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**American International University- Bangladesh (AIUB)**

**Department of Electrical and Electronic Engineering**

**EEE4103: Microprocessor and Embedded Systems Laboratory**

***Guidelines for students: Students can design an embedded system that will sense some parameters from their surroundings and using those parameters their system will provide security to human life/ treasury. Students will be completing their lab experiment by verifying the program for their experiment using a relevant software development tool and then implementing their experiment in the trainer board as hardware to observe their results. The time duration for this whole lab experiment will be 60 minutes per group. This overall lab experiment will be done group-wise including 5 or 8 members per group. All the groupmates will be responsible to complete the OEL lab report. The OEL lab report (one report in each group) must be submitted on the final lab exam week (softcopy + hardcopy) before starting the class. Late submission will be accounted for heavy penalty. If a student or group is found to not follow the guidelines, then deductions can be made or zero can be expected. In total, 10 marks are allocated for OEL lab report and student’s individual performance within the group.***

***For OEL report submissions, the following topics must be included:***

***Title:*** Students will provide an appropriate title for a microcontroller-based self-designed laboratory experiment based on ideas and knowledge they acquired from their previous laboratory experiments.

***Objective:*** Students will be implementing this experiment based on one or more objective/objectives.

***Theory and Methodology:*** Students will be explaining their experiment methodology in this section which will be brief. They may produce a circuit diagram by pen to explain the overall system of their lab experiment and label the circuit diagram. **They must use knowledge of SPI, USART, I2C, PWM, etc.**

***Apparatus:*** The students can select apparatus from the table below but are not limited to create their experiment according to their requirements. However, they must purchase or collect it before the experiment, if any particular components, sensors, or display devices are not available in the laboratory.

|  |  |  |
| --- | --- | --- |
| * Arduino UNO * Arduino Mega * Resistors * LED indicators * LCD device | * Ultrasonic sensor * OLED display * Pressure sensor * Breadboard | * Master-Slave Device * Potentiometer * DC motor * H-bridge motor driver * Push button switches |

***Experimental Setup:*** Students will be adding pictures of their implemented hardware circuit connection in this section.

***Codes of the Program:*** Students will be adding the program they wrote for hardware implementation in this section.

***Data collection table/comparison table based on results:*** The students will be including their collected results and make a data table for analysis.

***Discussions:*** Students will be writing reasonable conclusions here related to their experiment.

***References:*** Use appropriate references where necessary in IEEE format.

***Appendix:*** Include **‘individual’s contribution’** in a tabular form.

***Course Outcome Mapping with the OEL:***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CO/**  **CLO Number** | **CO/CLO Statement** | **K** | **P** | **A** | **Assessed Program Outcome Indicator** | **BNQF Indicator** | **Teaching-Learning Strategy** | **Assessment Strategy** |
| **1** | Simulate laboratory experiments using microcontrollers, sensors, actuators switches, display devices, etc., and a suitable simulator related to the fields of electrical and electronic engineering. |  | P1,  P4,  P5 |  | P.e.2.P4 | FS.6 | Practical Demonstration | OEL Report |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Name:** | | Microprocessor and Embedded System | **Course Code:** | | EEE 4103 |
| **Semester:** | | Spring 2022-2023 | **Section:** | |  |
| **Faculty Member:** | | Md Sajid Hossain | **Group #** |  | |
|  | |  |  | |  |
| **OEL Lab-2 Title:** | |  | | | |
| **Submission Link:** | | [**https://forms.microsoft.com/r/H2qfsUXZat**](https://forms.microsoft.com/r/H2qfsUXZat) | | | |
|  | |  |  | |  |
| **SL** | **Student ID #** | **Student Name** | **Obtained Marks** | | |
| **1.** |  |  |  | | |
| **2.** |  |  |  | | |
| **3.** |  |  |  | | |
| **4.** |  |  |  | | |
| **5.** |  |  |  | | |
| **6.** |  |  |  | | |
| **7.** |  |  |  | | |
| **8.** |  |  |  | | |

***Assessment Materials and Marks Allocation:***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **COs** | **CO Statement** | **Assessment Materials** | **POIs** | **Marks** |
| CO1 | *Simulate laboratory experiments using microcontrollers, sensors, actuators switches, display devices, etc., and a suitable simulator related to the fields of electrical and electronic engineering.* | Open Ended Laboratory Report | P.e.2.P4 | 10 |

***Assessment Rubrics:***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **COs-POIs** | Excellent  [9-10] | Proficient  [7-8] | Good  [5-6] | Acceptable  [3-4] | Unacceptable  [1-2] | No Response  [0] | Secured Marks |
| **CO1**  **P.e.2.P4** | The OEL developed as a process for complex engineering problems considering microcontrollers, sensors, switches, display devices, etc. The simulation and implementation processes are clearly demonstrated combining all input patterns with several outcomes. | The OEL developed as a process for complex engineering problems considering microcontrollers, sensors, switches, display devices, etc. The simulation and implementation processes are clearly demonstrated with some outcomes and limited input patterns. | The OEL developed as a process for complex engineering problems considering microcontrollers, sensors, switches, display devices, etc. The simulation and implementation processes are not clearly demonstrated with some outcomes and input patterns. | The OEL developed as a process for complex engineering problems considering microcontrollers, sensors, switches, display devices, etc. The simulation and implementation processes are not clearly demonstrated with a few outcomes for a few patterns. | The OEL developed as a process for complex engineering problems considering microcontrollers, sensors, switches, display devices, etc. are not appropriate. The simulation and implementation processes are not demonstrated with any outcomes and not for any pattern. | No responses at all |  |
| **Comments** |  | | | | **Total marks (10)** |  | |

***Include this page as cover of the report***

*How K/Ps are addressed through this task?*

In this POI, there is no need to think about knowledge profile (K) as per AIUB OBE Manual V21.

P1: This task requires knowledge of electrical circuits, electronic circuits, and digital electronics (K3), design knowledge (K5) of circuit design and simulation and hardware tools as well as test and measurement tools (K6). Therefore, it satisfies the requirements of depth and breadth of knowledge as per P1 (depth of knowledge at one or more levels of K3-K6 or K8). Practicing knowledge in electrical and electronic engineering discipline as per POI statement (P.e.2.P4), which is mapped to this course outcome, CO1.

P4: The circuit was designed where there is no knowledge on it. So, this full-fills the requirements of the involvement of the infrequently encountered issues.

P5: To design the circuit, the outside problems encompassed by standards and codes of practice for professional engineering are required including the serial communication protocols, interrupts, or pulse width modulation for the microcontrollers with the desktop PC. Without this working knowledge, no can design the system using microcontrollers.