

## SPRO1EE: Fall 2024

### Discover the Electronic Development Process: Designing a model of a Smart Home

Lecturers: Assoc. Prof. Luciana Tavares, Assoc. Prof. Oliver Niebuhr and Staff Engineer Kurt Godiksen.

#### Requirements

- In groups of 5-6 design a model of a Smart Home, where all lightning is controlled by a centralized unit.
- Mandatory functions are:

Room no 1	Room no 2	Room no 3	Main Door
1 x switch	2 x switch	1 switch	Motion sensor
Variable light intensity (POT)	na	Variable light intensity (POT)	Light sensor, LDR
White light (RGB Diode)	White light (RGB Diode)	Color changable (RGB diode)	White light (RGB Diode)

- It is mandatory to use an Arduino Nano as main controller of the Smart Home
- In the final prototype there should be no open wires, no cold soldering, and no floating pins
- The model of a Smart Home should be enclosed and easily portable
- The user should be able to choose between the available modes of Smart Home settings through a menu system
- Use the 4x20 lcd to Show Actual status of lighting in all rooms
- NOTE: Make sure that the Arduino is never exposed to voltages and currents higher than it is rated to – check the datasheet of the Arduino and the Atmega328p

#### Recommendations

- Investigate available functionality of Smart Home Systems and select what you would like to implement on your device
- You can also build in??
- Or include a sensor that would measure useful data in your Smart Home (temperature, light, humidity.)
- Simulate your circuit in LTSpice to check your calculations before building it
- Use the analog pins of the Arduino to interface it with the measuring circuitry and sensors, i.e. go for analog sensors, if possible.
- Advanced SW functionality?? A few ideas:
  - Automated time scheduled turn on/off lighting to save energy or to show activity (preventing burglars) during holidays
  - Energy Saving (Very advanced) Request the Control system to go to sleep and then wake up on activity

#### Project plan

Make a project plan in which you define deadlines, milestones, subtasks, and responsibilities.

## Report

Write a report about the project, where you detail the research, design, manufacturing and testing of the device. Test your model of a Smart Home and document the results. What are its limitations, does LTspice simulations comply with measurements etc. (Note that there will be a Tuesday lecture about reporting writing!)

## Components

You have a budget of 1,000 DKK for ordering any parts (sensors, power supply...) that you need. Parts you use from the e-lab do not count for this budget.

You can order your part from following websites:

[www.rs-online.com](http://www.rs-online.com)

Make sure that you are only ordering parts that are in stock – else your whole package will wait for the one part that is in backorder.

You can order your pcbs at [pcb-prototyping@sdu.dk](mailto:pcb-prototyping@sdu.dk) by filling out a pcb request sheet. Please refer to available guideline.

## Grading

- Grading of the project (Smart Home and report) is as follows:
  - Electrical execution 30 %
  - Software functions 20 %
  - Aesthetics 10 %
  - Project report 40 %

Please note that when sharing the work among you in a group, these grading percentages do not mean that those who work on, e.g., the electrical execution get better grades than those who work on the software... Everybody needs to understand and explain all aspects of the project. So, make sure that you are familiar with all aspects of the joint project.

## Timetable, deadlines

- Hand-in of team presentation: 16<sup>th</sup> September 2024
- Hand-in of project plan: 23<sup>th</sup> September 2024 (together with project video)
- Midterm presentation: 30<sup>th</sup> September 2024
- kiCAD lecture: 23<sup>rd</sup> October 2024
- TEK expo practice presentation: 27<sup>th</sup> November 2024
- TEK expo: 19<sup>th</sup> December 2024
- Report hand-in: 2<sup>nd</sup> January before 12.00 noon