American International University-Bangladesh (AIUB)

Faculty of Engineering

Department of CSE, EEE, and CoE

EEE4103 MICROPROCESSOR AND EMBEDDED SYSTEM

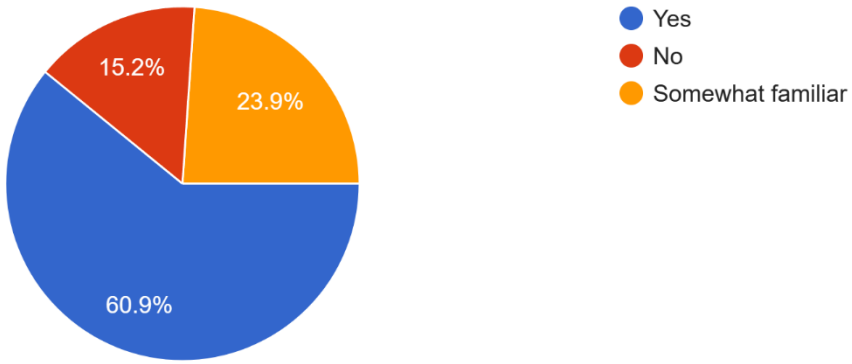
COURSE CAPSTONE PROJECT PROPOSAL FORM

SEMESTER: SPRING 2024-25
PROJECT TITLE: Arduino Based Remote-Controlled Pesticide Sprayer Car

SURVEY:

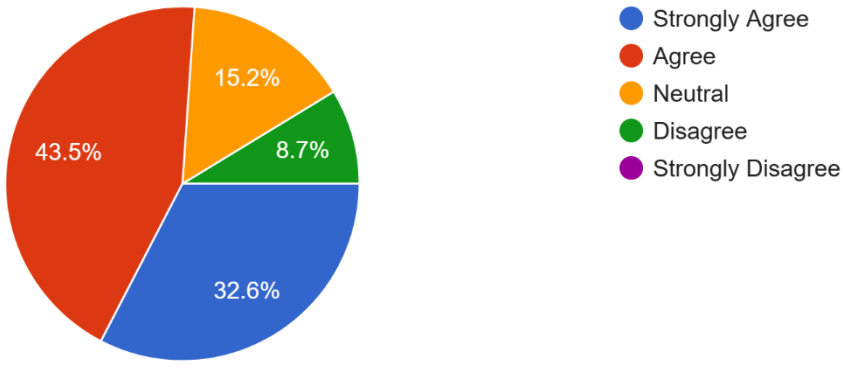
1. Are you familiar with the use of automation (robots, drones, or remote-controlled vehicles) in agriculture?

46 responses



2. Do you think pesticide spraying using remote-controlled vehicles can reduce farmers' health risks?

46 responses



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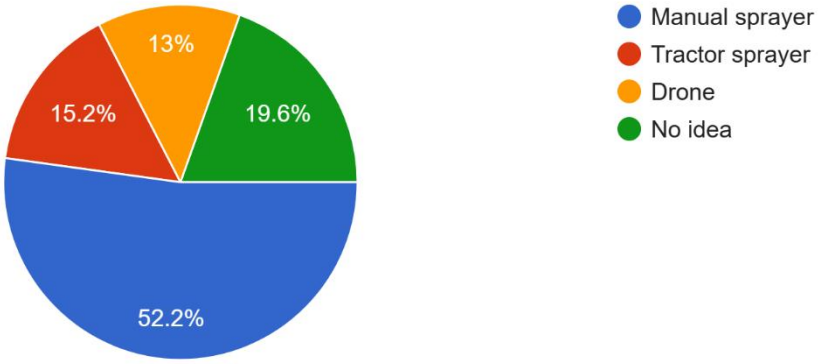
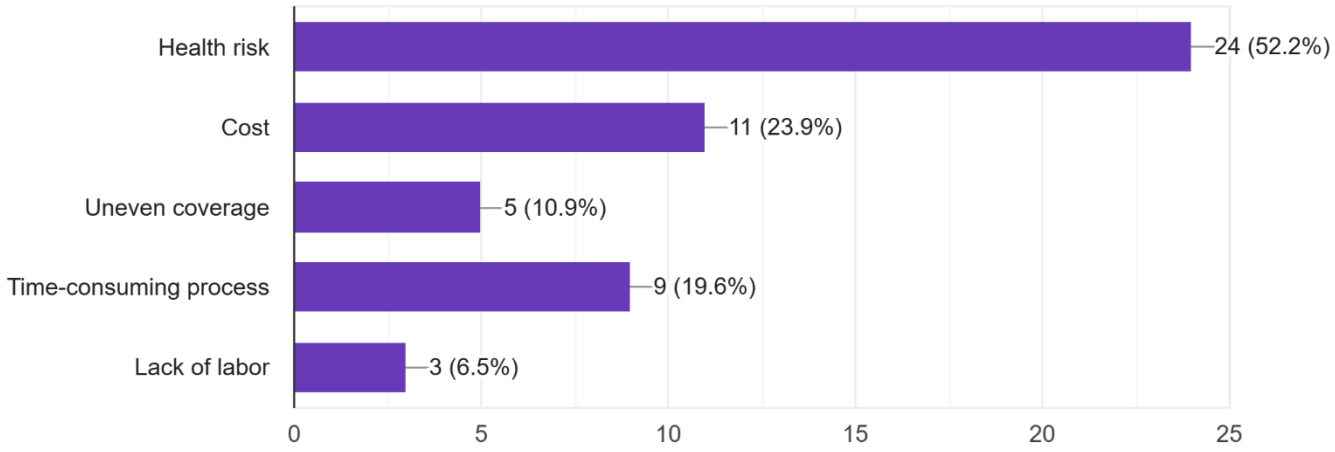
3. Which traditional method do you or people in your community use for pesticide spraying?

46 responses



4. Which of these do you think is the biggest challenge in current pesticide spraying methods?

46 responses



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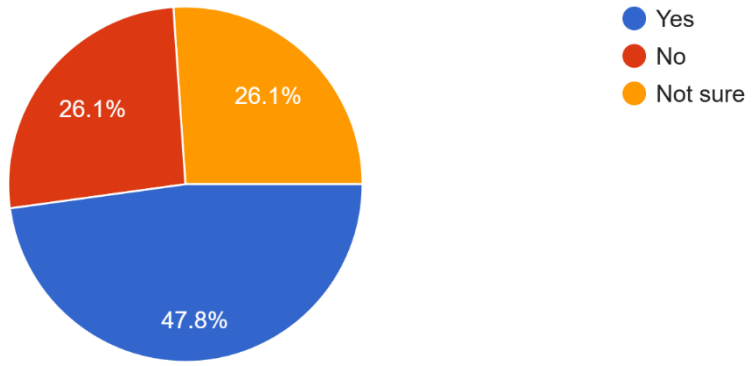
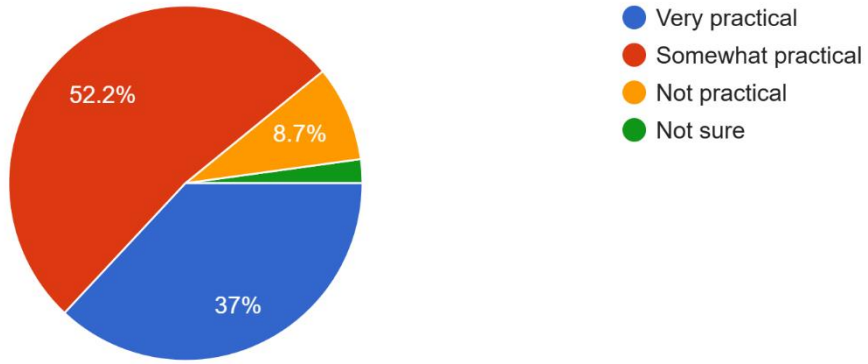
5. Have you or anyone you know experienced health problems from manual pesticide spraying?

46 responses



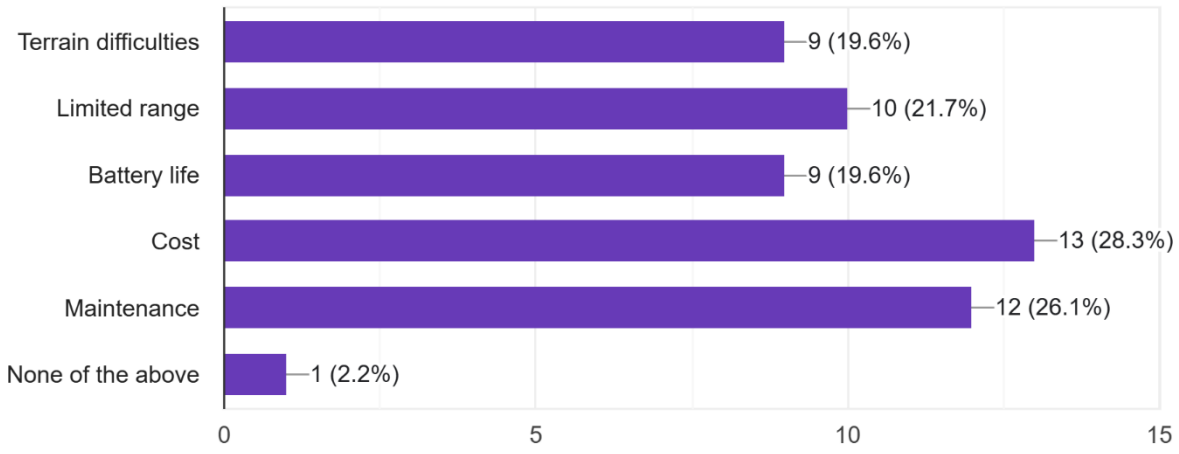
6. Do you think this kind of Arduino-based solution is practical for use in rural farming areas?

46 responses



7. What challenges do you think a remote-controlled pesticide car might face in real-world use?

46 responses



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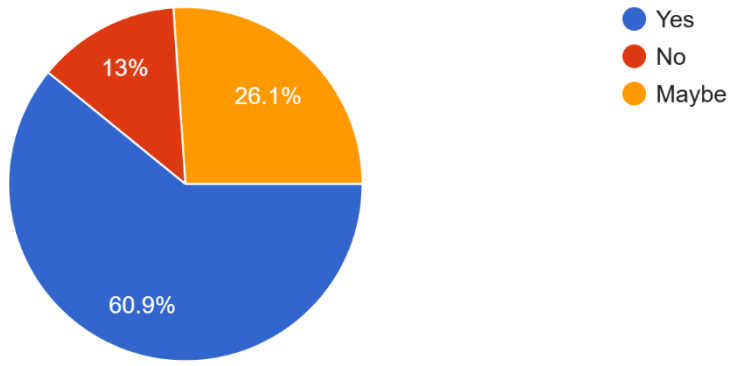
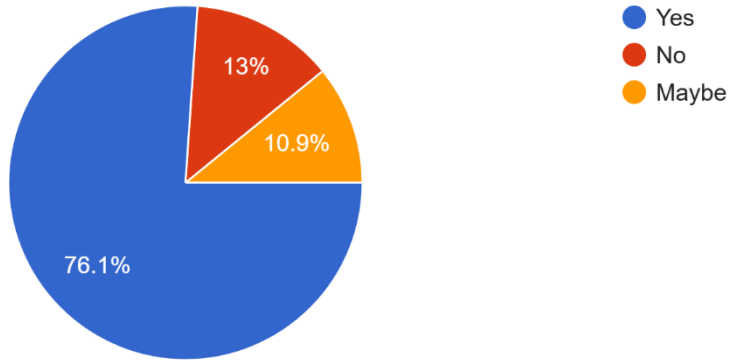
8. Do you believe a remote-controlled Arduino-based car can be a practical solution for small to medium farms in Bangladesh?

46 responses



9. Would you consider using a remote-controlled arduino car sprayer if it were affordable and easy to use?

46 responses



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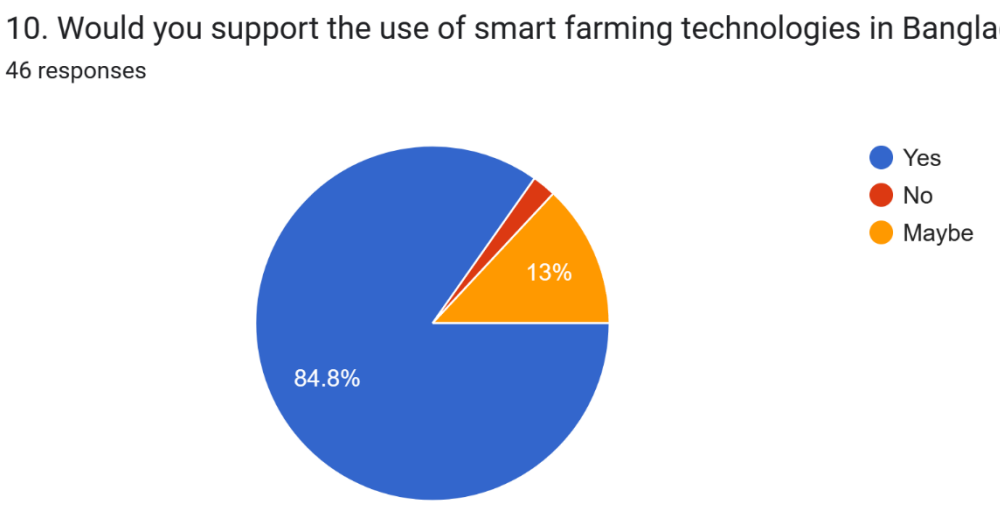

Link: https://forms.gle/3RFasstXoVQzWAbF6

AIMS AND OBJECTIVES OF THE PROJECT:

- **Design and Implement** a remote-controlled pesticide spraying vehicle using Arduino UNO/ESP32 microcontroller integrated with a motor driver (L298N) to automate safe pesticide application.

- **Develop and Integrate** Bluetooth or Wi-Fi communication between a mobile device and the microcontroller to receive directional and spray commands remotely.

- **Simulate and Test** motor control and spraying functions using Arduino IDE and Proteus before deploying the physical model to ensure accurate system responses.

- **Control and Operate** dual motors through the L298N driver module to navigate the wheels as per received signals and activate the pump for pesticide spraying via a relay-controlled sprayer.

- **Analyze and Evaluate** the movement control and spray mechanism performance in a test environment to ensure consistent operation and user safety.

LITERATURE REVIEW:

1. **Citation:** A. N. Babu *et al.*, "Internet of Things (IoT) based Pesticide Spraying Robot - A Revolution in Smart Farming," *Indian Journal of Science and Technology*, vol. 16, no. 22, pp. 1676–1681, Jun. 2023, doi: 10.17485/ijst/v16i22.926
   Limited Sensor Integration and Field Autonomy: The paper introduces an IoT-based pesticide spraying robot that responds to user commands for directional movement and spraying, offering flexibility in real-time operation. However, the system lacks integration with environmental or obstacle-detection sensors, making it less adaptive to field conditions such as uneven terrain or crop row alignment.

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2. **Citation:** S. T. Ayyagari, S. K. K. Erakkat, S. Ts, and M. Neerati, "Design and fabrication of solar powered remote controlled all terrain sprayer and mower robot," *arXiv preprint arXiv:2106.05236*, Jun. 9, 2021. https://arxiv.org/abs/2106.05236
   Multifunctionality with Increased Complexity: This work proposes a solar-powered, remote-controlled robot capable of both spraying pesticides and mowing unwanted plants. The system demonstrates flexibility with 4 Degrees of Freedom and a semi-automated mechanism that enhances precision in pesticide application and reduces environmental impact. However, integrating both spraying and mowing functions adds mechanical and control complexity, raising costs and limiting ease of maintenance for small-scale users.

3. **Citation:** M. A. Naik *et al.*, "Development of a telerobotic Target-Specific pesticide Applicator: an intervention for enhanced safety and efficiency," *Journal of Field Robotics*, Feb. 2025, doi: 10.1002/rob.22524.
   Power Source Focus and System Complexity: This study introduces a telerobotic pesticide spraying robot designed for greenhouse environments, which uses ultrasonic sensors for target-specific spraying based on foliage presence and height. While the robot offers significant advantages in reducing pesticide usage (24.95% less compared to traditional methods) and improving operator safety (eliminating dermal exposure), its complexity stems from the integration of real-time video feedback, wireless communication, and sensor-based spraying control. This complexity introduces higher initial costs and requires careful maintenance.

4. **Citation:** J. F. Kayode, O. O. Adeoye, A. A. Adebayo, and M. A. Yusuf, "Development of Remote-Controlled Solar-Powered Pesticide Sprayer Vehicle," *Research Square*, Aug. 2023. doi: 10.21203/rs.3.rs-3229329/v1
   Power Source Focus and System Complexity: This research introduces a semi-automated pesticide sprayer vehicle powered by solar energy and a 100 AH battery system, integrating four 30W solar panels to deliver 120W for operation. It utilizes remote control and an HC-05 Bluetooth module with an ATMEGA32A microcontroller, making it effective in minimizing manual labor and operator exposure to harmful chemicals. However, reliance on solar energy introduces weather-based limitations, and the system's capacity to operate for only 4 minutes per tank limits its field scalability.

5. **Citation:** P. K. C., B. S., G. B. B., M. K. N., and R. Kumbar, "Revolutionising Agriculture with Remote-Controlled Automatic Sprayer Machines," *Tuijin Jishu/Journal of Propulsion Technology*, pp. 4714–4715, Mar. 2024. [Online]. Available: https://www.researchgate.net/publication/379046265
   Power Source Focus and System Complexity:
   This paper presents the design and conceptual framework of a Remote-Controlled Pesticide Sprayer aimed at modernizing pesticide applications in agriculture. The system features a self-propelled vehicle with integrated spraying and remote operation, significantly reducing the manual labor, health risks, and inefficiencies of traditional spraying methods. While the paper emphasizes the potential for increased precision and automation, it does not elaborate in depth on the specific power source or range of control systems used.

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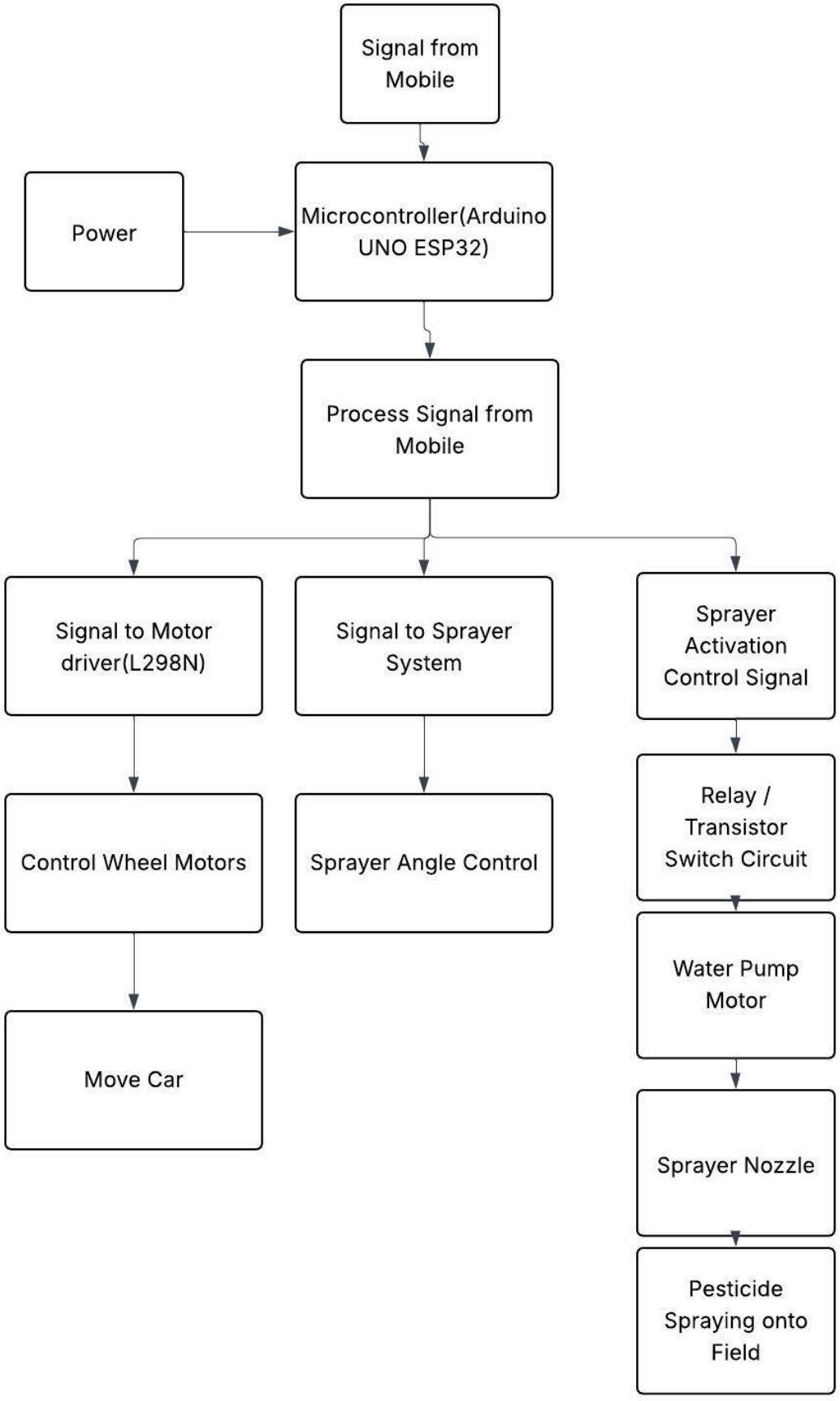
EXPERIMENTAL BLOCK DIAGRAM:



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POSSIBLE OUTCOMES OF THE PROJECT:

I. **Improving Farmer Safety:** The system enables farmers to apply pesticides remotely, reducing direct exposure to toxic chemicals and minimizing health hazards associated with manual spraying.

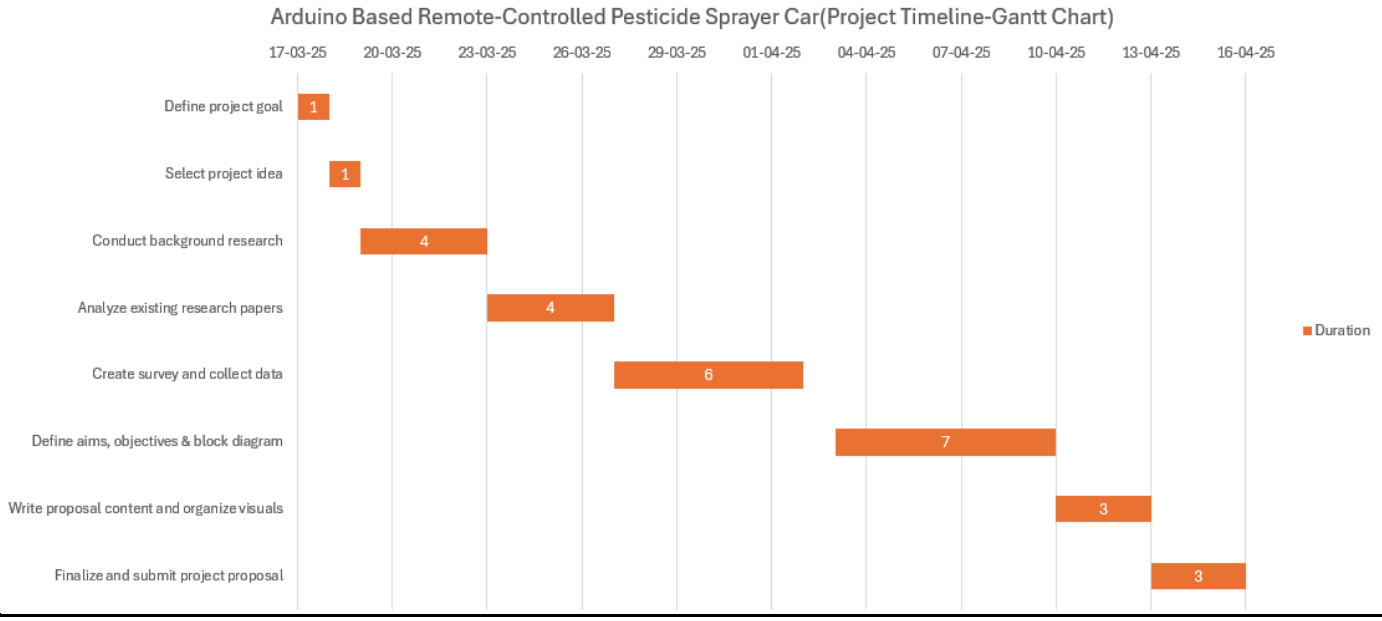
II. **Enhancing Field Efficiency:** By allowing precise control over both movement and spraying functions, the system reduces pesticide waste, saves time, and ensures more targeted application across crop areas.

III. **Promoting Technological Integration in Agriculture:** This project introduces embedded systems and wireless communication into farming practices, encouraging greater acceptance of automation and digital tools in rural and small-scale farming communities.

IV. **Supporting Environmentally Responsible Farming:** Controlled spraying contributes to reduced chemical runoff and overuse, promoting eco-friendly agricultural practices that help protect soil and nearby ecosystems.

V. **Empowering Cost-Effective Innovation:** Using affordable components like Arduino, L298N, and a basic mobile interface, the system offers a low-cost solution accessible to farmers with limited resources or technological infrastructure.

PROJECT TIMELINE (GANTT CHART):



REFERENCES:

1. J. F. Kayode *et al.*, "Development of remote-controlled solar-powered pesticide sprayer vehicle," *Deleted Journal*, vol. 6, no. 3, Feb. 2024, https://doi.org/10.1007/s42452-024-05748-x
2. R. Gorapudi, B. R. S. P. Rudrapaka, and A. S. Valluri, "Design and Implementation of Pesticide Spraying Robot using IOT," *International Journal of Advance Research and Innovation*, vol. 8, no. 2, pp. 36–41, Jan. 2020, https://doi.org/10.51976/ijari.822006
3. A. Chougule, D. Gadekar, V. Patil, and R. J. Patil, "Design and Development of Remote Controlled Agriculture Sprayer," Jan. 15, 2024. https://matjournals.net/engineering/index.php/JCC/article/view/32

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Instructions:

1. There is no definite format to write the proposal, but students must follow the mentioned instructions properly.
2. Fill in the form accurately with all necessary information.
3. Make a color print on this form.
4. Figures, tables, charts, circuit diagrams, block diagrams, and wave shapes must be color printed.
5. The survey form links with the answers must be provided in the proposal form.

FOR FACULTY USE ONLY

COMMENTS BY COURSE TEACHER:

COURSE TEACHER'S NAME **COURSE TEACHER'S SIGNATURE** **DATE**

GROUP MEMBERS

(Maximum 6 students are permitted to carry out a single Project. However, depending on the capability of the students, 4 students may be allowed but not less than that)

NAME: Shahriar Hossain **ID#:** 22-48990-3 **PROGRAM:** CSE **EMAIL:** 22-48990-3@student.aiub.edu	**NAME**: Al Mubtasim **ID #:** 22-49002-3 **PROGRAM:** EEE/CoE/CSE **EMAIL:** 22-49002-3@student.aiub.edu
NAME: Adiba Tanzila **ID #:**22-49012-3 **PROGRAM:** CSE **EMAIL:** 22-49012-3@student.aiub.edu	**NAME**: MD.Rakib Hasan **ID #:**22-49029-3 **PROGRAM:** CSE **EMAIL:** 22-49029-3@student.aiub.edu
NAME: Md.Imdadul Hasan(Ayon) **ID #:**22-49959-3 **PROGRAM:** CSE **EMAIL:** 22-49959-3@student.aiub.edu	

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REMARKS (for OFFICE use only)

Course Name:	Microprocessor and Embedded System	**Course Code:**	EEE 4103
Semester:	Spring 2024-2025	**Sec:**	R
Faculty Member:	Prof. Dr. Engr. Muhibul Haque Bhuyan		

Capstone Project Title:	Arduino Based Remote-Controlled Pesticide Sprayer Car
Project Group No.	5

Sl #	Student ID #	Student Name	Obtained Marks
1.	22-48990-3	Shahriar Hossain	
2.	22-49002-3	Al Mubtasim	
3.	22-49012-3	Adiba Tanzila	
4.	22-49029-3	MD.Rakib Hasan	
5.	22-49959-3	Md.Imdadul Hasan(Ayon)	

Assessment Materials and Marks Allocation:

COs	Assessment Materials	POIs	Marks
CO3	Course Capstone Proposal Form	P.c.2.C6	30

Assessment Rubrics:

KPIs	Excellent [2]	Proficient [1.5]	Good [1]	Acceptable [0.5]	Unacceptable [0]	No Response [0]	Secured Marks
Project Title	The title reflects an issue related to complex engineering problems showing targets and methods with possible outcomes.	The title reflects an issue related to complex engineering problems showing targets and methods but some missing issues.	The title reflects an issue related to the course capstone project but there may be some missing issues.	The title reflects an issue related to the course capstone project but is not complete or specific.	The title does not reflect any issues related to the course capstone project.	No Response at all/ copied from others /identical submissions with gross errors/ image file printed	
Comments						**Total Marks (2)**	

KPIs	Excellent [6-7]	Proficient [4-5]	Good [3]	Acceptable [2]	Unacceptable [1]	No Response [0]	Secured Marks
Survey	The survey developed as a process for complex engineering problems considering cultural and societal factors have superior variables, targets, measures, and the implementation process is clear and challenging for future project implementation	The survey developed as a process for complex engineering problems considering cultural and societal factors has good variables, targets, measures, and The implementation process is clear and challenging for future	The survey developed as a process for complex engineering problems considering cultural and societal factors has moderate variables, targets, measures, and The implementation process is clear and challenging for future	The survey developed as a process for complex engineering problems considering cultural and societal factors has good variables, targets, measures, and The implementation process is somewhat clear for future project	The survey developed as a process for complex engineering problems considering cultural and societal factors has poor variables, targets, measures, and the implementation process is very unclear for future project	No Response at all/ copied from others /identical submissions with gross errors/	

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	with several possible outcomes having good impacts.	project implementation, with some possible outcomes and little impact.	project implementation, with a few possible outcomes and impacts.	implementation, with very few possible outcomes and little impact.	implementation with a few possible outcomes but no impacts.	image file printed	
Comments						**Total Marks (7)**	
KPIs	Excellent [4]	Proficient [3]	Good [2]	Acceptable [1]	Unacceptable [0.5]	No Response [0]	Secured Marks
Aims and Objectives	Aims and objectives are written to solve complex engineering problems considering cultural and societal factors with specific targets, measurement, and implementation processes that are clear and challenging and have several possible outcomes having very good impacts.	Aims and objectives are written to solve complex engineering problems considering cultural and societal factors with general targets, measurement, and implementation processes that are not clear and challenging and have some possible outcomes having good impacts.	Aims and objectives are written to solve complex engineering problems considering a few cultural and societal factors with narrow targets; measurement, and implementation processes are clear and challenging and have a few possible outcomes having some impacts.	Aims and objectives are written to solve complex engineering problems considering cultural or societal factors with a very target; measurement and implementation processes are not clear or challenging and have little possible outcome having no impact.	Aims and objectives are written to solve complex engineering problems but do not consider cultural and societal factors with any targets; measurement, and implementation processes are not clear and challenging, and no possible outcomes have no impacts.	No Response at all/ copied from others /identical submissions with gross errors/ image file printed	
Comments						**Total Marks (4)**	

KPIs	Excellent [5]	Proficient [4]	Good [3]	Acceptable [2]	Unacceptable [1]	No Response [0]	Secured Marks
Literature Review	Specific formats are maintained to review and cite the literature with recent publications. Identified and analyzed the problem correctly.	Specific formats are maintained to review and cite the literature with recent publications. Identified and analyzed the problem correctly, but all issues were not addressed with relevant or intended work.	Specific formats are maintained to review and cite the literature with recent and past publications. Identified and analyzed the problem correctly, but all issues were not addressed with relevant or intended work.	Specific formats are maintained to review and cite the literature with recent and past publications. Identified but could not analyze all the problems correctly, and all issues were not addressed with relevant or intended work.	No specific formats are maintained to review and cite the literature with recent publications. Could not identify and analyze all the problems correctly, and all issues are not addressed with relevant or intended work at all.	No Response at all/ copied from others/ identical submissions with gross errors/ image file printed	
Comments						**Total Marks (5)**	

KPIs	Excellent [5]	Proficient [4]	Good [3]	Acceptable [2]	Unacceptable [1]	No Response [0]	Secured Marks
Experimental Block Diagram	The block diagram is drawn to show the connections of all the possible components or sub-systems to show their interdependence with all possible flows of signals from inputs to outputs.	The block diagram is drawn to show the connections of all of the possible components or sub-systems to show their interdependence with a few missing flows of signals from inputs to outputs.	The block diagram is drawn to show the connections of most of the possible components or sub-systems to show their interdependence with a few missing flows of signals from inputs to outputs.	The block diagram is drawn to show the connections of a few possible components or sub-systems to show their interdependence with some missing flow of signals from inputs to outputs.	The block diagram is not drawn to show the connections of all possible components or sub-systems to show their interdependence and flow of signals from inputs to outputs.	No Response at all/ copied from others /identical submissions with gross errors/ image file printed	
Comments						**Total Marks (5)**	

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KPIs	Excellent [4]	Proficient [3]	Good [2]	Acceptable [1]	Unacceptable [0.5]	No Response [0]	Secured Marks
Possible Outcomes	Outcomes are written to achieve complex engineering problems' solutions considering cultural and societal factors and showing measurement, and implementation processes to attain the outcomes with all possible impacts.	Outcomes are written to achieve complex engineering problems' solutions considering cultural and societal factors and showing measurement, and implementation processes to attain the outcomes with some impacts.	Outcomes are written to achieve complex engineering problems' solutions considering cultural and societal factors and do not show measurement, and implementation processes to attain the outcomes without showing any impacts.	Outcomes are written to achieve complex engineering problems' solutions but do not consider cultural and societal factors and do not show measurement, and implementation processes to attain the outcomes without showing any impacts.	Outcomes are not written to achieve complex engineering problems' solutions do not consider cultural and societal factors and do not show measurement, and implementation processes to attain the outcomes without showing any impacts.	No Response at all/ copied from others /identical submissions with gross errors/ image file printed	
Comments						**Total Marks (4)**	

KPIs	Excellent [5]	Proficient [4]	Good [3]	Acceptable [2]	Unacceptable [1]	No Response [0]	Secured Marks
Gantt Chart	Specific formats are maintained to draw the Gantt chart and there is the order of workflow with all work to be done.	Specific formats are maintained to draw the Gantt chart and there is the order of workflow with a few works missing.	Specific formats are maintained to draw the Gantt chart and there is the order of workflow with some works missing.	No specific formats are maintained to draw the Gantt chart and there is little order of workflow with some works missing.	No specific formats are maintained to draw the Gantt chart and there is no order of workflow with the most important works missing.	No Response at all/ copied from others/ identical submissions with gross errors/ image file printed	
Comments						**Total Marks (5)**	

KPIs	Excellent [3]	Proficient [2.5]	Good [2]	Acceptable [1]	Unacceptable [0.5]	No Response [0]	Secured Marks
References	Specific formats are maintained to write references, and all are recently published journal and conference papers having no missing information.	Specific formats are maintained to write the references, and all are journal and conference papers, but some old papers have missing information.	No specific formats are maintained to write the references, and many are internet sources with several missing information and very old references.	No specific formats are maintained to write the references and most of them are internet sources with missing information.	No specific formats are maintained to write the references, and all are internet sources with missing information.	No Response at all/ copied from others /identical submissions with gross errors/ image file printed	
Comments						**Total Marks (3)**	

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