

# Mars Rover Manipal



## Team Brochure

2020-2021



**MANIPAL**  
ACADEMY of HIGHER EDUCATION

*(Deemed to be University under Section 3 of the UGC Act, 1956)*

March 7, 2018

## IN APPRECIATION

Of late it has been the clarion call of educationists and industrialists that engineering education must spread beyond the academic bounds prescribed by the AICTE and attention must be diverted by the students in acquiring skill to make their academic career relevant to meet the present-day needs of all-round industrial development.

Manipal Academy of Higher Education has already taken steps to enshrine skill development in its graduating students and it is heartening that its interdisciplinary student team of MARS ROVER MANIPAL from Manipal Institute of Technology has made a mark in finding robotic solutions in exploring Mars and has achieved distinguished positions in the rover challenges continuously from 2016.

Manipal academy of higher education is too happy to be a sponsor of this programme by the MIT student team and give them all the encouragement and support needed. I request philanthropic organizations to extend their support and encouragement to these dynamic and innovative students.



Dr, H.S. Ballal  
PRO CHANCELLOR



Rajeev Suri  
CEO, Nokia

“ Cool, truly inspiring ”



Nitin Gadkari  
Union Minister



Abhas Mitra  
Astrophysicist

“ A well deserved win ”



G. Satheesh Reddy  
Chairman, DRDO

“ Great job! ”

# ABOUT THE TEAM



Mars Rover Manipal is a multi-disciplinary student project team from Manipal Academy of Higher Education striving to design and build next generation rover for exploration of extraterrestrial environment and applications of robotics in interplanetary missions.

**33 MEMBERS  
5 SUBSYSTEMS  
1 GOAL**

“ DESIGN TO DISCOVER ”

# COMPETITIONS

## UNIVERSITY ROVER CHALLENGE

University Rover Challenge is a robotics competition held annually at the Mars Desert Research Station organized by the Mars Society, USA. Mars Society is the world's largest space advocacy organization dedicated to human exploration and settlement of the planet Mars. The challenge is to build a next-generation Mars Rover capable of working alongside humans in extraterrestrial conditions.



# COMPETITIONS

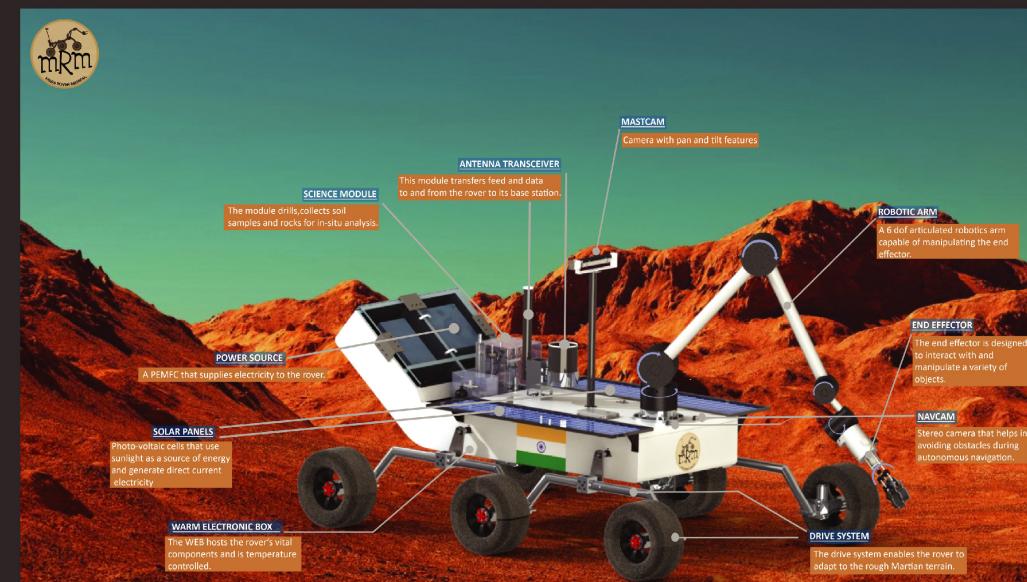
## INDIAN ROVER CHALLENGE

Indian Rover Challenge is a robotics and space exploration based competition organized by Mars Society South Asia. MSSA is the official chapter of the Mars Society for the South Asian region. IRC was launched in January 2018 and is the first of its kind competition in Asia. The participating teams design and build a Martian rover prototype and use that rover to compete in various tasks at a designated location.

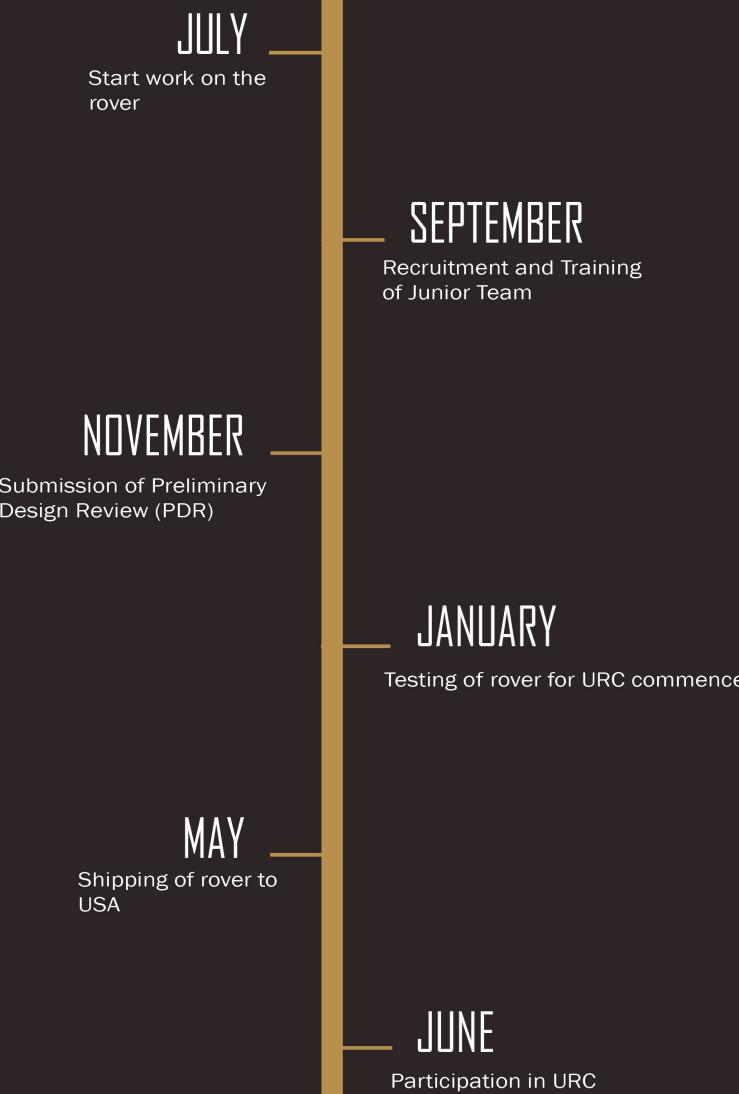


## INDIAN ROVER DESIGN CHALLENGE

The Indian Rover Design Challenge (IRDC) is a competition for university students which challenges to design Mars rovers which shall be fully equipped and mission ready for Operation on Mars. Teams are supposed to carefully plan each subsystem of the rover considering various extra-terrestrial parameters in design. Students are encouraged to be as imaginative, creative and insightful as possible within practical implementable limits for the human race.



# YEARLY Timeline



# ACHIEVEMENTS

2020

7th place in URC globally  
1st in inaugural edition of Indian Rover Design Challenge

2019

8th place in URC globally  
1st in Asia  
Best Science Team Award  
Organized **Indian Rover Challenge**

2018

7<sup>th</sup> all over the world in URC 2018  
1st in inaugural edition of Indian Rover Challenge

2017

8th place in URC globally  
1st in Asia  
100% score in Science task  
2nd in Critical Design Review task

2016

13th place in URC globally  
2nd in Asia

The research subsystem regularly represents the team at various national and international conferences and has presented research papers at conferences like International and National Conference on Machines and Mechanisms (INaCoMM) 2017, International Conference on Applied Sciences, Engineering and Technology (ICASET) 2017, and Symbiot 2017.

# OUR SUB-SYSTEMS

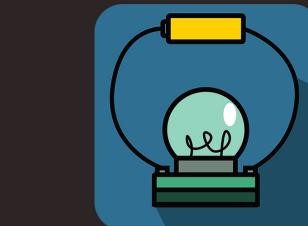
## Mechanical

The mechanical team provides the basic skeleton of the rover which includes the wheels, suspension, chassis, robotic manipulator and the soil collection mechanism. The guidelines provided by URC forms the basis over which each of our components is designed. Every part that is put on the rover undergoes an extensive development cycle to ensure its reliability. The development cycle includes a thorough study of the problem statement, and design and analysis of each component on various CAE softwares.



## Electronics & AI

The Electronics and AI team is responsible for powering various segments of the rover, that work together to achieve the desired performance of the rover over all the tasks. They are also responsible for control and communication of the rover, and also works towards maximum customization of the products that we use onboard the rover. The development of the autonomous system creates a closed-loop scenario where various sensors of the rover communicate with each other to



## Science

The goal is to conduct in-situ life-detection analysis onboard the rover to determine the presence of life and also comment on the habitability of the environment.

The team is equipped to be able to differentiate extinct or extant life, if present, at designated sites by analyzing data relevant to the setting on Earth while demonstrating an understanding of how these observations would translate to a Martian setting.



The Research subsystem aims to work on cutting edge technologies in the field of Robotics, Control Systems and Artificial Intelligence. They aim at developing technologies that are published in various Scopus indexed journals and has been presented at national and international conferences. This research can then be implemented on the Rover in future generations.

## Management

Management subsystem is responsible for all the non-technical work of the team. It is involved in the overall progress of the team by handling sponsorship, finance, public relations, publicity, media platforms and human resource management. The sub-system designs posters and brochures, manages the website and provides videos for advertisement and sponsors. It is also responsible for the smooth functioning of the team's day to day work.



## Research

# RESEARCH

Research is one of the integral aspects of Mars Rover Manipal. Our research activities seek to pioneer robotics through analysis, innovation and insight. Mars Rover Manipal conducts research activities in the field of robotics, artificial intelligence, machine learning and astrobiology.

Our team members have worked on case studies, which are used as reference materials for Biotechnology department of Manipal Academy of Higher Education. The research subsystem focuses on publishing papers in Scopus indexed journals and Web of Science indexed journals, also in National and International conferences.

**K.S. Dhankhar and D.K. Rajamani**

"Comparative Analysis of Industrial Grade Parallel Gripper and Linear Gripper" in paper presentation event conducted by International Society of Automation, Bangalore chapter

**K.S. Dhankhar, D.K. Rajamani, E.D. Pitichika and Y.S. Upadhyaya**

"Design of Linear Gripper for Unstructured Environment" in International Conference on Applied Sciences, Engineering & Technology (ICASET 2017), Manipal Academy of Higher Education

**K.S. Dhankhar, D.K. Rajamani, D. Bansal, S. Shorewala, E.D. Pitichika and Y.S. Upadhyaya**

"Design and Development of Planetary Exploration Rover for Unstructured Terrain" in 18th National and 3rd International conferences on Machines and Mechanisms (iNAComm 2017), Bhabha Atomic Research Center (BARC), Mumbai, India

**J. Samal, J. Joel, P.C. Nair, P.K. Debata, V. Kuchimanchi, R. Jaiswal and A.M. Rao**

"Search for life in 20 minutes" in Symbiot 2017 by the biotechnology department, Manipal Institute of Technology, Manipal Academy of Higher Education



**V.H. Dhongade, P.K. Debata, J. John and S. Kapoor**

"The Response of Prokaryotic Lifeforms to Environmental Stimuli" to be presented in "Manipal Research Colloquium 2018", Manipal Academy of Higher Education, April 2018

**K S Dhankhar, Md Sulaiman, Shuvadeep Sarkar and Siril D Teja**

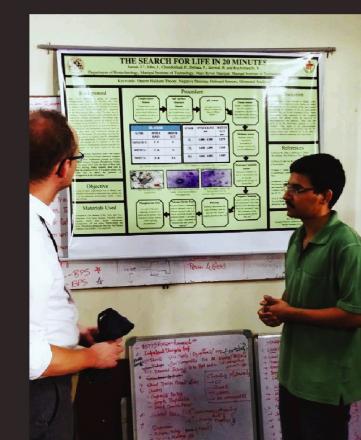
"Design and Analysis of Underactuated linear gripper for unstructured environments based on Chebyshev's Lambda Mechanism" has been presented in Manipal Research Colloquium, Manipal Academy of Higher Education, April 2018

**K S Dhankhar, Md Sulaiman, Shuvadeep Sarkar and Siril D Teja**

"Design and Analysis of Underactuated linear gripper for unstructured environments based on Chebyshev's Lambda Mechanism" to be presented in International Conference on Systems, Computation, Automation and Networking (ICSCAN 2018), IEEE Madras section, July 2018

**K S Dhankhar, Md Abdul Salman, Md Sulaiman and Shuvadeep Sarkar**

"Design and Analysis of Mars rover suspension based on Chebyshev's Lambda Mechanism" has been presented in Manipal Research Colloquium, Manipal Academy of Higher Education, April 2018



# HOW TO SPONSOR US?

## REQUIRED BUDGET

It is the constant support of our sponsors that keeps us focused and inspires us to work towards our goal. To constantly improve and implement better designs we need sponsors who can support us in our journey.

### COMPONENTS

Supply of parts required in building the rover.

### KNOWLEDGE

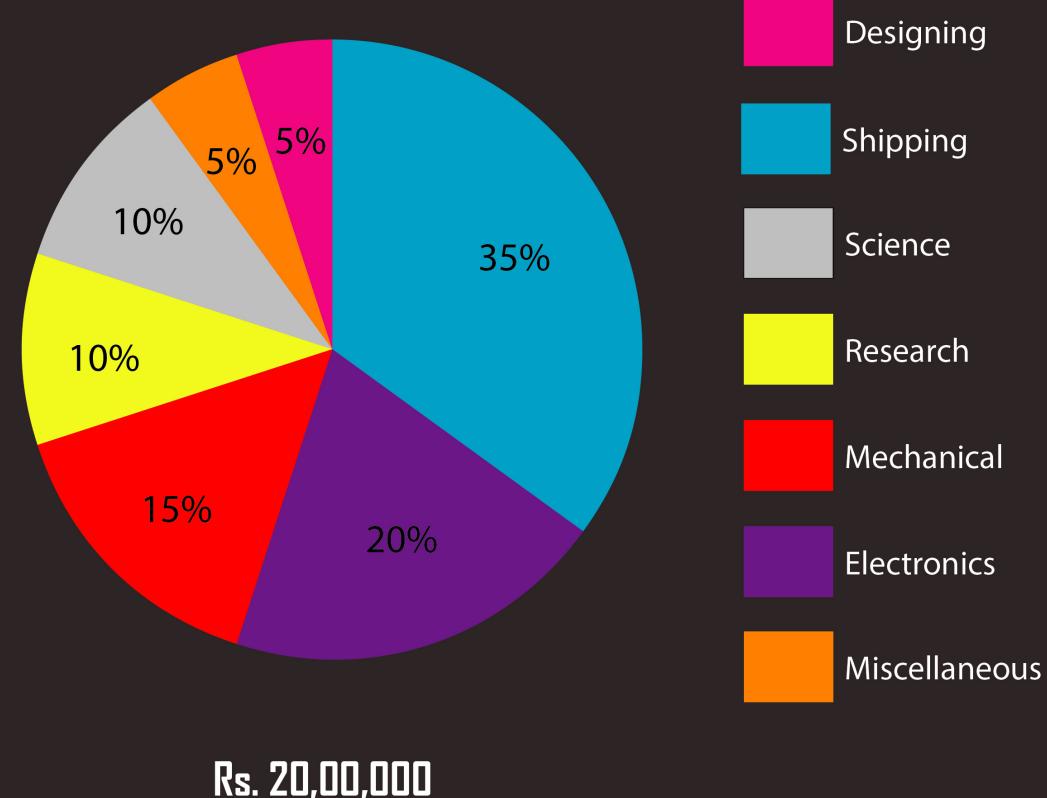
Guide the team with expertise in technical knowledge.

### MACHINING

Manufacturing or processing of various rover parts.

### FINANCIAL SUPPORT

Providing monetary assistance for purchase and manufacturing.



# SPONSORSHIP TIERS

## ELITE

> Rs. 80,000

- Logo of the sponsor on the homepage of the website.
- An acknowledgement of the company's contribution on our team's website and newsletters with complete description.
- Company logo will be displayed on separate dedicated banners in all robotics competitions and events we attend and conduct. Sponsors are welcome to attend all our events and visit our workshop.
- Logo of sponsor at multiple places on the rover.
- Logo of the sponsor will be there on all the merchandise of the team and in our System Acceptance Review (SAR) video.
- Support of sponsors will be accentuated on our social media platforms which includes Facebook, Instagram, LinkedIn and YouTube.
- The copyrights to all our photos and videos would be provided.
- Highlight the support by having a promotional video on all our social media handles.
- Support of sponsors will be emphasized in the national and international conferences the team attends, also we can give opportunities to hold seminars in Manipal Institute of Technology.
- Support will be highlighted in the press releases of the team.
- Supporting a team like us can go a long way in ensuring the Corporate Social Responsibility for your company.

## NORMAL

< Rs. 80,000

- Logo of the sponsor on the Sponsorship page of the website.
- An acknowledgement of the company's contribution on our team's website and newsletters with complete description.
- Company logo will be displayed on banners in all robotics competitions and events we attend and conduct. Sponsors are welcome to attend all our events and visit our workshop.
- Logo of sponsor at single place on the rover.
- Logo of the sponsor will be there on atleast one merchandise of the team and in our System Acceptance Review (SAR) video.
- Support of sponsors will be accentuated on our social media platforms which includes Facebook, Instagram, LinkedIn and YouTube.
- Supporting a team like us can go a long way in ensuring the Corporate Social Responsibility for the company.

Note: The above mentioned benefits can be modified upon request. We can negotiate the terms and reach an agreement accordingly.

# SPONSORS



**MOUSER**  
ELECTRONICS

**SICK**

Sensor Intelligence.

**Wheel EEZ**



Accurate Mobility Redefined

**Power**  
Products™

**LPS BOSSARD**

Proven Productivity

*Atul*

 **NVIDIA**

**K-R Composites®**  
Advanced Vacuum Bagging Materials

 **SOLIDWORKS**

**aeroqual** 

**STEVENS**  
MEASUREMENTS TO MIND

 **L&T Hydrocarbon Engineering**

## CONTACT US



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