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

**Department of Electrical and Electronic Engineering**

**EEE 4103: 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 90 minutes per group. This overall lab experiment will be done group-wise including 5 members per group, one member who has not submitted any lab report from his group in the final term will be completing a lab report based on this experiment, and all the groupmates will be helping the groupmate to complete the lab report. The lab report must be submitted on the final lab exam week within the lab class duration. Students will not be allowed to see lab manuals or collect experiment ideas using the internet, they will not be allowed to have access to their cellphones during this OEL experiment. If a student or group is found not to follow the guidelines, then deductions can be made or zero can be expected. In total, 10 marks are allocated for every student’s individual performance within the group and the group OEL report. For lab report submission, the following points 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 interrupts, SPI, USART, TWI, 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 * Raspberry Pi | * 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.

***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 2023-2024 | **Section:** |  |
| **Faculty Member:** | | **Md. Shaoran Sayem** | | |
|  | |  |  |  |
| **OEL Title:** | |  | | |
| **Group #:** | |  | | |
|  | |  |  |  |
| **SL** | **Student ID #** | **Student Name** | **Obtained Marks** | |
| **1.** |  |  |  | |
| **2.** |  |  |  | |
| **3.** |  |  |  | |
| **4.** |  |  |  | |
| **5.** |  |  |  | |
| **6.** |  |  |  | |

***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 Response at all/copied from others/ identical submissions with gross errors/image file printed |  |
| **Comments** |  | | | | **Total marks (10)** |  | |

*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.