**Automated Hydroponic Cattle Feed Generation System**  


**Project Title : Automated Hydroponic Cattle Feed Generation System**

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| Group Members | Registration # |
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**Course : Microprocessor System & Interfacing**

**Course Code: CPE 342**

**Course Instructor : Engr. Muhammad Naveed Shaikh**

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# Project Title:

**Automated Hydroponic Cattle Feed Generation System**

## **Problem Statement** Traditional cattle feed production methods are labor-intensive, time-consuming, and highly dependent on external conditions. There is a need for an automated, space-efficient, and sustainable solution to consistently produce fresh fodder for livestock, minimizing human intervention and water usage.

## **Project Description** This project develops a fully automatic hydroponic cattle feed generation system using the PIC18F452 microcontroller. It automates fodder growth in a 10-tray vertical structure with features such as scheduled watering, daily tray shifting, and water level monitoring. The system is entirely programmed in Assembly, utilizing timers, ADC, and I/O ports to control sensors, motors, and an LCD display, ensuring precise hardware-level control and optimal performance.

## **Deliverables**

## Functional prototype of the automated hydroponic fodder system

## Fully written assembly code for PIC18F452

## System schematic with block diagram

## Detailed report with implementation and testing results

## Demonstration video (optional)

# Justification for Complex Engineering Problem (CEP)

This project qualifies as a CEP due to its real-world relevance and integration of multiple engineering domains. It features precise timing, sensor integration, actuator control, and state-based logic — all written in low-level assembly. It addresses power and resource constraints, requires original design approaches, and involves system-level integration across mechanical, electrical, and software components.

1. **Open-ended**:  
   Your project does not have one fixed solution. You must choose the best design from multiple options.
2. **Not from textbook/lab manual**:  
   The complete solution is not directly available in class notes or tutorials. You need to explore, design, and test your own approach.
3. **Involves constraints**:  
   You must work within **real-world limitations** like cost, power consumption, speed, space, or accuracy.
4. **Multi-disciplinary**:  
   Your project combines **more than one field** — for example: microcontroller programming, sensor interfacing, signal processing, communication, etc.
5. **System-level integration**:  
   You are connecting and managing **multiple sub-systems**, such as input from sensors, data processing, and output to LCD or alarms.
6. **Real-world relevance**:  
   Your project has **impact on society, environment, or safety**, e.g., smart health monitor, energy saver, or pollution detector.

# Selected Washington Accord Knowledge Profiles (WPs)

(Tick all applicable and briefly justify each selected WP)

|  |  |  |  |
| --- | --- | --- | --- |
| WP | Description | Tick ✓ | Justification (1–2 lines) |
| WP1 | Depth of knowledge required |  | Requires low-level Assembly programming and microcontroller architecture knowledge. |
| WP2 | Range of conflicting requirements |  | Balances timing, power constraints, tray movement, and water management. |
| WP3 | Depth of analysis required |  | Involves cycle-accurate timing, real-time scheduling, and ADC configuration. |
| WP4 | Familiarity of issues |  | |  | | --- | |  |  |  | | --- | | Deals with real-world agricultural automation and embedded design challenges. | |
| WP5 | Extent of applicable codes |  | |  | | --- | |  |  |  | | --- | | Requires adherence to microcontroller standards and coding conventions. | |
| WP6 | Stakeholder involvement and needs | N/A | N/A |
| WP7 | Interdependence of subsystems |  | Sensors, motors, display, and controller work in a tightly integrated manner. |

# Selected Engineering Activities (EAs)

(Tick all applicable and justify briefly)

|  |  |  |  |
| --- | --- | --- | --- |
| EA | Description | Tick ✓ | Justification (1–2 lines) |
| EA1 | Range of resources |  | Combines PIC MCU, relays, stepper drivers, sensors, and LCD modules. |
| EA2 | Level of interactions |  | High interaction among mechanical trays, electrical circuits, and software logic. |
| EA3 | Innovation |  | |  | | --- | |  |  |  | | --- | | Provides an automated, energy-efficient solution to traditional feed production. | |
| EA4 | Consequences to society/environment |  | Promotes sustainable agriculture and minimizes water usage. |
| EA5 | Familiarity |  | Involves standard microcontroller systems with customized extensions. |

# Relevant UN Sustainable Development Goal (SDG)

(Tick one most relevant goal and explain)

|  |  |  |
| --- | --- | --- |
| SDG # | Goal Description | Tick ✓ |
| SDG 3 | Good Health and Well-being | ☐ |
| SDG 6 | Clean Water and Sanitation | ☐ |
| SDG 7 | Affordable and Clean Energy | ☐ |
| SDG 9 | Industry, Innovation, and Infrastructure |  |
| SDG 11 | Sustainable Cities and Communities | ☐ |
| Other | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |

SDG Justification (2–3 lines):

**SDG #9 – Industry, Innovation, and Infrastructure:**  
This project fosters innovation in agricultural technology by developing an infrastructure for automated fodder production. It supports modern livestock farming through sustainable and efficient practices, reducing manual labor and improving productivity.