IC201P: Design Practicum
Report 2 – Problem Definition and Solution Methodology

# RAKSHAK

**Team number : 6**

**Team members**


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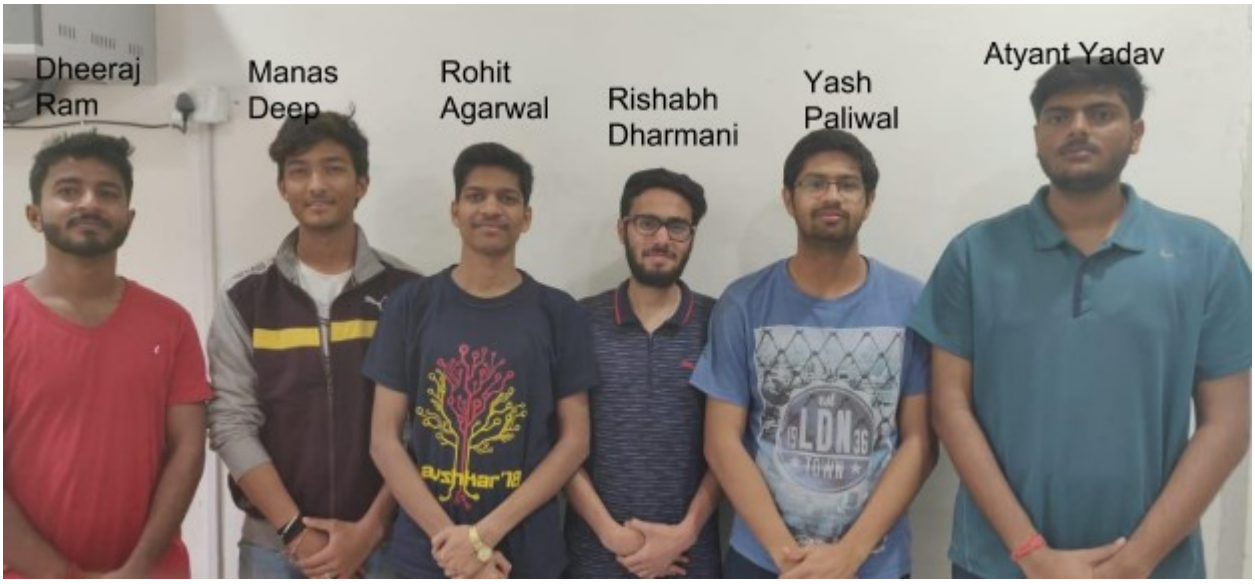
**Faculty mentors**

1. Dr. Arpan Gupta
2. Dr. Amit Prasad

**Team photograph** (if possible indicate name below each person) & Contribution




Contribution :-

1. Rohit Agarwal and Atyant Yadav– Implementation of Web page and uploading data on host server using Raspberry pi and programming and testing of sensors.

2. Rishabh Dharman and Manas Deep- Mounting of camera with adjustable height on rover and final assembly of RAKSHAK.

3. Yash Paliwal and Dheeraj Ram– Implementation of Rocker bogie mechanism and testing of mechanical structure.

**Abstract (100-200 words):**

The project decided is an unmanned rover (RAKSHAK) for surveillance along border for security purpose using camera and thermal imaging sensor to **reduce casualties of army personnel**. **It reduces the risk of life of soldiers**. RAKSHAK is going to be implemented by using eight wheels rocker bogie mechanism which can move on all uneven terrain. **Camera** will be mounted on rover for live video streaming of border. This rover will detect any intrusion through camera irrespective of day and light. **Thermal imaging sensor** will used to differentiate between individuals and surroundings. It works on the principle of temperature difference. This rover will be controlled by an individual who will be there in control centre by using **Bluetooth module** or **micro-controller** and data will be transferred to command control centre by wireless transmission. A local server will be created on IIT Mandi's WiFi using **raspberry-pi** so that accessible authorities can access the data using Internet Protocol (I.P.) address.

**Introduction**

RAKSHAK is a surveillance rover designed for patrolling of International Borders and various sneak operations.

The main Motivation behind this project is to reduce the risk of life loss / injuries of soldiers risking their everything at borders.

The beneficiaries of our product are the military and defense forces. Yes, there is a huge market for our product which includes the above beneficiaries and also there's a lot of monetary support available from organizations like DRDO.

The innovative aspect of our product is to revolutionize the border surveillance system in the country and amplify the success rate of sneak and spying operations.

**Problem Definition:**

**RAKSHAK** will be tremendously useful for surveillance of international borders. Sneak and spying operations of enemy bases are another fundamental application of RAKSHAK.

**Team's Final Idea and Design/other ideas (if any)**

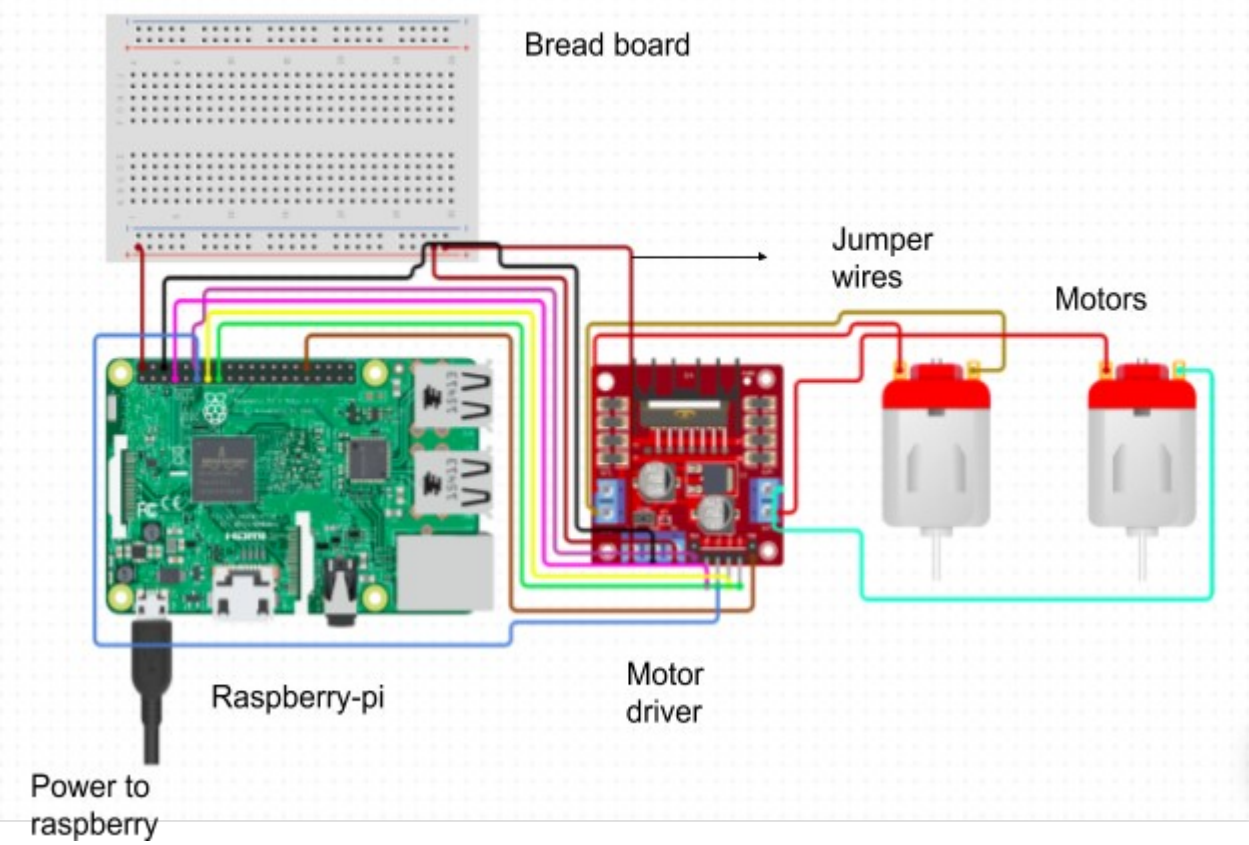
| No. | Idea | Intended beneficiary(ies) |
|---|---|---|
| 1. | Border Surveillance rover | Military and Defence personnel |
| 2. | Self Adjusting automobile seat | Passengers in hilly areas, especially senior citizens and pregnant ladies |
| 3. | Path Guiding robot (BotDog) | For blind people and people with chronic eye diseases |
| 4. | Automatic Street Lighting at night | Saving energy wasted by street lights during night(when they are of no use) |
| 5. | Plastic Shredder | Alternative method for recycling plastic by shredding it and converting it to plastic blocks |

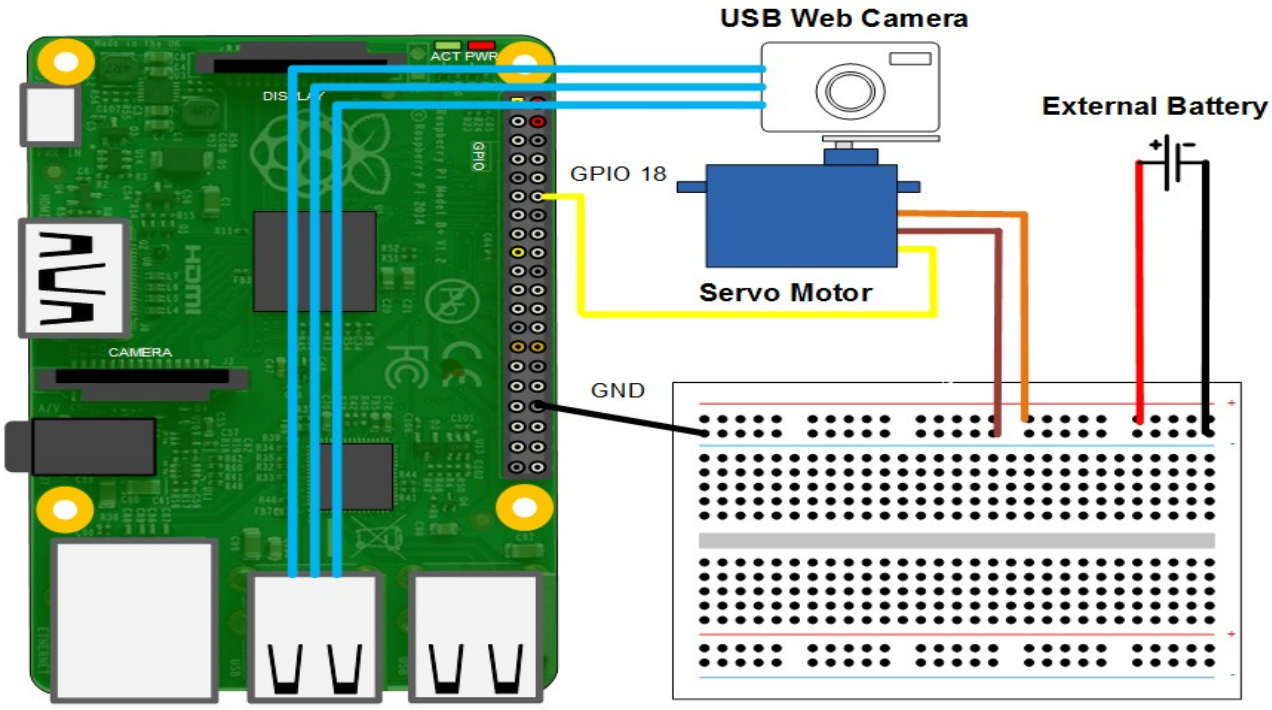
**Proposed solutions/concept (Final designs required).**

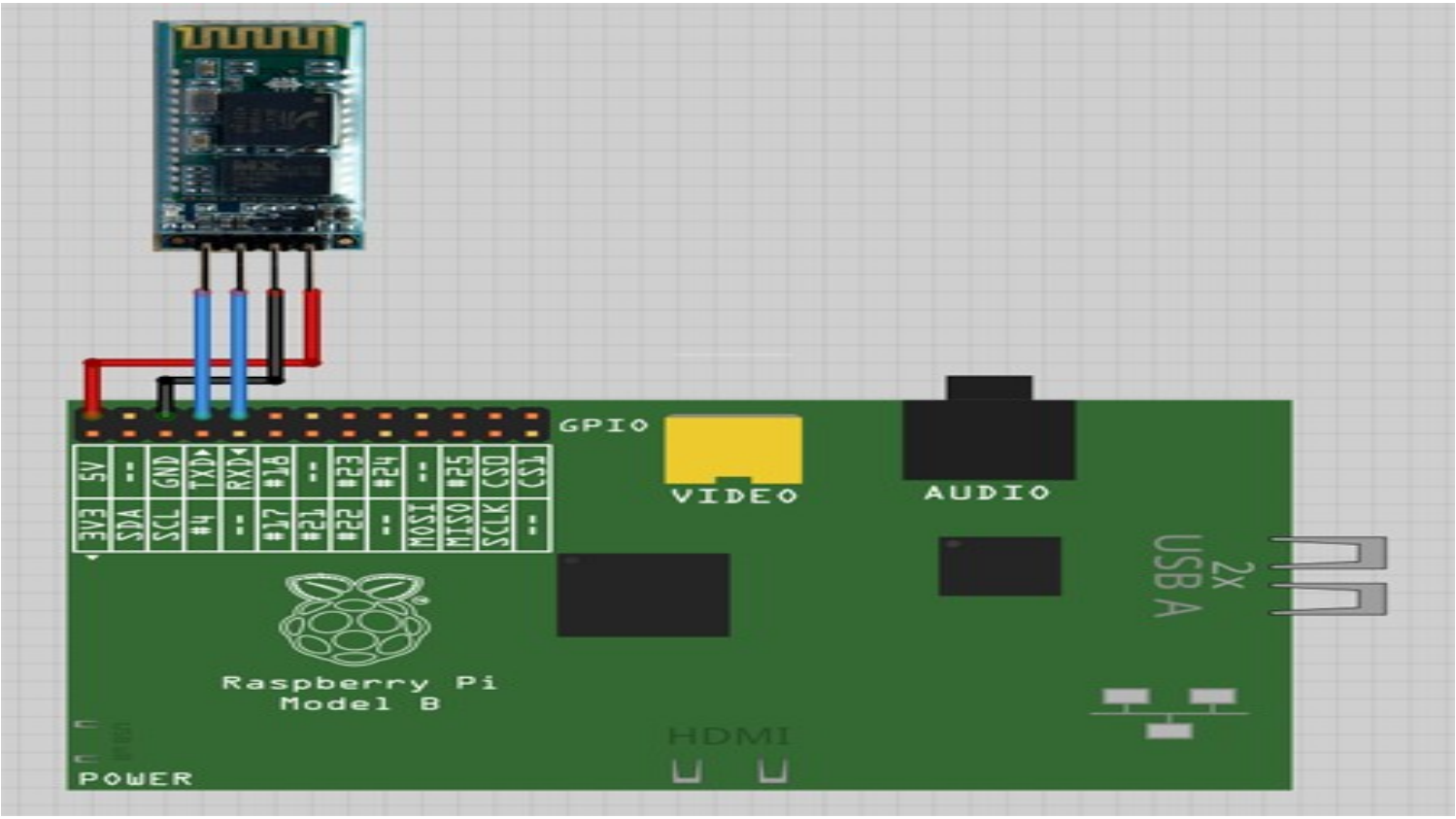
For each solution, include the following.

- Sketches/block diagrams to represent them

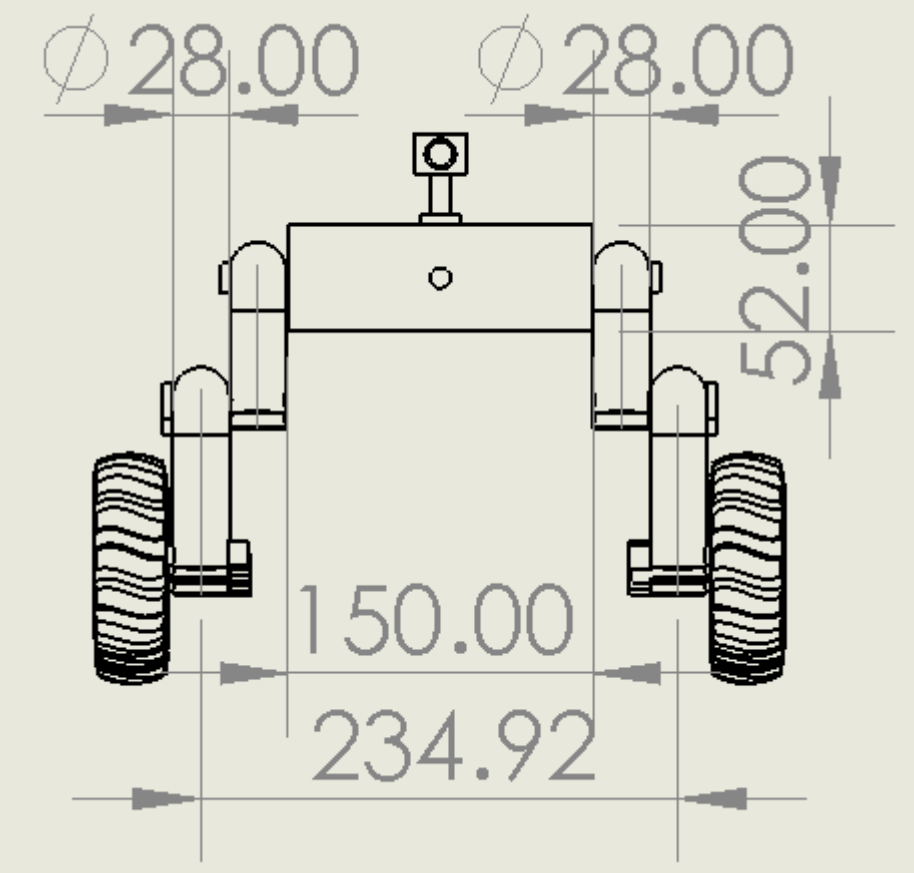
1. CIRCUIT DIAGRAM -



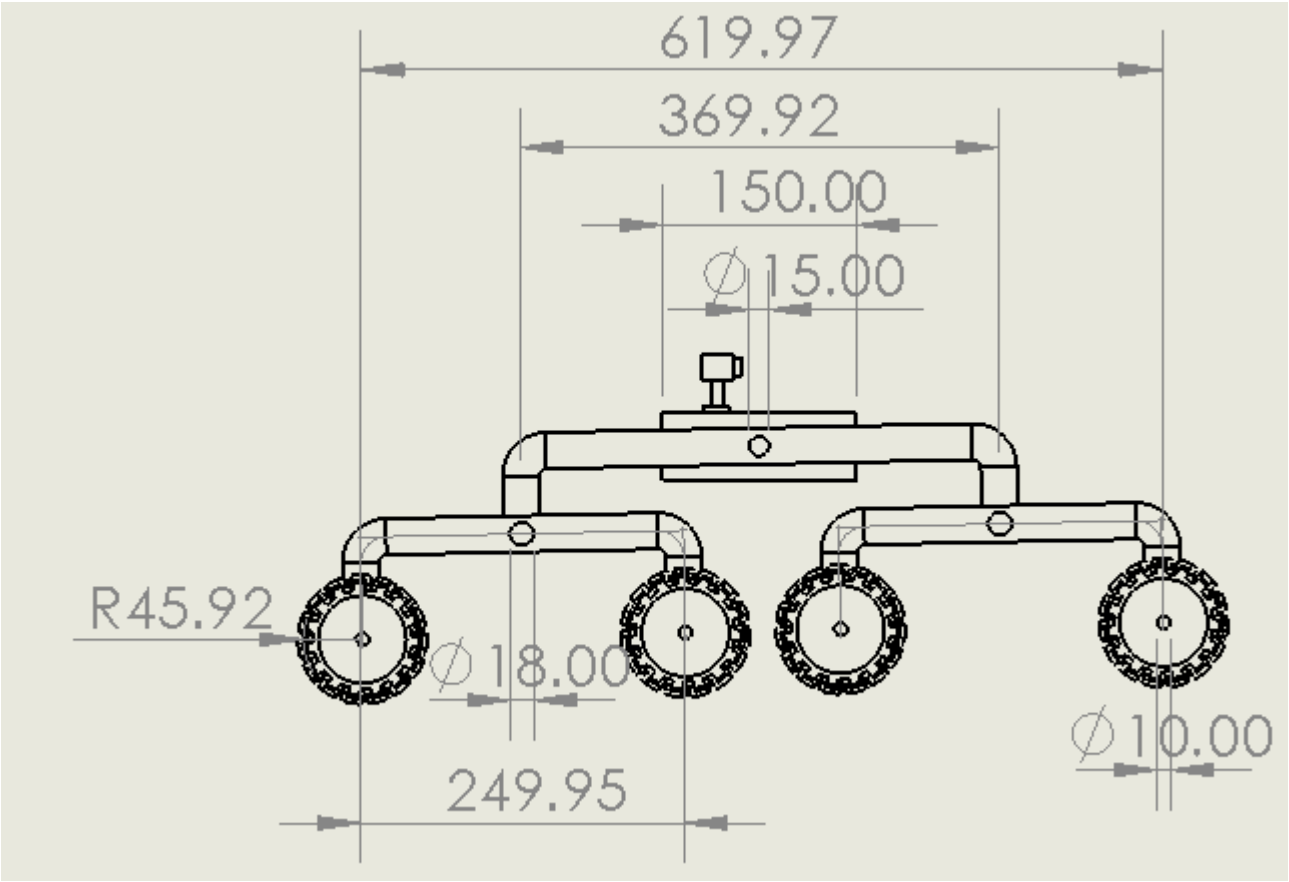





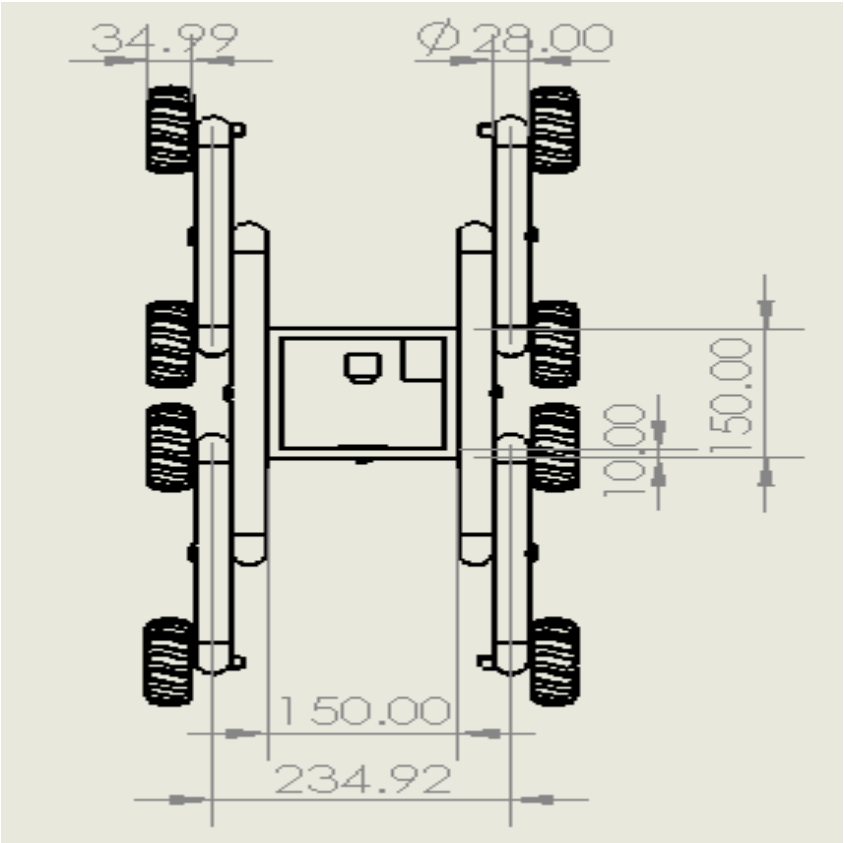

2. **SOLID WORKS DESIGN** -




**Front view**




**SIDE VIEW**




**TOP VIEW**

**Feasibility** – Major production of RAKSHAK needs to be done to be deployed at international borders. The rover has high adaptability for adverse terrain and the sensors to be used can be readily available. Overall, the rover is feasible to implement in real life.

- Cost/time needed-

  **Total Cost (image included):** Rs. 27,000 **(Expected)**

| Serial No. | Name of Item | Approximate Cost per item | Quantity | Approximate Cost |
|---|---|---|---|---|
| 1 | TYRE | 500 | 4 | 2,000 |
| 2 | MOTOR | 2500 | 2 | 5,000 |
| 3 | METAL SHEET | 1500 | 1 | 1,500 |
| 4 | CAMERA | 2500 | 1 | 2,500 |
| 5 | RASBERRY PI | 3500 | 1 | 3,500 |
| 6 | BATTERY | 1000 | 1 | 1,000 |
| 7 | SONAR SENSOR | 2,000 | 1 | 2,000 |
| 8 | THERMAL SENSOR | 4000 | 1 | 4,000 |
| 9 | METAL SENSOR | 500 | 1 | 500 |
| 10 | WIRELESS CONTROLLER | 5000 | 1 | 5,000 |
| Total Cost | | | | 27,000 |

  Time needed for making of prototype is approximately 3 months (starting from mid Feb)

- Any other design considerations that may be important (refer to slides).

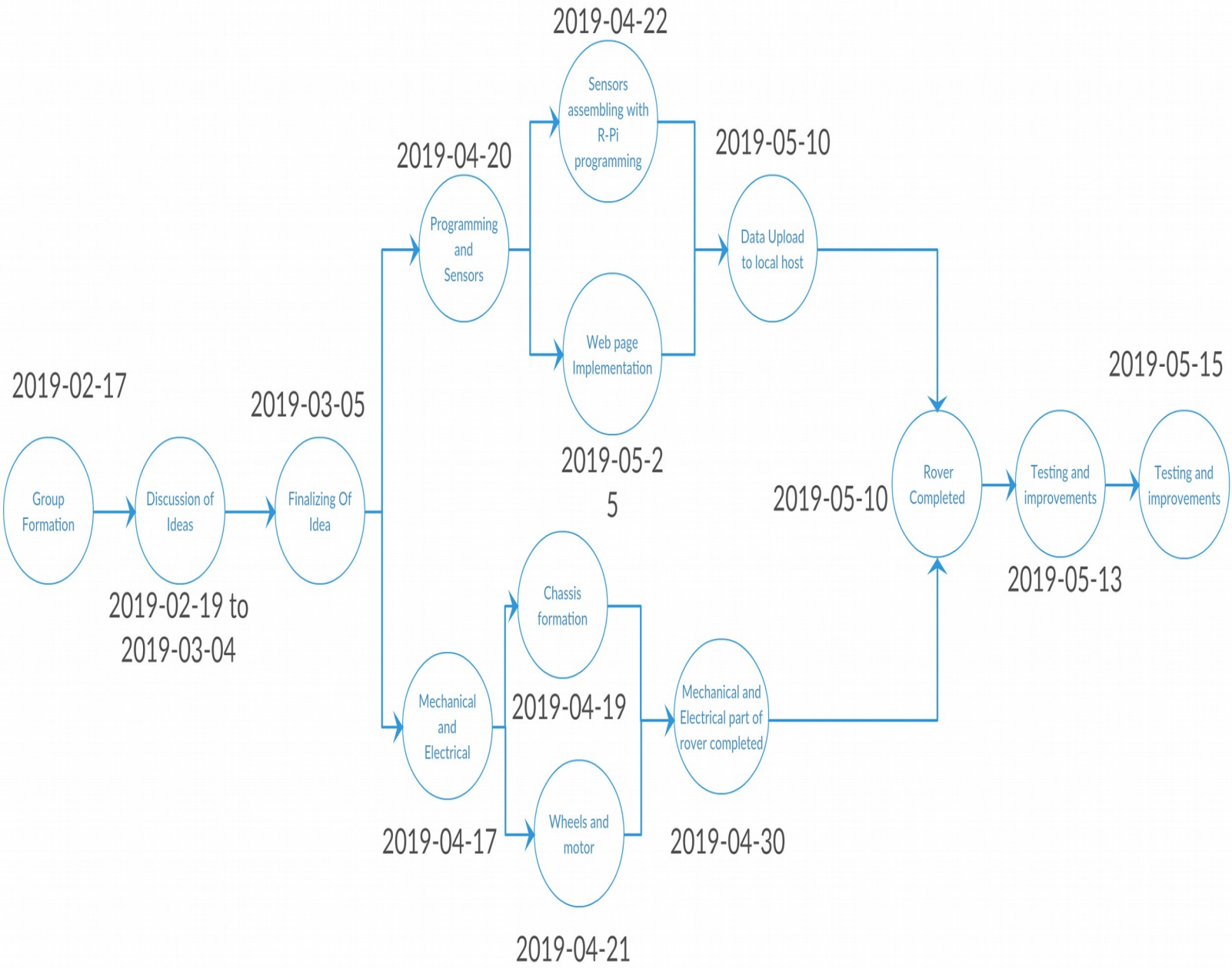
  Additional sensors can be added to the chassis so that better monitoring can be done. 6 wheel rocker bogie mechanism is also an option instead of 8 wheel rocker bogie mechanism for movement. Pneumatics can be used for height adjustment of night vision camera.

- Impact of Product on Society (*such as beneficiaries, environment, economy, job generation etc)*

  The product can have a revolutionizing impact on the security and surveillance system which, at present, is almost totally done using man power in our country. The environment won't have any major impact as the maintenance of the product can be easily done. A small fraction of the military fund is required for vast implementation of the rovers. The rover will help in considerably decreasing the work load on soldiers which can be deployed for other important missions/operations.

## Timeline

- **PERT CHART**



**Major concerns** in successful realization of the product (3 most important)

1) **Rocker-Bogie Mechanism:** 8-wheel rocker bogie mechanism needs to be implemented for proper and agile movement of rover over uneven terrain. The mechanism should enable the rover to move at required speed with excellent stability such that the sensors could function well.
2) **Proper Functioning of Sensors:** The night vision camera needs to be stable for proper capture of scenes around the rover. The camera also requires proper height adjusting mechanism for wide range of coverage as well as adaptability according to adverse situations. The thermal imaging sensor needs to be calibrated such that it is able to properly differentiate between individual and its surroundings without any hiccup.
3) **User Friendly data access:** The web page required for data access needs to be user friendly such that the user doesn't face any complication. The web page must include ample features like live video streaming, high definition image viewing and options for saving/deleting captured images, videos or any other sort of data.

## Conclusion

The conclusion of this report is that RAKSHAK, the border surveillance rover, has fundamental applications for border security purposes and sneak and spying operations. Implementation and installation of RAKSHAK across borders or at the very least sensitive regions can help in dramatically reducing the loss of life and fatal injuries while patrolling. RAKSHAK can play an essential role in surveying battle areas and targets especially during operations such as surgical strikes. RAKSHAK will surely be an asset for the Indian army to cherish.