

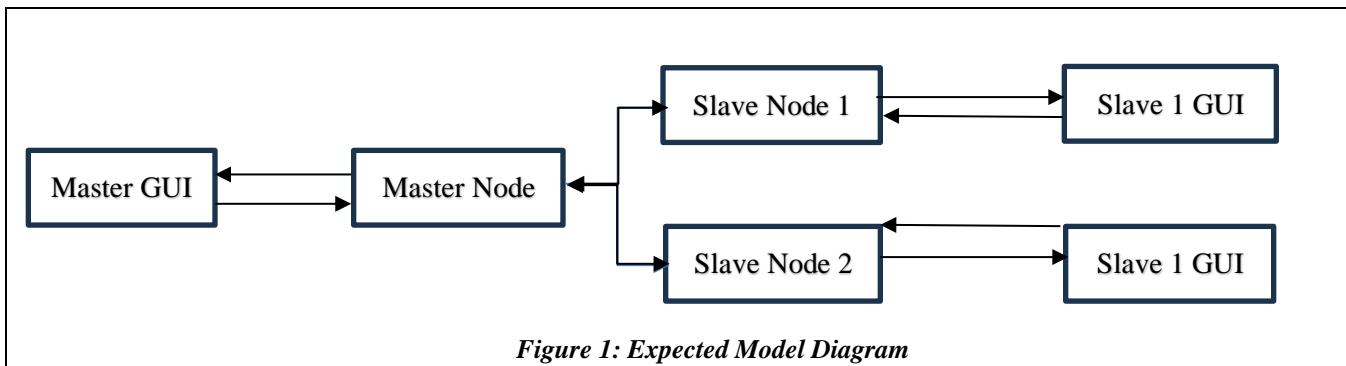
**FACULTY OF ENGINEERING, UNIVERSITY OF JAFFNA**  
**EC8020 – COMPUTER ENGINEERING DESIGN PROFICIENCY**  
**DESIGN TASK 4 - EMBEDDED SYSTEMS DESIGN**

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## 1 DESIGN TASK

You are tasked with designing a unique alphanumeric code authentication gate control system using microcontroller. Which have a master node and two slave nodes. Master node is the main server, Slave nodes are the gate controllers.

- Master Node is responsible for getting passenger information using GUI, creating unique alphanumeric code, storing unique alphanumeric code, authenticating unique alphanumeric code,
- Slave nodes are responsible for getting unique alphanumeric code from the passenger using GUI, sending the unique alphanumeric code to the master node for authentication, return the authentication status to the user through GUI, control the gate.
- Establish an SPI communication protocol for interconnecting the master and slave microcontrollers.
- Ensure that when a unique alphanumeric code is valid for one gate, another gate should remain closed.
- Implement error handling and feedback mechanisms for invalid unique alphanumeric code or communication failures.
- You can use any framework for IDE. You can choose any communication protocol between nodes and GUI.
- You have to create an algorithm to generate unique alphanumeric code by using user data.



## 2 APPARATUS

- Each group is allowed to borrow a **maximum of two** development boards.
- For third board, each group share with another group
- You can collect any required components from any department based on availability.

## 3 MODELING DEVICES IN SYSTEM

- You can demonstrate the gate mechanism using led.

## 4 SAFETY:

- You are to follow necessary safety guidelines to prevent personal harm and equipment failure.
- If you are working in a laboratory, you are requested to follow the guidelines relevant to that laboratory.

## EVALUATION:

- This task will be evaluated in two lab sessions, preliminary and implementation sessions.
- Preliminary session is basically a brain storming session. The schedule of the preliminary session is as follows:
  - 20 min reading time.
  - 10 min Discussion (requirement analysis) – will be marked.
    - Need to discuss only about what is required
    - Should not discuss any details within the protocol
  - 1 hour and 30 minutes for poster preparation
    - You can use internet and any resources
    - Can't talk with other students
    - It should be your own preparation
  - Next 3 hours for the poster presentation and marking
- Implementation lab session.
  - You can bring any documents, drawings, reports, code.
  - You **must** also bring the connected circuit.
  - Marking is divided into two categories: Demonstration and Understanding
  - Demonstration category:
    - Performance based marking - How well the signal is cleaned and based on the intelligibility of the signal.
    - You will have to actively demonstrate (without instructor asking you to describe) your system if required (design should independently operate without interference).
    - It is the time for you to do the marketing of your design.
    - Later, you may be asked further questions for clarification.
    - Marking will depend on how well you describe the process with spectrums and diagrams.
  - Understanding category:
    - Lab demonstrator may ask questions to you to check your understanding.
  - Design report
    - Design reports, test plan and any other documents that you bring will indirectly contribute to your marking under the categories of demonstration and understanding.
    - Showing your demonstration and understanding with a poor report is very difficult.
- Reflection sheet
  - Need to upload in Microsoft Teams assignment (not by email) within two days after the implementation lab
  - What you have learned, what went wrong in the lab, what weakness you have identified and how you would fix them in future
  - It should be at most one A4 page and not more than 250 words.