FACULTY OF ENGINEERING
ELECTRONIC (COMPUTER) ENGINEERING PROGRAM
KS30503 EMBEDDED SYSTEM
INDIVIDUAL MINI PROJECT

Problem Definition:

Task 1:

1.1 Pick one embedded system that is available in your house. Get its control panel's picture and obtain/derive the block diagram.

1.2 Suggest an optimal microcontroller for the control system. Explain why you picked that microcontroller based on the technical aspect.

Task 2:

2.1 Suggest a suitable device/component for every part in the block diagram. Justify your suggestion.

2.2 Obtain the datasheet of the suggested devices/components. Estimate the total application power required by the circuit and how much heat is produced. Determine whether the system can be powered using a battery. If yes, what are the battery capacity and run-time? If no, state the reason why. Provide calculation whenever necessary.

Task 3:

3.1 Construct the circuit for the selected embedded system in Proteus by using the PIC16F887 microcontroller as the processor. Use substitutes for components/devices that are not available in the Proteus Library.

3.2 Derive the flowchart/algorithm to present the operation of that embedded system. Write a C program based on the derived flowchart/algorithm.

3.3 Simulate the embedded system to verify its operation.

3.4 Improve the embedded system by adding at least a new practical feature.

i. Discuss why the system needs that improvement.

ii. Modify the circuit and program to accommodate the improvement.

iii. Reestimate the power requirement considering the improvement.

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Task 4:

4.1 Construct the real hardware for the system. Embed the program and demonstrate. Discuss the outcomes.

4.2 Submit a report detailing Task 1 to Task 4.1. The report should have:

i. Cover page.
ii. Content.
iii. Task 1
iv. Task 2
v. Task 3
vi. Task 4.1
vii. Conclusion

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Student Name: **Student Number:**	**Assessed by:**

Task	**Unsatisfactory (2)**	**Satisfactory (3)**	**Good (4)**	**Excellent (5)**	**Mark**
CO1: The ability to explain the embedded system and the features/organization of a microcontroller					
Task 1 (10 marks)	• The block diagram is missing out on crucial parts. • A microcontroller is proposed but without relevant technical justifications.	• The block diagram generally represents the system. • A microcontroller is proposed and supported with relevant technical justifications.	• An almost complete and detailed block diagram is given. • A microcontroller is proposed with relevant and acceptable technical justifications.	• A complete and detailed block diagram is given. • A microcontroller is proposed with sound technical justifications.	
CO2: The ability to analyze and interpret the design of an embedded system					
Task 2 (15 marks)	• Wrong/irrelevant devices or datasheets are provided. • Power requirement estimation is performed. • No discussion on the power requirement is provided.	• Correct devices and datasheets are provided for crucial components/parts in the system. • Power requirement estimation is performed roughly. • A discussion on the power requirement is provided.	• Correct devices and datasheets are provided for most components/parts in the system. • Power requirement estimation is supported with calculation. • A good discussion on the power requirement is provided.	• Correct devices and datasheets are provided for every component/part in the system. • Power requirement estimation is supported with detailed calculation. • A comprehensive discussion on the power requirement is provided.	

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Task	Unsatisfactory (2)	Satisfactory (3)	Good (4)	Excellent (5)	Mark
CO3: The ability to design the embedded system to solve a specific problem					
Task 3 (25 marks)	• The constructed circuit is not presenting the general/basic system. • The program flow does not make sense. • The basic connection of PIC16F887's is used. • Simulation produces wrong output. • The real system is not working.	• The constructed circuit presents the general/basic system. • The program flow can be understood. • At least one PIC16F887's feature is used. • Correct simulation output. • The real system is working.	• The constructed circuit presents the entire system. • The program flow is easily understood. • At least two PIC16F887 features are used. • Correct simulation output. • The real system is working and producing the desired output.	• The constructed circuit presents the entire system completely. • The program flow is neat and easily understood. • More than two PIC16F887 features are used. • Correct simulation output. • The real system is working perfectly and producing the desired output.	
CO4: The ability to properly use modelling and simulation tools					
Observation during project demo (10 marks)	• A circuit is drawn but can't be simulated. • Unable to compile the written program.	• A neat circuit is drawn and can be simulated. • The written program can be compiled without syntax error.	• A neat circuit is drawn and can be simulated. • The written program can be compiled without syntax error.	• A compact and neat circuit is drawn with complete label. The drawn circuit can be simulated. • The written program can be compiled without syntax and logic errors.	
				Total	