Look for grammar and spelling mistakes
- Important to use new vocabulary and expressions

HEATING AND COOLING

A well designed automation system can:

1. Improve passive solar heating and passive cooling through the control of blinds, awnings, windows, vents and fans.

2. Control heaters and air conditioners so they are only used when and where they are needed and are used to achieve a desired temperature.

Design your home to make the best use of solar energy and natural ventilation for passive heating and cooling.

Use temperature sensors in different rooms to control heating and cooling.

Consider how better temperature and the timing of use can minimize the energy used in heaters and air conditioners/coolers.

LIGHT

Automate lights so they operated only when needed and switch themselves off when rooms are vacant. This can be done through motion sensors and timers.

Use motion sensors to switch on external lights when needed, or lights when entering the home, rather than leaving lights on.
Use motion sensors, light sensors and timing controls to switch off lights when they are no longer needed. Give priority to rooms that often have lights left on unnecessarily, like bathrooms, pantries and toilets.

**ENERGY DEMAND**

In the near future, home automation systems may be linked to the electricity utility in a number of ways. The utility may communicate variations in electricity prices to a ‘smart’ electricity meter, that will interface with the home automation controller.

Nowadays, the price of electricity changes according to the time of day.

Therefore, you can program your appliances and equipment with timers to be able to switch on and off in time slots required.

So, thanks to home automation, householders can then program appliances to reduce power or switch off altogether during high price periods.

**LET’S WRITE ABOUT IT!**

- Write an essay about the advantages and drawbacks of home automation.
- Write your essay in 150-200 words.

**USEFUL LANGUAGE FOR ESSAYS**

- It is probably true to say that…
- On one hand… and on the other hand…
- It is also the case that…
- In conclusion…

**2.7 SYSTEM DEVICES**

For Home Automation to work we need different types of devices with different functions:

**SENSORS**

A sensor is a device that reacts to stimulus such as noise, temperature, pressure, etc… and it is able to capture and transmit in the form of an electrical signal to another device that performs the action.

**CONTROLERS**

Devices where the automation transactions are entered to start, modify or finish the operation of an automated system.
An electrical circuit linking one device, as a computer, with another one.

**ACTUATORS**

Element that performs the action.

**SYSTEM DEVICES**

**SENSORS**

- Rain detector
- Light detector
- Wind sensor
- Motion sensor
- Temperature sensor

**CONTROLERS**

- Central Automation
- Keyboard
- Mobile phone
- Internet

**ACTUATORS**

- Blinds
- Dimmers
- Heating and cooling regulator

**INTERFACES**

- Switch
2.8 DO THESE THINGS REALLY EXIST?
2.9 ACTIVITIES
11. What does home automation mean? Try to explain it with your words instead of copying just the
definition above.

- Individual research for each student.
- Important not to copy exactly but to understand what they are looking for.

12. Home Automation allows a better quality of life through technology. Put two examples of each:

a. Reduction in domestic work: buy food through smart fridges, automatic ventilation of the
   rooms by pre-determined times to open and close the windows.

b. Increased welfare and security: Fire detectors, motion sensors

c. Rationalization of the energy consumption: smart meters to let you know consumption in real
time, automated blinds.

13. Fill the gaps:

a. Automated controls can be used to __turn__ equipment __on__ or __off__

b. __Adjust__ the operating settings at pre-determined __times__

c. Can be __set__ to adjust the operation of __equipment__ in response to __changes__ in the __home__ environment.

14. Match the columns:

Temperature sensor

- Turns on/off the heating in a pre-
determined temperature.

External motion sensor

- Advise us when there is someone
outside our house.

Water leak detector

- Central Automation

- Advise us when we have had a
problem with the water installation.

Timer appliances

- Let us program, for example, a
coffee maker, at a pre-determined
time.

Music stereo

- Listen to a different type of music in
each room

Intercoms

- Allows us to talk between different
rooms.
15. There are 10 devices written below. Try to find them all. Remember they can be in any direction.

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16. Imagine you are installing a home automation system. Which would be your first system to install?

Explain all the process including the classification of its devices.

- Short writing about home automation devices. Look for grammatical and spelling mistakes.
- It is important the use of new vocabulary and expressions.
3. READY TO PLAY?

TEACHER’S GUIDE

1. WHAT DOES HOME AUTOMATION ALLOW?
   A – To increase domestic work
   B – To make our homes become safer
   C – To turn on the TV with the TV button
   D – To close the blinds in a manual way

2. FILL THE GAPS...

   Switch on/off  Open/Close  Turn on/off

   a. The blinds will automatically _open and close_ depending on the amount of light entering the room.
   b. The rooms are provided with motion senses so the light _switches off_ when people leave the room.
   c. I usually program the coffee maker to _turn on_ just before I have my breakfast.

3. MATCH THE WORDS IN BOTH COLUMNS...

   FIRE DETECTOR
   CONTROLERS  MOBILE PHONE
   SENSORS  TEMPERATURE
   ACTUATORS  DIMMERS
   KEYBOARD  AUTOMATIC BLINDS
4. YOU CAN PROGRAM YOUR WASHER DRIVER WITH TIMERS TO...
   A – REACT WITH A TEMPERATURE SENSOR
   B – ALLOW THE ACCESS TO SECURITY CAMERAS
   C– INCREASE THE QUALITY OF LIFE
   D – BE ABLE TO SWITCH ON IN A CERTAIN TIME SLOT

5. MATCH THE WORDS IN BOTH COLUMNS...

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<tr>
<td>CONTROL BY CAMERAS</td>
<td>WELFARE AND COMFORT</td>
</tr>
<tr>
<td>PROGRAM YOUR FAVORITE SONG TO SOUND IN YOUR ROOM</td>
<td>COMMUNICATION MANAGEMENT</td>
</tr>
<tr>
<td>CLOSE THE BLINDS WHEN THERE IS HIGH HEAT LEVELS</td>
<td>SAFETY</td>
</tr>
<tr>
<td>SENSORS FOR DOORS AND WINDOWS</td>
<td>AUTOMATIC TEMPERATURE REGULATION</td>
</tr>
<tr>
<td>CONTROLLED SYSTEMS WITH INTERNET</td>
<td>SWITCH THE ROOMS LIGHT OFF AFTER 5 MINUTES IF NO MOTION IS DETECTED</td>
</tr>
</tbody>
</table>

6. COMPLETE THE SENTENCE

   WHAT IS HOME AUTOMATION?

   HOME AUTOMATION IS THE REMOTE CONTROL APPLIANCES AND EQUIPMENT IN THE HOUSE

   DOES HOME AUTOMATION SAVE ENERGY?

   AUTOMATED SYSTEMS WILL ONLY LEAD TO ENERGY SAVINGS IF THEY SAVE MORE ENERGY THAN THEY USE
ANNEX 4– UNIT 6 “ENERGY AND TECHNOLOGY”

CLASS GUIDE
UNIT 6
ENERGY AND TECHNOLOGY

CLASS GUIDE

1. SUSTAINABLE TRANSPORT

WHAT IS SUSTAINABLE TRANSPORT?
- Transport has significant:
  - Economic
  - Social
  - Environmental

SUSTAINABLE TRANSPORT

WHAT IS SUSTAINABLE TRANSPORT?
- Therefore society and transport are changing to become more sustainable.
  - Sustainable transport refers to any means of transport with low impact on the environment.
  - Non-motorised vehicles
  - Public transportation
  - Clean vehicles

IMPROVE SUSTAINABILITY
- We need to improve sustainability:
  - Change prices
  - Change technology
  - Change the way that we live
CLEAN VEHICLES
- We do have now some alternatives to traditional fuel transports.

PUBLIC TRANSPORT
- Public transportation is a shared passenger transportation service and it is generally regarded as significantly more energy efficient than other forms of travel.

NON-MOTORISED VEHICLES
- Cities are now transforming into smart and sustainable cities becoming much more efficient for non-motorised vehicles, such as bicycles.
- We do have now large paths in order to allow the safe circulation of this vehicles.
2. HOME AUTOMATION

WHAT IS HOME AUTOMATION?

- Home automation is the automated or remote control of appliances and equipment at home.

- Therefore, a home automation allows a better quality of life through technology, providing a reduction in domestic work, increased welfare and safety of its inhabitants and a rationalization of the different energy consumption.

WHERE DO WE APPLY HOME AUTOMATION?

- Automation systems: General closures, Program switch on/off, Regulation of lighting according to ambient light.
- Heating and cooling: Heating and cooling management of multimedia entertainment.
- Lights: TV, stereo, video games, internet, computers, and more...

WELLFARE AND COMFORT


SAFETY

- Sensors: Presence, motion, fire, door and window closed.
- Detectors: Fire, flood, gas, water leaks.
- Medical alert and attention: Connected to cameras, phone calls.
- Access to security cameras.

COMMUNICATION MANAGEMENT

- Communication systems: External and internal, transmission of alarms, interconnections, and controlled systems with internet.

OPTIMIZATION OF ENERGY RESOURCES

- Home automation systems can only improve the energy efficiency of your home if they are designed for this purpose.

- Operating automated systems use energy, so the automated systems will only lead to energy savings if they save more energy than they use.
**Optimization of Energy Resources**

### Heating and Cooling
- Reduce the need to use equipment.
- Design your home to make the best use of solar energy and natural ventilation.
- Control of blinds, curtains, windows, vents and fans.

### Lights
- Operate only when needed; turn themselves off when rooms are vacant.
- Motion sensors and timers.
  - Use motion sensors, light sensors, and timing controls to switch off lights when they are no longer needed.
  - Example: Room lights may be switched off after five minutes if no motion is detected.

### Electricity Demand
- The price of electricity changes according to the time of day.
- Program your appliances and equipment with timers to be able to switch on and off in advance if required.
  - Example: Program the washing machine during low price periods, for example, night time.

### System Devices

#### Sensors
- Rain detector
- Light detector
- Wind sensor
- Motion sensor
- Temperature sensor

#### Controllers
- Central automation
  - Birds
  - Heating and cooling regulators

#### Actuators
- Switch
- Internet

#### Interfaces
- An electrical circuit linking one device, as a computer, with another.

### Examples
- Whole house control
  - Vehicle detection
  - Lighting
  - Security
  - Heating and cooling
  - Irrigation
  - Multi-room audio and video

**Institut de Ciències de l’Educació**

**Universitat Politècnica de Catalunya**

**ANNA AUGÉ GARCIA - TREBALL FINAL DE MÀSTER**
3. VOCABULARY

<table>
<thead>
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<th>ENGLISH</th>
<th>CATALÀ</th>
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<tr>
<td>Appliances</td>
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<td>Según, en función de</td>
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4. READY TO PLAY?

ARE YOU READY?

In ...3...2...1...go!

WHAT DOES HOME AUTOMATION ALLOW?

A - To increase domestic work
B - To make our homes become safer
C - To turn on the TV with the TV button
D - To close the blinds in a manual way
FILL THE GAPS...
The blinds will automatically depending on the amount of light entering the room.

The rooms are provided with motion sensors so the light __________, when people leave the room.

I usually program the coffee maker to ______________ just before I have my breakfast.

**Switch on/off**

**Turn on/off**

Open/close

MATCH THE WORDS IN BOTH COLUMNS...

**A** CONTACTORS

1. Fire detector
   2. Mobile phone
   3. Temperature
   4. Dimmers
   5. Keyboard
   6. Automatic blinds

**B** SENSORS

**C** ACTUATORS

YOU CAN PROGRAM YOUR WASHER/DRIEVER WITH TIMERS TO...

**A** – react with a temperature sensor

**B** – allow the access to security cameras

**C** – increase the quality of life

**D** – be able to switch on in a certain time slot

MATCH THE WORDS IN BOTH COLUMNS...

**A** OPTIMIZATION OF ENERGY RESOURCES

1. Interconnections
   2. Control by cameras
   3. Program your favourite song to sound in your room
   4. Close the blinds when there is high heat levels
   5. Sensors for doors and windows
   6. Automatic temperature regulation
   7. Controlled systems with internet
   8. Switch the room lights off after 5 minutes if no motion is detected

**B** WELFARE AND COMFORT

**C** COMMUNICATION MANAGEMENT

**D** SAFETY

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