Lokmanya Tilak Jankalyan Shikshan Sanstha's
PRIYADARSHINI BHAGWATI COLLEGE OF ENGINEERING
Harpur Nagar, Umred Road (Near Bada Tajbagh), Nagpur-24
(Approved by AICTE, New Delhi, Govt. of Maharashtra
and affiliated to Rashtrasant Tukdoji Maharaj Nagpur University)
Email: principalpbcoe@gmail.com, Website: www.pbcoe.edu.in
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3.2.2 Grants received from Government and non-governmental agencies for research projects / endowments in the institution during the last five years (INR in Lakhs)

ACADEMIC YEAR 2022-2023						
Sr. No.	**Name of the research project/ endowment**	**Name of the Principal Investigator/ Co-investigator**	**Department of Principal Investigator**	**Amount Sanctioned**	**Duration of the project**	**Name of the Funding Agency**
1	Design and Fabrication of Fire Fighting Robot	Dr. S. P. Daf	Mechanical	0.45 L	6 Month	Aeroflutter Techlabs

Certified documents from page no. 01 to 19

NITIN KRISHNARAO CHOUDHARI
Digitally signed by NITIN KRISHNARAO CHOUDHARI
Date: 2023.12.12 12:03:18 +05'30'

Principal

Lokmanya Tilak Jankalyan Shikshan Sanstha's
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Ref: PBCOE/2022-23/321

23/07/2022

To,
The CEO,
Aeroflutter Techlabs,
Nagpur.

Sub: Research Project- Proposal for a joint work on your industrial problems.
Greetings from Priyadarshini Bhagwati College of Engineering, Nagpur
Dear Sir,

It gives us immense pleasure to introduce ourselves as a premier Engineering College in Nagpur, imparting quality Engineering Education. We are offering five fulltime B. Tech degree programs and two post graduate programs affiliated to the RTMNU, Nagpur University and recognized by AICTE, New Delhi.

We know that you are a pioneer in the field of manufacturing high quality Drone and Robots to the needs of all types of industries a well-known company with modern equipment's for manufacturing of Drone and Robots.

To strengthen Institute-Industry partnership, we offer a research Activity in various areas of the Industries. Our faculty members are specialized in their field and have adequate knowledge to address and solve the problems arising in Industries. We also have state of the art modern infrastructure in our laboratories/workshops
primarily to focus on academic needs of our students. And these facilities can be used up for design, drawing, conduct experiments, testing and can be extended up to validation etc,

Also we believe when theory and practice go hand in hand, many of the challenges faced by industries could be solved to achieve better results. In this regard, we would like to have a discussion with you and work on areas where we could jointly work together.

With regards,

Dr. N. K. Choudhary
Principal

Principal
Priyadarshini Bhagwati College of Eng
Umred Road, Nagpur.

Aeroflutter Techlabs

40, Dhanvantari nagar,
Umred Road, Nagpur-440009
www.aeroflutter.com

Phone no.: +918087805452
Email: aeroflutter@gmail.com

AFT/NAG-HR/22-23 / 121

Date: 02/08/2022

To
The Principal,
Priyadarshini Bhagwati College of Engineering,
Nagpur.

Sub: Our approval for your offer of Research works.

Ref: i) Your willingness/offer letter Ref: PBCOE/2022-23/321 dated on 23/07/2022
ii) Our Telephonic discussions

Dear Sir,

In continuation with your offer of research works and further discussion over phone by representatives of both the parties in the reference cited, we are happy to offer our partnership in carrying out the new product development of manufacture of **"Design and fabrication of Fire Fighting Robot"** as a part of research activities.

As we have been in this field of manufacturing and provide a service of Robots and Drone for many years, some of our clients require Fire Fighting Robot, We will be happy if you propose a project from design to complete manufacture of Fire Fighting Robot with our existing facility.

Kindly give us your consent on this at the earliest so we can further decide on the modalities of this work. We suggest you to go ahead on this project and if necessary, we are willing to attend meetings arranged by you to give technical inputs.

Also please note that your team can come and access our manufacturing, testing facilities on all working days with a prior intimation for collecting data.

Kindly inform us the schedule of meetings in advance so that we can depute our representatives to take part and give required inputs.

Thanking You.

Bhagat

Proprietor

AEROFLUTTER TECHLAB

PROPRIETOR

Lokmanya Tilak Jankalyan Shikshan Sanstha's
PRIYADARSHINI BHAGWATI COLLEGE OF ENGINEERING
Harpur Nagar, Umred Road (Near Bada Tajbagh), Nagpur-24
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06/08/2022

From

The Principal,
Priyadarshini Bhagwati College of Engineering,
Nagpur.

To,
Department of Mechanical Engineering,
Priyadarshini Bhagwati College of Engineering,
Nagpur.

Dear Sir,
Sub: Allotting of Research work to your department.

Herewith I am pleased to assign the research work- Design and Fabrication of Fire Fighting Robot. of M/s Aeroflutter Techlabs, Nagpur who has taken interest in offering their project work to us.

I am directing this to depute project coordinators to work on this and I wish you to successfully complete the project.

Please note the terms and conditions regarding technical and commercial part of implementation of this project.

Kindly prepare a schedule and implement this project work.

Thanking You

PRINCIPAL
Principal
Priyadarshini Bhagwati College of Engg
Umred Road Nagpur.

Lokmanya Tilak Jankalyan Shikshan Sanstha's
PRIYADARSHINI BHAGWATI COLLEGE OF ENGINEERING
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DEPARTMENT OF MECHANICAL ENGINEERING

07/08/2022

SUBMITTED TO THE PRINCIPAL

Sub: Allotting of Research work.

The following research work has been allotted to our department.
The title of the research work: **Design and Fabrication of Fire Fighting Robot**
Duration of the work: **6 months**
The following staff member have been deputed for this research work:

Name: **Dr. Shailendra P. Daf**
Designation: **Assistant Professor**
Mobile: **9665087710**
Department: **Mechanical Engineering**
Email Id: **Shailu_daf@rediffmail.com**

HoD/Mechanical

Head
Mechanical Engg. Deptt.
Priyadarshini Bhagwati College of Engg.
Umred Road, Nagpur.

Copy to
i) Principal
ii)Dean Academic
iii) Department file
iv) Individuals

Lokmanya Tilak Jankalyan Shikshan Sanstha's
PRIYADARSHINI BHAGWATI COLLEGE OF ENGINEERING
Harpur Nagar, Umred Road (Near Bada Tajbagh), Nagpur-24
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Ref: PBCoE/2022-23/333

10/08/2022

To
The CEO,
M/s Aeroflutter Techlabs,
Nagpur.

Dear Sir,
Sub: Research work .

We would like to submit a feasibility report for your consideration based on our discussion about **Design and Fabrication of Fire Fighting Robot**. The feasibility study includes industry-level technical and implementation concepts.

Sr. No.	Name of Project	Cost (Rs)	Duration
01	**Design and Fabrication of Fire Fighting Robot**	45000/-	6 Month

Terms and Conditions:

- All the necessary components should be provided by the M/s Aeroflutter Techlabs, Nagpur for Research work
- If a field visit is necessary, M/s Aeroflutter Techlabs must organize it.
- It will be possible to modify and revise the design in the future.
- Payment can be issued after the results have been obtained to the satisfaction of the engineers of M/s Aeroflutter Techlabs.

Please contact us if you require any more information.
Thanking You!

PRINCIPAL

Principal
Priyadarshini Bhagwati College of Engg.
Umred Road, Nagpur

A. Project Detail:

Title of Project: **Design and Fabrication of Fire Fighting Robot**		
Types of Client Organization	Government/ Non-Government	Non-Government (Private)
Types of Work	Research Work / Consultancy Work	Research Work
Nature of work	New product/ Process development/Testing and Interpretation/ Design Checking	New Product

B. Investigator Details

Particulars	**Investigator Detail**
Name	Dr. Shailendra P. Daf
Designation	Assistance Professor
Mobile	9665087710
Department	Mechanical Engineering
Email	Shailu_daf@rediffmail.com

C. Client Details

Client Detail	
Company Name	M/s Aeroflutter Techlabs, Nagpur
Name of Contact Person	Mr. Ankit Bhagat
Designation	Director, Aeroflutter Club
Mobile	8087805452
Email	aeroflutter@gmail.com

D. Time Schedule

Academic Year	**Month**	**Year of Starting**	**Date (From -To)**
2022-2023	**August**	**2022**	**10/08/2022 to 10/01/2023**

E. Payment Details

Payment Details (To be Filled Accounts Department)	
Total Value of Work (in Rs)	**45000**
Payment Terms/MoU/Agreements	**Agreements**
Advance Payment (If any)	**Nil**
Mode of Payment	**Cheque/NEFT**

F. Scope of the Research work

Keep Life Safe:- As a lifeless robot, fire fighting robot can fully play their role in various dangerous and complex environment such as high temperatures ,toxic, hypoxia and greatly reduce the casualties of firefighters

AGREEMENT BETWEEN CLIENT AND PRIYADARSHINI BHAGWATI COLLEGE OF ENGINEERING, NAGPUR.

The above schedule/terms and conditions have been mutually agreed by both the parties, and have been signed in the presence of witness.

AEROFLUTTER TECHL...

Signature of the Client

PROPRIETOR

Priyadarshini Bhagwati college of Engineering, Nagpur.

Principal

Principal
Priyadarshini Bhagwati College of Engg.

Witness:

Head
Mechanical Engg. Deptt.
Priyadarshini Bhagwati College of Engg
Umred Road, Nagpur.

1. Mr. S. M. Pimpalgaonkar

2. Dr. Shailendra P. Daf

Assistant Professor
Priyadarshini Bhagwati College
of Engineering, Nagpur.

Aeroflutter Techlabs
40, Dhanvantari nagar,
Umred Road, Nagpur-440009
www.aeroflutter.com

Phone no.:+918087805452
Email: aeroflutter@gmail.com

AFT/NAG-HR/22-23 | 138

Date: 13/08/2022

To

The Principal,

Priyadarshini Bhagwati College of Engineering,

Nagpur, Maharastra

Subject: Sanction Letter of Research Grant for Project entitled- "Design and Fabrication of Fire Fighting Robot"

Dear Sir,

I am writing to officially notify you that Aeroflutter Techlabs, Nagpur, is pleased to approve and sanction the Grant for Research Project titled "Design and Fabrication of Fire Fighting Robot" proposed by your esteemed institution, Priyadarshini Bhagwati College of Engineering.

This project aligns with our commitment to supporting innovative and cutting-edge research in the field of robotics and fire safety. We believe that the collaboration between Aeroflutter Techlabs and Priyadarshini Bhagwati College of Engineering will contribute significantly to advancements in technology and will provide valuable insights into the development of firefighting solutions.

Key Project Details:

Project Title: Design and Fabrication of Fire Fighting Robot

Principal Investigator: Dr. Shailendra P. Daf

Duration: 6 Month

Budget: Rs.45,000 /-

We are impressed with the research proposal submitted by your institution and are confident that your team possesses the expertise and capabilities required to execute this project successfully.

To facilitate the smooth progress of the project, we will disburse funds according to the agreed-upon schedule. Additionally, our technical team will be available for consultations and support as needed throughout the duration of the project.

Aeroflutter Techlabs
40, Dhanvantari nagar,
Umred Road, Nagpur-440009
www.aeroflutter.com
Phone no.:+918087805452
Email: aeroflutter@gmail.com

We expect regular updates on the project's progress, including milestones achieved and any challenges faced. Please submit progress reports in the format provided by our project coordinator.

We look forward to the successful completion of this Research Grant Project and anticipate groundbreaking results that will benefit both our organizations and contribute to the broader scientific community.

Thank you for your commitment to excellence in research, and we are excited about the prospects of this collaboration.

If you have any questions or require further clarification, please feel free to contact.

AEROFLUTTER TECHL..
PROPRIETOR
Aeroflutter Techlabs, Nagpur

Lokmanya Tilak Jankalyan Shikshan Sanstha's
PRIYADARSHINI BHAGWATI COLLEGE OF ENGINEERING
Harpur Nagar, Umred Road (Near Bada Tajbagh), Nagpur-24
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UTILIZATION CERTIFICATE

This is to certify that an amount of Rs. 45,000 (Rs. Forty-five thousand only) sanctioned during the academic year 2022-23 in favour of the Principal, Priyadarshini Bhagwati college of engineering, Nagpur received from the M/s Aeroflutter Techlabs, Nagpur has utilized for the purpose of Research work entitled **"Design and fabrication of Fire Fighting Robot"** and conditions of grants are fulfilled.

The detail of amount utilization are as follows;

Sr. No.	Particulars	Quantity	Cost
1	**DC Diaphragm WATER PUMP 12V** Make: BalRama Enterprises, Khatoni, Punjab Model No.: 12V DC 150PSI MOTOR PUMP1	1	4000
2	**Robo Wheel** Make: Robo_India_Pvt.LTD Product No.: ISC 1599-2	4	2000
3	**High Pressure Nozzle Water Spray Gun** Make: CJEN INTERNATIONAL Product No.: B0C69GP5RY EF-253	1	2000
4	**Geared DC Motor** Make: Invento Research Inc. Product No.: 12VF617NXISC 677-M	4	8000
5	**Camera Kit** Make: Dazzle Robotics Pvt. Ltd. Product No.: STM32F40MT9V034	1	15000
6	**Arduino Kit** Make: GYM Electronics Product No: **1050-1075-ND K000007**	1	7800
7	**Tank 10 Litre**	-	2500
8	**Miscellaneous**	-	3700
	Total		**45000**

PRINCIPAL

Principal
Priyadarshini Bhagwati College of Engg
Umred Road, Nagpur.

Lokmanya Tilak Jankalyan Shikshan Sanstha's
PRIYADARSHINI BHAGWATI COLLEGE OF ENGINEERING
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MINUTES OF MEETING

Title of the Work: **Design and Fabrication of Fire Fighting Robot**
Meeting Number:**01**
Date: **14/08/2022**

Investigator (PBCOE, Nagpur)		**Client Incharge (Aeroflutter Techlabs, Nagpur)**	
Name	Dr. Shailendra P. Daf	**Name**	Mr. Ankit Bhagat
Designation	Assistance Professor	**Designation**	Director
Mobile	9665087710	**Mobile**	8087805452
Department	Mechanical Engineering	**Adress**	40, Dhanvantari Nagar Umred Road, Nagpur 440009
Email	Shailu_daf@rediffmail.com	**Email**	aeroflutter@gmail.com

Minutes of Meeting

Points Discussed:

1. A formal meeting comprising of representatives of the industry and faculty is arranged in the board room to discuss and detail of the research work.
2. The PBCOE team and Coordinator of the research work Dr. S. P. Daf, Assistant Professor elaborated the technical details required to undertake the works.
3. The company permitted the design team to visit their site to obtain some technical data.
4. First week of September 2022 has been fixed up for visiting the site.
5. The team discussed about the phases of the research work.
6. It is agreed that the cost of manufacturing is to be borne by the company.

Investigator **HOD** **Client** **Principal**

Assistant Professor
Priyadarshini Bhagwati College of Engineering, Nagpur.

Head
Mechanical Engg. Deptt.
Priyadarshini Bhagwati College of Engg.
Umred Road, Nagpur.

AEROFLUTTER TECHL.
PROPRIETOR

Principal
Priyadarshini Bhagwati College of Engg
Umred Road, Nagpur

Lokmanya Tilak Jankalyan Shikshan Sanstha's
PRIYADARSHINI BHAGWATI COLLEGE OF ENGINEERING
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MINUTES OF MEETING

Title of the Work: **Design and Fabrication of Fire Fighting Robot**
Meeting Number:**02**
Date: **18/09/2022**

Investigator		**Client Incharge**	
Name	Dr. Shailendra P. Daf	**Name**	Mr. Ankit Bhagat
Designation	Assistance Professor	**Designation**	Director
Mobile	9665087710	**Mobile**	8087805452
Department	Mechanical Engineering	**Adress**	40, Dhanvantari Nagar Umred Road, Nagpur 440009
Email	Shailu_daf@rediffmail.com	**Email**	aeroflutter@gmail.com

Minutes of Meeting

Points Discussed:

1. A meeting with the representatives of the company and PBCOE is arranged in the board room on 14-08-2022.

2. Work of Phase 1 was discussed.

3. Data relating to input and output parameters of the Design and Fabrication of Fire Fighting Robot were discussed.

4. The details of electrical power required, mechanical components — its dynamic and kinematic details, the overall dimensions, space constraints, detailed drawings of individual parts were discussed.

5. The company agreed to manufacture/ fabricate the components.

Investigator **HOD** **Client** **Principal**

Assistant Professor
Priyadarshini Bhagwati College of Engineering, Nagpur.

Head
Mechanical Engg. Deptt.
Priyadarshini Bhagwati College of Engg.
Umred Road, Nagpur.

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PROPRIETOR

Principal
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Lokmanya Tilak Jankalyan Shikshan Sanstha's
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MINUTES OF MEETING

Title of the Work: **Design and Fabrication of Fire Fighting Robot**
Meeting Number:**03**
Date: **16/10/2022**

Investigator		Client Incharge	
Name	Dr. Shailendra P. Daf	**Name**	Mr. Ankit Bhagat
Designation	Assistance Professor	**Designation**	Director
Mobile	9665087710	**Mobile**	8087805452
Department	Mechanical Engineering	**Adress**	40, Dhanvantari Nagar Umred Road, Nagpur 440009
Email	Shailu_daf@rediffmail.com	**Email**	aeroflutter@gmail.com

Minutes of Meeting

Points Discussed:

1. A Meeting is organized for research work of Mechanical Engineering department in the board room.

2. Design of hydraulic and pneumatic system components and specifications and their drawings have been finished and PBCOE asked the company to buy standard bought out components and others to machine in their factory.

3. The PBCOE company requested Aeroflutter Techlabs designers to be present during the Fabrication in Workshop.

4. The designers enquired about standard bought out components for the design of pneumatic systems and other accessories like valves, pressure switches, pump etc.,

5. The company from their experience asked the designers to modify some of the components to their requirements.

Investigator
Assistant Professor
Priyadarshini Bhagwati College of Engineering, Nagpur.

HOD
Head
Mechanical Engg. Deptt.
Priyadarshini Bhagwati College of Engg.
Umred Road, Nagpur.

AEROFLUTTER TECHLAB
Client
PROPRIETOR

Principal
Principal
Priyadarshini Bhagwati College of Eng
Umred Road, Nagpur.

Lokmanya Tilak Jankalyan Shikshan Sanstha's
PRIYADARSHINI BHAGWATI COLLEGE OF ENGINEERING
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MINUTES OF MEETING

Title of the Work: **Design and Fabrication of Fire Fighting Robot**
Meeting Number:**04**
Date: **14/12/2022**

Investigator		**Client Incharge**	
Name	Dr. Shailendra P. Daf	**Name**	Mr. Ankit Bhagat
Designation	Assistance Professor	**Designation**	Director
Mobile	9665087710	**Mobile**	8087805452
Department	Mechanical Engineering	**Adress**	40, Dhanvantari Nagar Umred Road, Nagpur 440009
Email	Shailu_daf@rediffmail.com	**Email**	aeroflutter@gmail.com

Minutes of Meeting

Points Discussed:

1. A Meeting is organized for research work of Mechanical Engineering department in the board room.
2. The Fabricated setup are sent to the IT Department for Software Development and Coding.
3. The trail run taken in the presence of the PBCOE and industry representatives.
4. The components functions are monitored and have been checked for design values.
5. The fitness of components was adjusted with technicians of the company.

Investigator — Assistant Professor, Priyadarshini Bhagwati College of Engineering, Nagpur.

HOD — Head, Mechanical Engg. Dept., Priyadarshini Bhagwati College of Engg, Umred Road, Nagpur.

Client — AEROFLUTTER TECH... PROPRIETOR

Principal — Principal, Priyadarshini Bhagwati College of En...

Lokmanya Tilak Jankalyan Shikshan Sanstha's
PRIYADARSHINI BHAGWATI COLLEGE OF ENGINEERING
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MINUTES OF MEETING

Title of the Work: **Design and Fabrication of Fire Fighting Robot**
Meeting Number**:05**
Date: **22/01/2023**

Investigator		**Client Incharge**	
Name	Dr. Shailendra P. Daf	**Name**	Mr. Ankit Bhagat
Designation	Assistance Professor	**Designation**	Director
Mobile	9665087710	**Mobile**	8087805452
Department	Mechanical Engineering	**Adress**	40, Dhanvantari Nagar Umred Road, Nagpur 440009
Email	Shailu_daf@rediffmail.com	**Email**	aeroflutter@gmail.com

Minutes of Meeting

Points Discussed:

1. The company congratulated the management of PBCOE, the Principal, HoD, Invigilator for their cooperation.
2. PBCOE thanked the company for providing an opportunity to address the industry problems and to arrive at solutions.
3. It is planned to conduct cost estimation of the newly developed Fire Fighting Robot
4. The company has agreed to give the details of costing from their past experience.
5. The testing is carried out in the test bench of the industry.
6. The performance analysis is discussed and compared with the design values.
7. The drawings and reports were handed over to the company and is permitted to go for

Assistant Professor
Priyadarshini Bhagwati College of Engineering, Nagpur.

Investigator

HOD Head
Mechanical Engg. Deptt.
Priyadarshini Bhagwati College of Engg.
Umred Road, Nagpur.

AEROFLUTTER TECH...
PROPRIETOR

Client

Principal
Priyadarshini Bhagwati College of Eng
Umred Road, Nagpur.

Principal

Lokmanya Tilak Jankalyan Shikshan Sanstha's
PRIYADARSHINI BHAGWATI COLLEGE OF ENGINEERING
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DEPARTMENT OF MECHANICAL ENGINEERING

DESIGN AND FABRICATION OF FIRE FIGHTING ROBOT

ABSTRACT

This project is designed to develop a fire fighting robot using RF control technology for remote operation. The robotic vehicle is loaded with water tanker and a pump which is controlled over wireless communication to throw water. An 8051 series microcontroller is used for the desired operation. This mobile robot is controlled using a mobile phone and reaching fire at the transmitting end using push button, commands are sent to the receiver to control the movement of the robot either to moved forward, backward and left or right. At the receiving end four dc motors are interfaced to the microcontroller. Further project enhanced by interfacing it with a wireless technology.

Detail of Project:

Fire causes tremendous damage and loss of human life and property. It is sometimes impossible for the fire fighter personnel to access the sight of fire because of explosive materials, smoke and high temperature. Through this we can conclude that robot can be placed where human lives are at risk. The robot can operate in the environment which is out of human reach in very short time. In such environments, fire fighting robots can be useful for extinguishing fire. These robots should be controlled remote operators who are located far away from the fire site using remote communication systems. The robot accurately and efficiently finds the fire within minimum time after the fire is detected. In future work Project aims to promote technology innovation to achieve a reliable and efficient outcome. Mobile robot that can move through a model structure, find fire and extinguish it. The movement of the robot is controlled by the sensors which are fixed on the mobile platform .is to provide security of home, laboratory, office, factory and building is important to human life. We develop an intelligent multisensory based security system that contains a fire fighting system in our daily life. We design the fire detection system using sensors in

the system, and program the fire detection and fighting procedure using sensor based method.

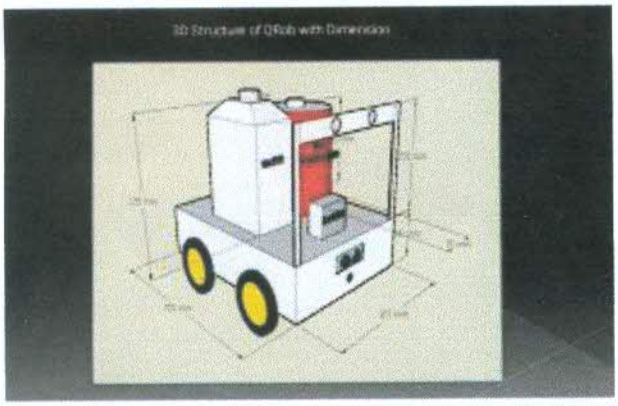
Components Used:

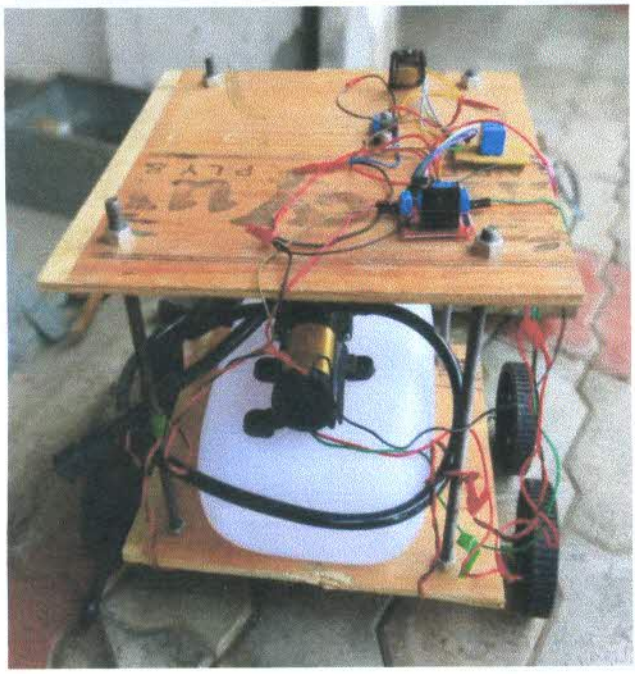
The model which we have fabricated fire fighting robot. All these components assembly assemble on the flat ply board

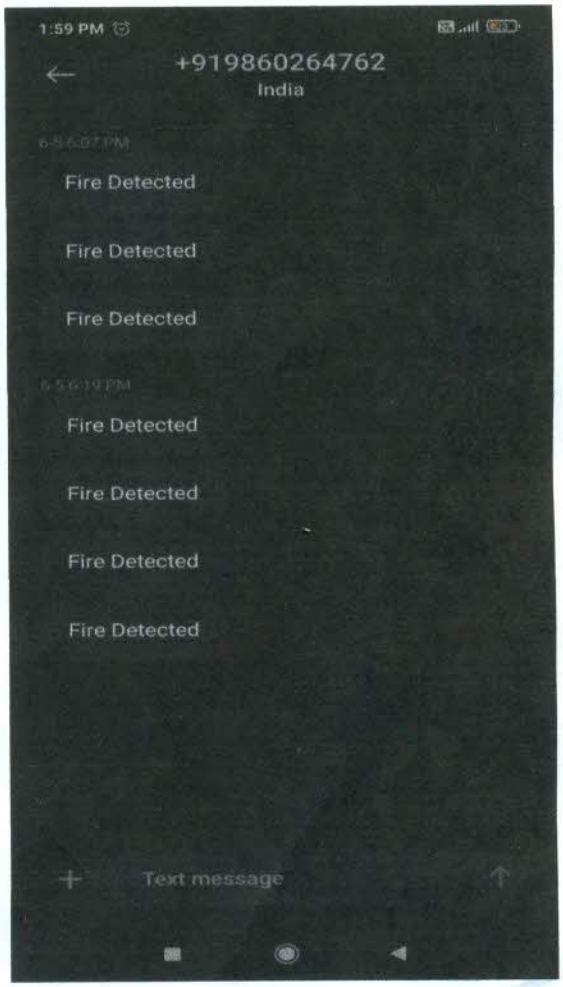
The main components used to fabricate the model are:

1. DC Diaphragm WATER PUMP 12v
2. NODE MCU
3. Wheels
4. GSM Modem
5. Relay 12 Volt
6. Copper Clad
7. Etching Powder (FECL3)
8. BC 547 Transistor

Diagram:







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AFT/NAG-HR/22-23/138

Date: 23/03/2023

Appreciation Letter

To,
The Principal,
Priyadarshini Bhagwati College of Engineering,
Nagpur.

Subject: Appreciation for Collaboration on Research Project

Dear Sir,

I wanted to express our heartfelt appreciation to Priyadarshini Bhagwati College of Engineering and specifically Dr. S. P. Daf, Assistant Professor in Mechanical Engineering, for their invaluable contributions to the successful completion of our research project, "Design and Fabrication of Fire Fighting Robot."

The dedication and expertise displayed by Dr. S. P. Daf and the collaborative spirit of Priyadarshini Bhagwati College of Engineering's students and faculty have been instrumental in achieving the project's goals. Dr. S. P. Daf guidance's and mentorship were exceptional, and the support we received from your institution, including access to cutting-edge facilities, greatly enhanced the project's outcome.

The Fire Fighting Robot we have developed stands as a testament to the outstanding educational environment and commitment to excellence at your college. Your institution's contributions have been a driving force in pushing the boundaries of technology and advancing the field of robotics.

We look forward to the possibility of future collaborations and thank you once again for your invaluable support.

Aeroflutter Tech Lab

AEROFLUTTER TECHLAB

PROPRIETOR