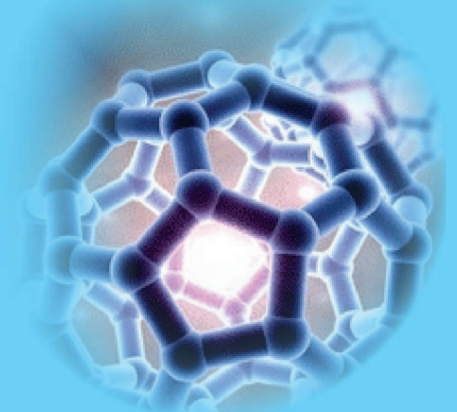


4

We develop the design of
our innovative product
with Arduino



4.1. ARDUINO WORKSHOP: FIRST STEPS

Arduino is a programmable general purpose electronic device by which you can control a myriad of variable signals. Following the reading of the input signals, a program processes them. The device has a range of analog and digital outputs to be emitted to any electronic actuator.

This definition is the base of the control programming and thus control systems can be easily performed. To learn more about Arduino and be able to implement its functionality in the development of your innovative ideas, make the "*Arduino Workshop: First Steps*"

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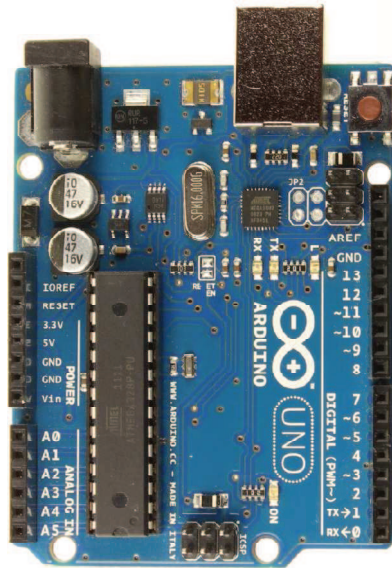
4.2. WE DESCRIBE THE NEED WE WANT TO SOLVE

Meet with the team and try to detect what needs are surrounding you. Focus to those ones that you are able to solve with the use of a control system. Open your mind when facing the needs. A good advice is to make a list of needs or problems at the same time you offer ideas to solve them respectively and fix a series of criteria as feasibility, complexity, cost, maintenance, etc. Apply the criteria to each solution and try to choose the system to develop. Use the below text area in the notebook or directly type and upload them in the digital platform in order to determine your list of solutions, make the analysis for selection, and finally, describe what system you want to build.

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4.3. DESIGNING THE SYSTEM TO SOLVE THE NEED

Once you have chosen what product to develop, make a block diagram using the central Arduino picture. From this, indicate by means of arrows what components you need to connect to Arduino. Place the sensors and detectors directly pointing to Arduino, as well as locate the actuators connected to Arduino outlets using ongoing arrows from the digital and analog output pins. If you want to make the block diagram with a specific computer aided design application, you can use the Arduino picture available in this digital document.



4.4. WHAT COMPONENTS DO WE NEED TO FIT OUT WITH ARDUINO?

Use the spreadsheet you create in previous stages to make a component list in order to fit out Arduino with the required components to develop your innovation. Name the sheet as “Comp_List” for instance. Copy the following column headers.

Item number	Topologic reference (*)	Physical description	Technical features	Amount
1				
2				
3				
4				

You have to remember that you are in the design stage and it's probably that some of the components you have selected to use, could be substituted by some other more appropriate or by the same component but with different electric value. Access to the spreadsheet in the digital platform in order to make as many corrections as it's required throughout this section, as well as throughout the following section about the building of the system.

(*) The topologic reference is the name or key assigned to each component in the block diagram. For instance, a led diode could have been named L₁, resistors R₁, R₂, etc.

4.5. THE WIRING LIST AND THE WIRING SCHEME

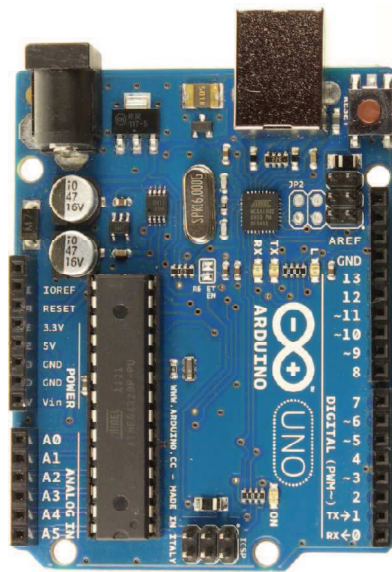
Components situation in the block diagram may help you to make the wiring connections needed to carry out the control system. Use a second sheet in your spreadsheet to describe the wiring connections between components and Arduino, using the information from the list of components.

The wiring list

Wire number	Source component topologic reference		Target component topologic reference	
	Component	Pin	Component	Pin
1				
2				
3				
4				
5				

The wiring scheme

According to the wiring list, you can make a graphical representation of the system based on the blocks diagram. Remember to name each component as done in the component list as well as each component used pins by numbers or letters in order to be able to distinguish each connection.



4.6. WRITING SOFTWARE

You're going to design now the software to be processed in Arduino control board according to different phases. Open a new sheet in your spreadsheet and write the input and outlet signal with specific name that are called variables. Use the following table to copy the column headers, and write the information required for each signal to manage.

Name of the variable	Input (I) / Outlet (O)	Digital (D) / Analog (A)	Pin number	Description of the variable

Draw in this space in your InnoEscuela notebook or use a specific design software application to draw the diagram of the algorithm of your program. Make it in general terms but determine in this point those parts of the program you better know how to do. In the following section you will be able to write the source code and the diagram will then be very useful.

