

Dear students,

The assignments from II to IV are combined in one bigger project assignment. By completing this assignment you will acquire knowledge to develop a fully automated system using different sensors and actuators, while having fun and building something real that you can later put in your resume or showcase. This would be more valuable as you will have a chance to work on a small, but real project.

The high level goal is to build some automated system using sensors, actuators, Arduino (or similar architectures) and write a control algorithm in arduino, similarly like we have been doing in Lectures.

### **Instructions:**

- for this assignment you can work on topic/project of your own choice as long as it is related to some of the things I mentioned above (sensors, actuators, automation, using Arduino or similar architectures),
- thus the first task is to think about the topic/project you want to work on, if you have already some topics in your mind or some specific project you want to work on feel free to propose this,
- if you define a topic by yourself, please write down the title of the project and provide a one sentence description what you want to do,
- if you don't have a specific project on your mind, that is absolutely fine, then please choose one of the projects that are listed below (Project Topics).

### *Group work:*

- 20 groups are created (6 students per group), see in Canvas / People then group set named Lecture Assignment Group,
- the groups are open for you to join i.e. please think first to organize yourself into groups of 6 people and then add your names into any of the group that are written there,
- agree with your group on which project you want to work (either propose yourself or choose from the list below),
- other option is to find people who are willing to work on the same project then you can form a group.

### *Individual work*

- if you wish to work alone and not in group that is also possible, but please at least consider to have something like a work group of 6 people who are working alone as well, just so that you can exchange opinions and give you a feedback on your work and receive help if needed,
- if you want to work alone, either propose a topic or choose from the list, the same like with group work.

### *To do next*

- when you have selected a topic (or propose your own), formed a group or alone, please write me a short email with the name of your group and project topic/name you will work on.

### *Things to do in short*

- pick a project from list of projects or propose your own,
- form a group and add your names into Canvas / People / Lecture Assignment Group,
- for people who want to work individually, try form a work group (no worries if you don't manage it),
- send me an email and write: project title, one sentence project description, your names

### **Assignment instructions:**

- in order to pass the assignment you at least need to make a simulation of how the system works using some of the platforms we have been learning in Lectures like: <https://www.tinkercad.com/>

[Links to an external site.](#), or <https://wokwi.com/>

- [Links to an external site.](#)
- thus your basic assignment is to demonstrate how the system works in simulation,
- then after you finish, share the link of your simulation as assignment submission (you can save it in the platform and share a link),
- if you are open to it you can also build the whole physical system, using arduino and small cheap components, you are also free to use MakerSpace at OsloMet to do some prototyping, but all this is not a requirements, only a nice option if you want to do it,
- if you manage to build a physical system please record a small media or video, upload it to YouTube and share a link as your submission additionally to the simulation.

### **How to solve assignment**

- if you didn't attend lectures please watch the lecture recordings in order to solve the assignment,
- some general methodology is outlined below
- break your system into smaller parts and components first (think which sensors and actuators you need),
- insert these components into simulation from the components library,
- insert Arduino board,
- connect all the components (sensors, actuators) to Arduino using proper inputs pins,
- write a script/code in Arduino in order to control/automate the system,
- run the simulation and check that all is working,
- when you finish it submit the link to your saved project,
- if you want to go step further, then buy the small components, sensors, actuators, Arduino board,
- produce the needed supporting parts using 3d printer,
- connect all the components the same as you used in your simulation,
- write the same code/script as in simulation.
- run the system and hope that all will work.

## **Project topics to select**

1. Obstacle avoidance robot (use 4 motors, different detection sensors or distance sensors, like ultrasonic or photoelectric). You can see some examples at these videoclips:

[https://www.youtube.com/watch?v=1n\\_KjpMfVT0](https://www.youtube.com/watch?v=1n_KjpMfVT0)



[Links to an external site.](#)

<https://www.youtube.com/watch?v=yAV5aZ0unag>



[Links to an external site.](#)

2. Gesture control robot (use 4 motors and accelerometer for controlling the robot). You can see some examples at these videoclips:

<https://www.youtube.com/watch?v=svJwmjplm4c>

<https://www.youtube.com/watch?v=t7k9D1jDEtk>

3. Line follower robot (2 or 4 motors and sensors). See examples here:

<https://www.youtube.com/watch?v=5jh-5HGvC-I>

<https://www.youtube.com/watch?v=t7k9D1jDEtk>

<https://www.youtube.com/watch?v=QKXEycqRphg>

<https://www.youtube.com/watch?v=kJsRV7pu71Q>

4. Robotic arm with 2 or 3 degrees of freedom (use 2 or 3 motors and build some interface to control motors position). You can see some examples at these videoclips:

[https://www.youtube.com/watch?v=\\_B3gWd3A\\_SI](https://www.youtube.com/watch?v=_B3gWd3A_SI)  
<https://www.youtube.com/watch?v=LBNRGRBY5zN8>  
<https://www.youtube.com/watch?v=ADJGxOrEZAM>

5. Temperature control using Fan (temperature sensor, one motor to simulate a fan). See example here:

<https://www.youtube.com/watch?v=rsl8KS1exB8&t=183s>

6. Making a scale using force sensors (use force sensor). Example:

[https://www.youtube.com/watch?v=LRd3W\\_p8PJ4&t=118s](https://www.youtube.com/watch?v=LRd3W_p8PJ4&t=118s)

7. Some of the projects that would include use of LCD display. Choose any of the following examples:

<https://www.youtube.com/watch?v=LMWp1eWxj08>

<https://www.youtube.com/watch?v=wEbGhYjn4QI>

<https://www.youtube.com/watch?v=dZZynJLmTn8>

8. Fire alarm system. Here is an example:

[https://www.youtube.com/watch?v=fwwI4R\\_97DI](https://www.youtube.com/watch?v=fwwI4R_97DI)

9. You can also try to automate in Arduino your Assignment I. Take at least 2 parts of the process, example bottle lid filling, bottle lid transport and empty bottle filling and transport, and try to automat that in simulation.

10. You can choose some of the examples that are outlined in these videos, feel free to choose:

<https://www.youtube.com/watch?v=JmUt9O4c2-c>

<https://www.youtube.com/watch?v=uNbLqZ0ZeUs>

<https://www.youtube.com/watch?v=l8RgVn5hHBg>

**The final list of groups and assigned topics can be found at this link:**