

**T.C.  
DOKUZ EYLUL UNIVERSITY**

**FACULTY OF  
ENGINEERING**

**DEPARTMENT OF  
COMPUTER ENGINEERING**

**2022 – 2023  
SPRING SEMESTER**

**CME 3208  
PRINCIPLES OF  
EMBEDDED SYSTEMS**

**LAB 3:  
BUZZER CONTROLLER**

**DUE DATE:  
23:55 – 28.03.2023**

In this lab session, you are required to create a buzzer controller to simulate a door bell using Arduino and other circuit elements. This controller will be managed by global variables and a push down button. The global variables are given below.

```
int SOUND_DURATION = 500;  
// This variable is for the main time duration for every  
sound step in sound string. 500 is for 500 milliseconds.
```

```
int SILENCE_DURATION = 50;  
// This variable is for the time duration between elements  
of the sound string. This is used to have a tiny window of  
separation between sounds to make it more understandable.  
50 is for 50 milliseconds.
```

```
int MELODY [] = {1,1,5,5,6,6,5,0,4,4,3,3,2,2,1};  
// This variable is for melody that will be played when  
push down button is pressed. This melody is a simplified  
representation of “Twinkle Twinkle Little Star” by Wolfgang  
Amadeus Mozart.
```

For melody, you should use different integers for different sounds. Examples of integers and corresponding musical notes are given below. You should search how can you play different notes with your buzzer to make these musical notes work.

INTEGER	MUSICAL NOTE
0	NO SOUND
1	Do (Low)
2	Re
3	Mi
4	Fa
5	Sol
6	La
7	Si
8	Do (High)

Your circuit should work like the following, when the push down button is pressed, the melody given above should be played for a single time (simulating a door bell button and music that is played by door bell).

If your buzzer is not able to simulate different musical notes, please explain in your video what kind of problem you have encountered and which ways you tried to solve it before giving up. In table below, you can see an example run time of this assignment with the global variables given above.

<b>CURRENT TIME (MS)</b>	<b>SOUND INTEGER CHARACTER</b>	<b>BUZZER STATUS (ON or OFF)</b>
0	1	ON
500	SILENCE	OFF
550	1	ON
1050	SILENCE	OFF
1100	5	ON
1600	SILENCE	OFF
1650	5	ON
2150	SILENCE	OFF
2200	6	ON
2700	SILENCE	OFF
2750	6	ON
3250	SILENCE	OFF
3300	5	ON
3800	SILENCE	OFF
3850	0	OFF
4350	SILENCE	OFF
Continues with next elements...		

Please use Tinkercad online simulator to create and test your design before creating the circuit using your Arduino. This will allow you to design your circuit without experiencing connectivity or similar hardware problems.

You are advised to use Tinkercad individually (for every group member) first to design the circuit and code to understand it better and gain experience. Next you should create your circuit as a group by meeting in real life if possible or having an online meeting if it is not possible.

Make sure you use resistors with every connection and circuit with your Arduino board. Otherwise you might burn the port you are using (Digital 10 for example) or even your whole Arduino board. This is also true for circuit elements as well (temperature and humidity sensor for example).

# 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.

For this lab assignment, you should also create a new melody to play with different sound and silence durations that is unique to you. It does not have to be a door bell melody, you can create or use alternative music or melody.

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.

### **FORMAT:**

GROUP\_<group\_number>\_<student\_number\_1>\_<student\_number\_2>\_<student\_number\_3>\_CODE.c  
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.c  
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 be 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, 29.03.2023. 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!**