T.C.
DOKUZ EYLUL UNIVERSTY

FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

2022 – 2023 SPRING SEMESTER

CME 3208 PRINCIPLES OF EMBEDDED SYSTEMS

LAB 10: PLANT MONITOR

DUE DATE: 23:55 – 23.05.2023

In this lab you are asked to create a plant monitor. This will involve monitoring temperature, humidity and light. Your system will use an LCD screen to inform the user about current values and give warning if the system is not in an optimal state. To define the optimal values, the following global variables should be used.

```
int TEMPERATURE_MIN = 25;
int TEMPERATURE_MAX = 35;

int HUMIDITY_MIN = 30;
int HUMIDITY_MAX = 70;

int LIGHT_MIN = 300;
int LIGHT_MAX = 700;
```

The values above should not be taken as literal and you should change them to suit your needs and environment. The temperature variables are assumed to be Celsius values, however, you can change them if this is not workable for your circuit. The humidity value is given as a percentage of current humidity. The light is given as an arbitrary integer that assumes the range of light sensor is between 0 and 1000.

Please explain the values or types you have used for these variables in your video.

For LCD screen, you are required to create a couple of different screen. First one is the main LCD screen that is given below, that will show the results of sensors and current status.

MAIN LCD SCREEN:

	00	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**
00	T	:	3	0		H	:	5	5		L	:		6	5	0
01	S	T	A	T	U	S	:			O	P	T	I	M	A	L

In addition, there should be six warning screens in total, warning the user about too low or high current sensor value for temperature, humidity or light.

TEMPERATURE TOO HIGH LCD SCREEN

	00	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**
00	T	E	M	P		I	S		T	O	O		H	I	G	H
01	T	M	A	X	:	3	5		T	C	U	R	:	4	0	

TEMPERATURE TOO LOW LCD SCREEN

	00	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**
00	T	E	M	P		I	S		T	O	O		L	O	W	
01	T	M	I	N	:	2	5		T	C	U	R	:	2	0	

HUMIDITY TOO HIGH LCD SCREEN

	00	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**
00	H	U	M	I		I	S		T	O	O		H	I	G	H
01	H	M	A	X	:	7	0		H	C	U	R	:	8	0	

HUMIDITY TOO LOW LCD SCREEN

	00	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**
00	H	U	M	I		I	S		T	O	O		L	O	W	
01	H	M	I	N	:	3	0		H	C	U	R	:	2	0	

LIGHT TOO HIGH LCD SCREEN

	00	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**
00	L	I	G	H		I	S		T	O	O		H	I	G	H
01	L	M	A	X	:	7	0	0	L	C	U	R	:	8	0	0

LIGHT TOO LOW LCD SCREEN

	00	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**
00	L	I	G	H		I	S		T	O	O		L	O	W	
01	L	M	I	N	:	3	0	0	L	C	U	R	:	2	0	0

If any one of the sensor values is outside of given range, these screens should be shown instead. In addition you can add a LED to light up any time a warning screen is shown, to get more attention to the plant.

You can map the light sensor values to 0 to 100 interval instead of 0 to 1000 interval, it might make it easier for you to print it on LCD screen. Try to follow the LCD screen format given here unless you run into a serious problem that prevents from using this format. In that case, please explain the problem you experienced.

UPLOAD REQUIREMENTS:

You are required to upload three different files for this assignment. First is a text file that contains your source code for your circuit. Second is a Tinkercad screenshot showing your circuit after your design is finished. Third is a video file showing your circuit that has been created using lab supplies. Only one of the group members can make an upload, there is no requirement for all members to do a separate upload of same files.

For your video, you are expected to introduce yourself and your teammates, showing your student IDs in video too. If your group are working online rather than meeting in real life, you do not have to show the ID cards of students who are not physically present.

You are also expected to explain your circuit in a brief but complete manner and show its execution. This video should not be too long (a maximum of 3 to 5 minutes is acceptable) and should not be too large otherwise you will not be able to upload to Sakai (check the maximum allowed file size for upload to Sakai). You should also consider choosing resolution 720p over 1080p or larger for smaller file size (make sure your circuit is still visible and understandable over this resolution). You can also change your video format to a more space efficient one.

You should show the effects of changing every global variable that is mentioned above in your video. Again, please do not consider too many different values to make a too detailed video, just show the effect of changing that particular global variable.

If you experience problems with your circuit and cannot make it work, show your design in Tinkercad and your circuit at the same and explain what is the problem and what might be causing it in your opinion.

The naming of your files should follow the format below for 3 person groups. For 2 or 4 person groups just write 2 or 4 student numbers in ascending order. You should write your group numbers with one leading zero if it is between 1 and 9, normally for 10 and above.

The file extension for screenshot (Tinkercad) and video does not have to be “jpg” and “mp4”, you can use other formats as well like “png” or “mkv” or etc. However, make sure you use commonly used image and video formats, if we cannot open it on our computers, you grade related to them will be zero. In addition your source code file extension could be either “c” or “ino”, do not leave it as “txt”.

Do not “zip” or “rar” requested files and upload them. It is not necessary and it makes it harder for us to evaluate your assignments. Please upload 3 files as they are without compressing them to a single file.

You are advised to use serial monitor for debug purposes, it will help you to check your program state more in detail and more freely.

FORMAT:
GROUP_<group_number>_<student_number_1>_<student_number_2>_<student_number_3>_CODE.ino
GROUP_<group_number>_<student_number_1>_<student_number_2>_<student_number_3>_TINKERCAD.jpg
GROUP_<group_number>_<student_number_1>_<student_number_2>_<student_number_3>_VIDEO.mp4

EXAMPLE:
GROUP_01_2023510123_2023510124_2023510125_CODE.ino
GROUP_01_2023510123_2023510124_2023510125_TINKERCAD.jpg
GROUP_01_2023510123_2023510124_2023510125_VIDEO.mp4

You are expected to write your own code for algorithms instead of using an available method for calculations. If you use such as a method that makes this assignment trivial to code, your grade for coding will be zero.

Your uploaded source codes (as well as your circuit design) will be checked for cheating and plagiarism. If cheating is detected, your entire assignment will be graded zero. If you or other students copy your code from an online source rather than writing it yourself, it will be considered as cheating as well.

Make sure that you upload your correct assignment to correct upload section. If you accidentally upload another assignment (from another class for example) or to an incorrect upload (other section's upload), it will be considered as not turned in and it will be graded as zero. Worst of all, you will only realize it after grades are published and it will too late to fix it.

If you have any questions or problems regarding this lab paper, you can ask about it in our lab sessions. If you wish, you can also ask it in class forums or assignment page comments. If you send an email and if your question is answered, please share this information with other students to prevent asking of the same question again and again.

Your assignment will be open for upload until 23:55, 24.05.2023. This is done to allow students who may experience extreme problems (no Internet or electricity, computer crash or failure, etc.) and miss the deadline as a result. This one day extension will allow them to upload. If you are still unable to upload, send us an email informing your situation and at the same time, try everything you can to make your assignment upload.

Lastly, please do not forget to click "Submit" button after you upload your assignment files. If you do not, even though your files are uploaded to Sakai, you are labeled as "No Submission" and ignored when we try to download your assignments, making your uploaded files invisible to us, leading us to assume you did not make an assignment submission.

GOOD LUCK TO YOU ALL!