German Jordanian University
School of Applied Medical Sciences
Department of Biomedical Engineering

BM358: Biomedical Sensors and Transducers Lab

Course Catalog
1 Credit hour (3 hrs laboratory) The aim of this lab is to gain insight into working of such sensors which can be used in day-to-day life. moreover, the student will take measurements for many sensors using the Arduino Uno and the LabVIEW to study the characteristic and the relation between the input and output. Topics covered include temperature measurement using Arduino UNO then using a LabVIEW, Light dependent resistor using the Arduino, sound level sensor, magnetic field sensor, PH sensor, light sensor, thermocouple, and gas pressure sensor. Moreover, the students have the ability to be familiar with LabVIEW and the Arduino while take the measurement of each sensor.

Lab Instructor	
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Evaluation		
Assessment Tool	**Weight**	**Expected Due Date**
Lab Reports	30 %	Each report is due at the beginning of the next lab session
Quizzes	10 %	At any time in any lab session
Midterm Exam	20%	Assigned at the beginning of each semester
Final Exam	40%	Assigned at the beginning of each semester
Total	100%	After completing final exam

	Topics Covered	
Week	**Experiment No.**	**Topic**
1	**----------**	Lab Introduction
2	Experiment 1	Exercises on Lab View
3	Experiment 2	Temperature Measurement using Lab View
4	Experiment 3	Temperature Measurement using Arduino UNO
5	Experiment 4	Light Dependent Resistor (LDR)
6	Experiment 5	Sound Level Sensor
7	Exam	**Midterm Exam**
8	Experiment 6	PH Sensor
9	Experiment 7	Gas Pressure Sensor
10	Experiment 8	Light Sensor
11	Experiment 9	Magnetic Field Sensor
12	Experiment 10	Thermocouple
13	Exam	**Final Exam**

Objectives and Outcomes	
Objectives	**Outcomes**
1.Learning about the LabVIEW.	1.1.Recognize the LabVIEW and basic block and tools . 1.2.understand the difference between the block diagram and the front panel window. 1.3.Build some VI's to be familiar with LabVIEW.
2.Understand the characteristic of Temperature sensor (LM35) using LabVIEW.	2.1.Measure the room temperature using LM35. 2.2.Analyze the characteristic of LM35.
3.Measure the Temperature using (LM35) and Arduino UNO.	3.1.Recognize the Arduino Uno and the IDE software. 3.2. Measure the temperature and knowing the conversion equations by using certain command in Arduino to get the temperature reading via the software .

4.Understanding the Light Dependent Resistor(LDR).	4.1.Recognize the operation principle of the LDR. 4.2.Wrirte the suitable code in Arduino to get the reading from the LDR after connecting the simple circuit. 4.3.Analyze the result obtained from the Arduino and do certain calculation to draw the relation between the duty cycle and the resistance of the LDR.
5.Learning about the Sound level sensor (SLS).	5.1.Understand the operation principle of SLS . 5.2.Acquire the signal from the SLS and do some processing on LabVIEW to get the input and output reading from the sensor . 5.3.Analysis the result obtained and know the relation between the input and output.
6.Learning about the PH sensor.	6.1.Recognize the operation principle of PH Sensor . 6.2.Acquire the signal from the PH Sensor and do some processing on LabVIEW to get the input and output reading from the sensor . 6.3.Analysis the result obtained and know the relation between the input and output.
7.Learning about the Gas pressure sensor (GPS).	7.1.Recognize the operation principle of GPS . 7.2.Acquire the signal from the GPS and do some processing on LabVIEW to get the input and output reading from the sensor . 7.3.Analysis the result obtained and know the relation between the input and output .
8.Learning about the Light sensor.	8.1.Recognize the operation principle of Light Sensor. 8.2.Acquire the signal from the Light Sensor and do some processing on LabVIEW to get the input and output reading from the sensor. 8.3.Analysis the result obtained and know the relation between the input and output.
9.Learning about the Magnetic field sensor.	9.1.Recognize the operation principle of Magnetic field Sensor. 9.2.Acquire the signal from the Magnetic field Sensor and do some processing on LabVIEW to get the input and output reading from the sensor. 9.3.Analysis the result obtained and know the relation between the input and output.
10.Learning about the thermocouple.	10.1.Recognize the operation principle of thermocouple. 10.2.Acquire the signal from the thermocouple and do some processing on LabVIEW to get the input and output reading from the sensor. 10.3.Analysis the result obtained and know the relation between the input and output.

Lab Report Requirements	
Report section	**Description**
Introduction	This section should provide the context and motivation for the experiment, briefly explain relevant theory in sufficient detail, introduce any relevant laws, equations or theorems, and clearly state the aim or research question that the experiment is designed to address. You should try to write it in your own words, rather than paraphrasing the lab manual (but if you have to, be sure to include the appropriate references). It's always a good idea to read the entire experiment in the manual before you begin your introduction.
Procedure	This section must include a description of the procedure followed. It should not simply be a re-statement of the procedure section of this manual. You should interpret the procedure section and develop your own step-by step method.
Results	In this section, you present the main data collected during your experiment. Each key measurement needs to be reported appropriately. Data are often presented in graphs, figures or tables. These need to be labelled appropriately to clearly indicate what is shown. Tables should be labelled numerically above the table as Table 1, Table 2, etc. Everything else (graphs, images, diagrams etc.) is labelled numerically below the figure as Figure 1, Figure 2, etc.
Discussion	This section should demonstrate how will you understand what happened in the experiment. You should identify and comment on any trends you have observed, compare the experimental results with any predictions, identify how any sources of error might impact on the interpretation of your results, suggest explanations for unexpected results, and where appropriate, suggest how the experiment could have been improved.
Conclusion	This section should provide a message summing up what has been learned from the experiment such as: briefly restate the purpose of the experiment (the question it was seeking to answer), identify the main findings (answer to the research question), note the main limitations that are relevant to the interpretation of the results, summarize what the experiment has contributed to your understanding of the problem.
References	List all sources that you have referred to in the body of your report. These can include references to accepted literature values or equations you use in your calculations. You should use proper referencing techniques.
Appendix	It contains material that is too detailed to include in the main report, such as tables of raw data, software code or detailed calculations.
Formatting	Font type: Times New Roman. Font size: 12 for the main paragraphs and 14 bold for the titles. Justify the paragraphs. Numbering. Figures should be inserted in the center of the page and they should be labeled below the figure with font size 10.

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Policy	
Attendance	Attendance will be checked at the beginning of each lab session. University regulations will be strictly followed for students exceeding the maximum number of absences (20%).
Reports	Each student must hand his\her own separate report. Laboratory reports are due to ***one week after*** the experiment was carried out and it will be collected at the beginning of each laboratory. If any report is not submitted to the TA by the deadline, it will be judged as "**LATE**".
Examinations	The midterm and the final exams are closed book tests. Students who are not able to attend an examination (medical or another emergency) must notify the instructor. Make up tests require a Valid University excuse.
Student Conduct	It is the responsibility of each student to adhere to the principles of academic integrity. Academic integrity means that a student is honest with him/herself, fellow students, instructors, and the University in matters concerning his or her educational endeavors. Cheating will not be tolerated in at all. University regulations will be pursued and enforced on any cheating process.