INDUSTRIAL INTERNSHIP REPORT

TITLE OF THE PROJECT

UGV-SAATHI

Submitted in partial fulfillment of the

Requirements for the award of

Degree of

B.Tech CSE

Submitted By

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B.Tech CSE (3rd SEM)

Submitted To

GSFC University, Vadodara

Internship Institution: **GUIITAR COUNCIL**

Internship Period: 01/12/2025 to 31/12/2025

Date of Report Submission: **31/12/2025**

DECLARATION

I hereby declare that the Industrial Internship Report entitled **"UGV (Unmanned Ground Vehicle)"** is an authentic record of my own work carried out as a requirement of the **Industrial Internship** during the period from **01/12/2025 to 31/12/2025** for the award of the degree **B.Tech CSE** at **GSFC University, Vadodara**, under the guidance of **Mr.Yatharth Bhatt**.

(Signature of student)

Vishva Haresh Zala
24BT04183

Date :-

CERTIFICATE

ACKNOWLEDGEMENT

I want to express my heartfelt thanks to everyone who supported and guided me during my winter internship project titled:

“UGV – Unmanned Ground Vehicle”

First, I am very grateful to GUIITAR COUNCIL for giving me the chance to do this internship as part of my academic program.

I also want to thank my project mentors and faculty guides for their encouragement, valuable insights, and technical support throughout the project. Their feedback helped me stay focused and improve the robot's functionality at every level.

I appreciate my team members and peers for their collaboration, support, and hard work during brainstorming, development, testing, and presentation phases.

A special thanks goes to the technical staff and lab assistants for their help with equipment, components, and workspace needs.

Finally, I want to thank my family and friends for their ongoing motivation and trust in my work.

This project has been a valuable learning experience and has improved my practical understanding of embedded systems, IoT integration, and real-world robotics applications. I have contributed to the design, development, testing, and documentation of the project with the guidance of my mentors.

Thank you.

Vishva Haresh Zala

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INTRODUCTION

1.1 About the Internship

The summer internship program is an essential component of engineering education, bridging the gap between theoretical knowledge and practical industrial experience. As part of this program, I completed a **4-week internship** from **1st December to 31st December**, focused on the design, development, and testing of an **Unmanned Ground Vehicle (UGV)**.

The internship involved hands-on work in **mechanical assembly, electronics integration, motor control, wiring, and system testing**. It provided comprehensive exposure to practical engineering challenges, including structural stability, power management, motion control, and troubleshooting in real-world conditions.

1.2 Project Title

UGV – Unmanned Ground Vehicle

1.3 Objective of the Project

The primary goal of this project was to design and develop a **functional, remote-controlled UGV prototype** capable of demonstrating core robotic principles, reliable movement, and stable operation. Specific objectives included:

- Designing a **structurally stable chassis** to support motors and electronics.
- Integrating **hub and stepper motors** for propulsion and precise motion control.
- Implementing **manual remote control** for basic navigation.
- Testing and validating system performance under real operational conditions.
- Understanding practical challenges in hardware-based robotic systems, such as power distribution, motor alignment, and load handling.

The project aimed to provide hands-on exposure to **engineering problem-solving**, system integration, and testing workflows, forming a foundation for more advanced robotics projects.

1.4 Problem Statement

Traditional robotics and unmanned systems often focus on **autonomous or highly automated vehicles**, which require advanced sensors, microcontrollers, and complex programming. For a student-level project, there is a need to:

- Build a **cost-effective, reliable, and functional UGV** without relying on complex microcontrollers or wireless modules.
- Understand **hardware limitations**, such as chassis stability, motor torque, and power supply management.
- Gain practical experience in **component integration, troubleshooting, and system testing**.

The challenge was to develop a **prototype that demonstrates mobility and control principles** while providing meaningful learning in hardware-based robotics.

1.5 Relevance to Industry and Society

The UGV prototype, although simple, is highly relevant to real-world applications:

- **Industrial inspection:** Can traverse hazardous areas for routine checks or maintenance.
- **Surveillance and monitoring:** Offers a platform for remote observation in risky or inaccessible zones.
- **Education and research:** Serves as a learning platform for robotics, control systems, and mechanical design.

This project combines **mechanical design, motor integration, and practical system testing** to create a foundation for future unmanned ground systems. It also provides valuable experience in **hardware assembly, motor control, system integration, and troubleshooting**, all of which are critical skills for robotics engineering.

Technologies used:

Hardware:

-Arduino UNO R4

-ESP32

-Raspberry Pi

-Li-ion battery

-Webcam

-Motor Driver

Software & Platforms:

-Arduino IDE

-Canva

-Squarespace

-ChatGPT

Fabrication Tools:

-Laser cutting

-3D Design

-Metal chassis welding

PROJECT DESCRIPTION

1.1 Introduction to Unmanned Ground Vehicle (UGV)

An Unmanned Ground Vehicle (UGV) is a robotic system designed to operate on land without a human onboard. UGVs are capable of performing various tasks either through remote control or autonomous operation. These systems utilize sensors, motors, controllers, and communication modules to navigate and perform assigned functions efficiently.

UGVs are increasingly used in applications such as military surveillance, border security, disaster management, agriculture, industrial inspection, and hazardous environment operations. By eliminating the need for human presence in dangerous areas, UGVs significantly enhance safety, reliability, and operational efficiency.

The UGV developed during this internship was a remote-controlled working prototype designed to demonstrate fundamental principles of robotics, motion control, and wireless communication. The project focused on achieving reliable movement control, stable operation, and successful testing under real conditions.

1.2 Need for Hardware-Based Engineering Projects

Hardware-based projects play an essential role in engineering education as they provide hands-on exposure to real systems. Unlike simulation-based learning, hardware projects involve real components, real constraints, and real-world challenges such as power limitations, signal noise, mechanical stability, and system failures.
The UGV project addressed these challenges by involving:

- Physical assembly of components
- Electrical wiring and power management
- Motor control and movement testing
- Wireless communication verification
- System troubleshooting and optimization

By working on a hardware project that was successfully tested and verified, students gained confidence in handling real engineering systems and understanding the practical limitations of theoretical designs.

1.3 Objectives of the Internship and UGV Project

The primary objectives of the internship and UGV project were:

- To design and develop a working Unmanned Ground Vehicle prototype
- To integrate hardware components such as motors, motor drivers, microcontroller, and power supply
- To implement wireless control for remote operation
- To perform systematic testing and validation of the hardware system
- To understand real-time motor control and movement coordination
- To develop teamwork, documentation, and professional engineering practices
- All objectives were successfully achieved, resulting in a fully functional and tested UGV prototype.

1.4 Scope of Work

The scope of the internship and project covered multiple technical domains:

- Mechanical Design: Structural design and chassis assembly of the UGV
- Electronics: Selection and wiring of motors, motor driver, microcontroller, and power supply
- Control System: Implementation of remote control and movement logic
- Testing: Verification of movement, control response, and system stability
- Documentation: Preparation of technical documentation, posters, and reports

This wide scope ensured holistic exposure to practical engineering development.

1.5 Learning Outcomes

Through this internship and UGV project, the following learning outcomes were achieved:

- Practical understanding of robotic systems and UGV architecture
- Hands-on experience in hardware assembly and wiring
- Improved troubleshooting and testing skills
- Understanding of real-time control and system integration
- Enhanced teamwork, communication, and professional discipline

The successful testing and operation of the UGV validated the effectiveness of the learning process.

WORK RESPONSIBILITIES AND CONTRIBUTION

I was responsible for the Web Development, UI Designing, and Database Integration for the UGV SAATHI project, focusing on creating a platform to market the project and interact with potential customers. My key contributions included:

Website Design and UI/UX:

Developed a professional, user-friendly website showcasing UGV SAATHI's features, applications, and capabilities.

Designed attractive layouts and interactive elements to engage visitors and highlight key functionalities.

Frontend Development:

Implemented the website using HTML, CSS, and JavaScript, ensuring responsive design across devices.

Integrated interactive sections such as project demos, feature descriptions, and contact forms for customer inquiries.

Backend and Database Management:

Created a database to manage customer queries and feedback submitted through the website.

Enabled efficient data storage and retrieval for lead management and communication purposes.

Customer Interaction Features:

Developed contact forms, subscription forms, and enquiry submission systems to connect with potential clients.

Implemented interactive demo sections to give visitors a better understanding of UGV SAATHI's capabilities.

Testing and Optimization:

Ensured website responsiveness, fast loading times, and cross-browser compatibility. Tested all interactive features to ensure smooth operation and seamless user experience.

Outcome:

The website effectively promotes UGV SAATHI, provides detailed information to potential customers, and enables direct interaction for queries, feedback, and business opportunities, making it a key tool for marketing and outreach.

REVIEW

3.1 Literature Review

A literature review examines previous research, existing systems, and technological advancements related to a project domain. For **Unmanned Ground Vehicles (UGVs)**, numerous studies have been conducted to enhance mobility, control, communication, and operational safety. Reviewing this literature helps identify effective design strategies, common hardware components, applications, and limitations in existing UGV systems.

3.1.1 Overview of Existing Research

- Early research on UGVs focused on **remote-controlled vehicles** for basic tasks like surveillance or exploration.
- With advances in embedded systems, robotics, and wireless communication, UGVs evolved into **semi-autonomous and fully autonomous platforms** capable of complex operations.
- Studies emphasize the importance of **motor control, power management, sensor integration, and communication protocols** for reliable performance.
- Research on UGVs in hazardous environments, agriculture, and industrial inspection demonstrates the practical utility and versatility of these systems.

3.1.2 Key Insights from Literature

1. **Motor Control Strategies:** Efficient control of DC, stepper, and hub motors is critical for stability and accurate movement.
2. **Chassis Design:** Frame structure directly affects load-bearing capacity and terrain adaptability. Triangular, rectangular, and tracked designs are commonly studied.
3. **Control Systems:** Wireless, remote, and autonomous control mechanisms are explored, highlighting trade-offs between simplicity and sophistication.
4. **Sensor Integration:** Cameras, ultrasonic sensors, and LiDAR improve environmental awareness and navigation accuracy.

5. **Challenges:** Common challenges include limited battery life, terrain constraints, communication range, and high costs for advanced systems.

3.1.3 Applications Highlighted in Literature

- **Military & Defence:** Bomb disposal, reconnaissance, and surveillance.
- **Disaster Response:** Search and rescue in earthquake, fire, or flood zones.
- **Agriculture:** Automated planting, crop monitoring, and spraying.
- **Industrial Inspection:** Monitoring pipelines, plants, and hazardous sites.

The literature review provides a **comprehensive understanding of UGV systems**, informing design choices and ensuring the project avoids common pitfalls.

SYSTEM OVERVIEW AND BLOCK DIAGRAM

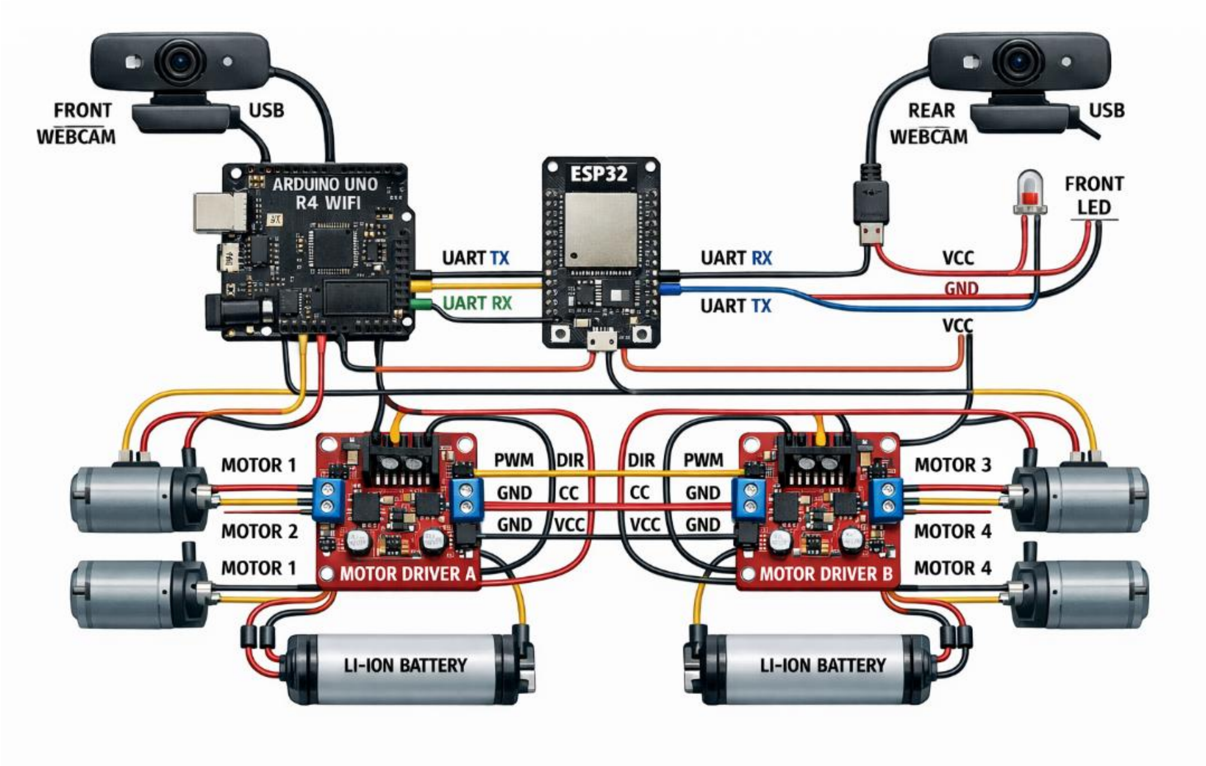
4.1 Overall System Architecture

The Unmanned Ground Vehicle (UGV) system is designed using multiple hardware and control blocks that work together to achieve smooth and reliable movement. The system consists of a power supply unit, microcontroller, motor driver, DC motors, wireless communication module, and sensors. Each block performs a specific function and is interconnected to ensure proper operation of the vehicle.

The architecture follows a modular design approach, which makes the system easy to understand, assemble, and maintain.

4.2 Block Diagram Description

The block diagram represents the functional structure of the UGV system. It shows the flow of power and control signals between different components.



The main blocks of the system include:

- Power Supply
- Motor Driver
- Geared Motors

The power supply provides electrical energy to all blocks. The motor driver controls the motors.

4.3 Power Supply System

The power supply system provides the required electrical energy to operate the UGV. A rechargeable battery is used as the primary power source. Voltage regulation is applied to ensure that each component receives the appropriate voltage level. A stable power supply is essential for reliable operation and to prevent damage to electronic components.

4.4 Motor Driver Module

The motor driver module is used to control the speed and direction of the DC motors. Since the microcontroller cannot directly drive motors due to current limitations, the motor driver acts as an interface between the controller and motors.

The motor driver allows:

- Direction control
- Speed regulation
- Safe motor operation

4.5 Geared Motors

Geared motors are used to convert electrical energy into mechanical motion. The motors drive the wheels of the UGV, enabling movement. By controlling the direction and speed of the motors, different vehicle movements are achieved.

The motors are mounted securely on the chassis to ensure stable and smooth motion.

4.6 Working Principle of the UGV

The working principle of the UGV is based on command reception and motor control. When a command is sent from the remote controller, it is received by the wireless communication module. The microcontroller processes the command and sends appropriate signals to the motor driver. The motor driver then controls the motors to move the vehicle in the desired direction.

This process continues continuously during operation, ensuring smooth and responsive control.

HARDWARE DESIGN AND COMPONENTS

5.1 Mechanical Structure and Chassis

The chassis is the main structural part of the Unmanned Ground Vehicle (UGV). It supports all hardware components such as motors, battery, controller, and sensors. The chassis is designed to be strong and lightweight to ensure stability and smooth movement. Proper mounting holes and alignment are provided to securely fix components and avoid vibration during operation.

5.2 DC Motors

DC motors are used to provide motion to the UGV. These motors convert electrical energy into mechanical energy and are connected to the wheels. By controlling the direction and speed of the motors, the vehicle can move forward, backward, and turn left or right.

The motors are selected based on torque and speed requirements to ensure proper movement of the UGV.

5.3 Motor Driver Module

The motor driver is used to control the DC motors. It acts as an interface between the microcontroller and the motors. Since the microcontroller cannot supply enough current to drive the motors directly, the motor driver amplifies the control signals.

The motor driver allows control of:

- Motor direction
- Motor speed
- Safe operation of motors

5.4 Power Supply System

The power supply system provides electrical energy to all components. A rechargeable battery is used as the main power source. Voltage regulation is applied to supply suitable voltage levels to the microcontroller, motor driver, and sensors.

A stable power supply ensures reliable operation and prevents damage to components.

5.5 Wiring and Hardware Integration

All hardware components are connected using proper wiring techniques. Secure connections are maintained to avoid loose contacts and short circuits. Proper cable routing is followed to ensure neat and reliable integration.

SOFTWARE AND CONTROL SYSTEM

6.1 Control System Architecture

The UGV's control system was designed to operate using **direct electrical and mechanical signals** rather than a microcontroller. The main components of the system include:

- **Motor driver circuitry:** Provides power to the motors and allows control of direction and speed using switches or relays.
- **Control switches:** Physical switches or buttons that send signals to the motor driver, determining the movement of the UGV.
- **Power source:** Batteries provide the required energy to the motors and the control system.

This architecture ensures that the UGV moves as per the operator's input, maintaining **reliable and stable operation** without the complexity of digital control systems.

6.2 Motor Control Logic

The UGV moves based on **direct electrical control** of the motors. The logic is implemented using **relays, switches, or simple circuits**, which dictate how the motors should operate:

- **Forward movement:** Both motors rotate forward, moving the UGV ahead.
- **Reverse movement:** Both motors rotate backward to move the UGV in reverse.
- **Left turn:** Right motor rotates forward while the left motor stops or rotates backward, pivoting the UGV to the left.
- **Right turn:** Left motor rotates forward while the right motor stops or rotates backward, pivoting the UGV to the right.
- **Stop:** Both motors are disconnected from the power source, halting all movement.

The **motor control logic** ensures precise direction and smooth operation using simple electronic control circuits.

6.3 Command Processing and Operation

Since no wireless module or microcontroller is used, all commands are **manually controlled**:

1. The operator uses switches or a remote wired controller to provide commands.
2. The control circuitry translates these signals into motor actions.
3. Motors operate in the required direction and speed according to the input.

This method allows **real-time control** without programming, relying entirely on the design of the motor driver circuits and manual inputs.

6.4 Software or Control Logic Approach

Even without a digital microcontroller, the system follows a **logical control structure**:

- **Initialization:** Ensuring all relays, switches, and power connections are correctly set before operation.
- **Command response:** Direct mapping of switch positions to motor movements.
- **Safety measures:** Circuits designed to stop motors in case of power failure or accidental input.

This approach makes the UGV **simple, reliable, and easy to maintain**.

6.5 Safety and Error Handling

Safety measures are implemented using **hardware-based solutions**:

- **Default stop:** If no switch is pressed or if a power interruption occurs, motors automatically stop.
- **Manual overrides:** Operator can immediately cut off power or deactivate motors using dedicated switches.
- **Circuit protection:** Fuses or resistors prevent damage to motors and circuits in case of short circuits.

These measures ensure safe operation without requiring software-based error handling.

6.6 Testing and Validation of Control System

Testing involved manual operation of the UGV by using the control switches:

- Forward and backward movements worked consistently.
- Left and right turns were smooth and responsive.
- The stop function worked immediately when switches were released or power was cut.

The testing confirmed that the **control logic and motor circuits** functioned correctly, making the UGV reliable for its intended operation.

IMPLEMENTATION, TESTING AND RESULTS

7.1 Hardware Assembly

The hardware assembly began with the fabrication of a **triangular metal frame**, which was intended to hold all components including motors and battery. Both the **hub motor** and the **stepper motor** were initially attached to this triangular structure.

- The **hub motor** was mounted to provide propulsion for the UGV.
- The **stepper motor** was positioned to control a mechanism requiring precise movement.

During initial testing, the triangular frame **proved to be structurally weak**, unable to bear the weight and torque from the motors. This failure highlighted the importance of **rigid and load-bearing chassis design**.

Following this observation, a **reinforced chassis** was implemented to replace the triangular structure, ensuring stability and proper alignment of all components.

7.2 Wiring and Integration

Wiring involved connecting the geared motors to the power supply and motor drivers:

• Geared motor wiring: Correct polarity and stable power supply ensured smooth and consistent operation.

• Power distribution: Batteries were connected to provide consistent voltage to all motors and drivers.

Proper cable management reduced electrical noise and prevented accidental disconnections during testing.

7.3 System Initialization

After wiring, the system was powered on, and individual geared motors were tested:

• The motors rotated correctly in both forward and reverse directions.

• Testing confirmed proper mounting and electrical connections, even though the initial triangular frame was structurally insufficient.

7.4 Testing Procedure

7.4.1 Motor Testing

- Each geared motor was tested separately to verify direction, speed, and load-handling capacity.
- Minor adjustments ensured alignment and stable operation.

7.4.2 Structural Validation

- The triangular frame was evaluated under full motor load.
- It failed to maintain stability and showed bending or deformation.
- This led to the design and fabrication of a **reinforced chassis**, which provided sufficient support for hub and stepper motors.

7.4.3 Integrated System Testing

- After moving the motors to the reinforced chassis, full system testing was performed.
- The UGV executed forward, reverse, left, right, and stop commands accurately.

- Geared motors enabled precise and controlled movement for mechanisms requiring accurate positioning.

7.5 Results and Observations

- Geared motors provided smooth and powerful propulsion.
- The triangular frame was insufficient to support motor weight, while the reinforced chassis ensured stability.
- Electrical connections remained stable during operation.

7.6 Performance Analysis

- **Response time:** Immediate response to control inputs.
- **Movement stability:** Improved with the reinforced chassis, reducing vibrations.
- **Control accuracy:** Stepper motors allowed precise motion for mechanisms.
- **Load handling:** Hub motors could handle UGV weight without issue after moving to the reinforced frame.

7.7 Final Working Prototype

The final UGV prototype included:

- **Reinforced chassis** replacing the triangular frame.
- **Geared motors** for propulsion and controlled movement.
- Motor assemblies for precise operation of mechanisms.

Testing confirmed the UGV's reliability, stability, and correct motor functionality. The experience provided valuable hands-on learning in:

- Understanding the **limitations of a triangular structure** for load-bearing applications.
- Mounting and integrating **geared motors** within a UGV system.
- Designing and testing a **stable chassis** to support all components effectively.

APPLICATIONS AND FUTURE SCOPE

8.1 Military and Defence Applications

Unmanned Ground Vehicles (UGVs) play a crucial role in modern military operations. They are widely used for:

- **Surveillance and reconnaissance:** UGVs can be deployed in dangerous zones to monitor enemy movements or gather intelligence without risking human lives.
- **Bomb disposal and mine detection:** Equipped with robotic arms or sensors, UGVs can safely handle explosive devices and reduce casualties.
- **Logistical support:** UGVs can transport supplies, ammunition, or medical equipment in combat zones.

The developed UGV prototype demonstrates **basic motion control and stability**, which are fundamental for military applications. With additional payload capacity and sensor integration, it could be adapted for defense-related tasks.

8.2 Border Security and Surveillance

UGVs can be used in **border monitoring** and **restricted areas surveillance**:

- **Remote monitoring:** Equipped with cameras and sensors, UGVs can transmit real-time video feeds to security personnel.
- **Patrolling hazardous areas:** They can cover difficult terrains or areas with environmental hazards, reducing human risk.
- **Integration with alert systems:** Sensors can detect intrusions, motion, or environmental changes, and alert authorities immediately.

The prototype's controlled movement provides a foundation for developing automated border patrolling systems.

8.3 Search and Rescue Operations

In disaster scenarios such as **earthquakes, floods, industrial accidents, or fires**, UGVs can assist in:

- **Navigating dangerous areas:** Reaching places that are unsafe for humans.
- **Locating survivors:** Using sensors or cameras to detect trapped individuals.
- **Transporting emergency supplies:** Carrying water, medicine, or first-aid kits to affected areas.

Enhancing the UGV with **sensor arrays, cameras, and communication modules** would make it more effective in rescue missions.

8.4 Agricultural Applications

UGVs are increasingly applied in agriculture for tasks such as:

- **Crop monitoring:** Using cameras and sensors to assess crop health and growth.

By incorporating environmental sensors and automation, the UGV could help reduce labor costs and increase productivity.

8.5 Industrial Inspection and Maintenance

UGVs are valuable in industrial sectors for inspection and maintenance tasks:

- **Facility inspection:** Monitoring pipelines, storage tanks, and high-risk areas without human exposure.

The prototype UGV can be enhanced with **industrial sensors, robotic arms, and autonomous navigation** to increase operational efficiency.

8.6 Disaster Management

UGVs can play a significant role in disaster management by:

- **Providing situational awareness:** Capturing images and videos of disaster-affected areas.
- **Damage assessment:** Collecting data to help plan rescue and recovery operations.

The controlled motion and stability of the prototype serve as a base for developing advanced disaster management vehicles.

8.7 Future Scope of the Project

Several enhancements can significantly improve the functionality and usability of the UGV:

1. **Integration of cameras for live video streaming:** Enables remote monitoring and real-time feedback.
2. **Addition of GPS for location tracking:** Helps in navigation and automated route planning.
3. **Implementation of autonomous navigation:** Using path-planning algorithms to move without constant human control.
4. **Use of advanced sensors for obstacle detection:** Ultrasonic, LiDAR, or IR sensors to avoid collisions.
5. **AI-based decision-making:** Enabling the UGV to make smart decisions in dynamic environments.
6. **Enhanced payload capacity:** Allowing transport of heavier tools or supplies.
7. **Modular design:** Making it easy to attach different sensors, robotic arms, or specialized tools depending on the application.
8. **Energy-efficient systems:** Optimizing battery life for longer operation in the field.

With these enhancements, the UGV can be transformed from a basic prototype into a **fully functional, multi-purpose unmanned vehicle** suitable for military, industrial, agricultural, and disaster management applications.

INTERNSHIP ACTIVITIES

YUKTI Presentation Visit – Rajkot

As part of the internship activities, a visit was made to **Rajkot** to attend the **YUKTI Presentation**, where innovative student projects were showcased. During this event, our project was presented, and valuable feedback was received from mentors and evaluators. The presentation provided exposure to real-world project evaluation, improved presentation and communication skills, and helped in understanding how technical ideas are represented at a professional level. The visit also offered an opportunity to observe other innovative projects and gain inspiration for future improvements.

Microsoft C# Course Participation

During the internship period, a **Microsoft C# programming course** was successfully completed. The course covered fundamental programming concepts such as variables, data types, conditional statements, loops, and object-oriented programming principles. Practical coding exercises helped strengthen logical thinking and problem-solving skills. This course enhanced understanding of software development and provided a strong foundation for future programming and application development tasks.


freeCodeCamp(🔥) Microsoft

This certifies that

Vishva Zala

successfully completed the

Foundational C# with Microsoft

Developer Certification on December 30, 2025

Quincy Larson
Executive Director, freeCodeCamp.org

Julia Liuson
President, Microsoft Developer Division

Verify this certification at:
https://freecodecamp.org/certification/fcc-56978002-e02f-4ece-b774-c28b6c8cf16f/foundational-c-sharp-with-microsoft

CONCLUSION

The internship at GUIITAR Council was a valuable and enriching experience that effectively bridged the gap between theoretical knowledge and practical application. The primary objective of gaining hands-on exposure to real-world engineering practices was successfully achieved through active involvement in software development, hardware integration, website design, and the development of an Unmanned Ground Vehicle (UGV).

During the internship, significant learning was gained in Microsoft C# programming, strengthening object-oriented programming concepts, logical thinking, and problem-solving skills. Designing and publishing a website further enhanced practical knowledge of web technologies such as HTML and CSS, along with real-time project planning and deployment.

The UGV project was a key highlight, providing multidisciplinary exposure to electronics, motor control, wireless communication, and system testing. This project demonstrated the real-world applications of UGVs in areas such as surveillance, defence, agriculture, and disaster management.

In addition to technical skills, the internship helped develop important soft skills including teamwork, communication, time management, and professional ethics. Overall, the internship at GUIITAR Council was a well-structured learning experience that strengthened both technical and professional competencies and will be beneficial for future academic and career growth.