# Team VICHARAKA : URC 2024

## Mechanical Subsytem Module Technicalities

Forging history's uncharted path, a groundbreaking project redefines the realm of possibilities at IISc

# What do we do

- The Mechanical Subsystem is responsible for designing and manufacturing of the framework of the rover.
- We design, model, analyze, prototype, test and manufacture different parts of the rover.
- We co-ordinate with other subsystems, understanding their requirements and work with the constraints provided by them.

We would be mainly working on the following broad disciplines :

- Chassis
- Suspension
- Wheels
- Assemblies including Robotic Arm Assembly and Life-Detection Assembly

# Skills and Soft-wares

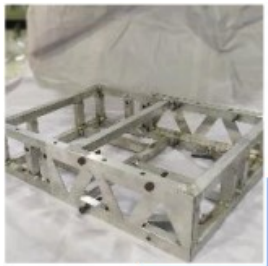
We would be primarily involved with (subject to modification)

- SOLIDWORKS / AutoCAD / Fusion360 / CATIA ( for Computer Aided Design and Modelling )
- Ansys for structural analysis.
- Gazebo and Simulink for stimulations

Different skills which would be learnt and procued during the process include :

- Advanced Manufacturing Processes like 3D Printing, CNC Machining and Laser Cutting
- Developing a Critical way of thinking for designing a part by considering many constraints.

# A Sample Case Study



## Mobility

- A 6 wheels rocker-bogie mechanism is used incorporating a suspension system for the rover, which allows for an effortless mode of transport primarily due to the presence of individual steering links present in four corners and presence of transverse links which promotes stability and helps in multi terrain traversal. The space chassis design, being the core of the rover, is equipped with aluminium T6 6000 series which gives it superior structural strength and at the same time is lightweight making it easy to dismantle and assemble. The sides of the chassis are covered with trussed sheets which gives it convenient strength. The centre of gravity of the rover is closer to the front of the rover. High traction inflated wheels with a diameter of 24.5 cm are used to balance the weight equally. The wheels are also able to withstand sudden jerks due to the material property of vulcanized rubber and traverse through potential obstacles. They are driven by 24 volts high torque planetary DC motors.

## Arm

- We have designed a 6 degree of freedom articulated robotic manipulator out of aluminium sheets and 3D printed composites which are controlled by a combination of rotary, linear actuators, and stepper motor. The precision of movement it both the radial and the angular path is finer and has better control. The work volume of the manipulator is one of the highlights since we are using a 6 degree of freedom manipulator. The arm is capable of lifting a 5 kg payload. Finger gripper with lead screw mechanism is employed to give better grip strength. Inverse kinematics is incorporated to achieve semi autonomy to position the arm in three-dimensional coordinates in order to perform different tasks.