



THE TECHNOCRACY
STUDENTS' TECHNICAL COMMITTEE, NIT RAIPUR

AAVARTAN'23-24



VIGYAAN
DEPARTMENT OF MECHANICAL ENGINEERING
PROBLEM STATEMENTS

MECH01. Solar-Powered Agricultural Robot

The objective of this challenge is to encourage participants to design and fabricate an advanced solar-powered agricultural robot capable of addressing two significant real-world issues: sustainable farming practices and effective disaster response in agricultural regions. Through this competition, participants will be tasked with creating a versatile robot that can navigate challenging terrains, perform agricultural tasks efficiently and sustainably, and operate solely on solar energy. Additionally, participants are expected to integrate AI algorithms for obstacle detection and plant recognition, while also providing modular attachments for disaster response functions. The goal is to foster innovation, creativity, and problem-solving skills, leading to the development of a working model that showcases the potential of robotics in promoting sustainable agriculture and efficient disaster management.

MECH02. Non-electric Refrigerator using Eco-friendly Refrigerant Materials

Create a thorough study proposal that describes how to design, build, and carry out performance tests on a non-electric refrigerator that uses environmentally acceptable refrigerant ingredients. Discuss the important project elements, such as the design guiding principles, building process, refrigerant material choice, and experimental setup for performance assessment. Emphasize the suggested refrigerator's eco-friendliness and sustainability, emphasizing its potential to reduce energy use and the environmental effect. Give a concise explanation of the project's goals, approach, anticipated results, and importance in promoting environmentally friendly cooling systems.

MECH03. Stair Climber Robot

Design and fabricate a stair climber robot which can be controlled remotely and can cross hurdles like stairs, or can move in any uneven terrain. Build a strong robot chassis such that all the electronics can be fixed on it, the robot should be able to move stably, and the center of balance of the robot should be maintained.

MECH04. Next-Generation Multi-Terrain Hovercraft

Hovercrafts are innovative vehicles that utilize a cushion of air to glide over surfaces, combining elements of boats, airplanes, and land vehicles. By generating lift through an air cushion and propulsion from a rear-mounted fan, hovercrafts can traverse a wide range of terrains, including water, mud, ice, and grasslands. Their unique design allows them to move smoothly over both solid and liquid surfaces, making them invaluable for search and rescue missions, military operations, transportation in remote or difficult-to-reach areas, and even as recreational vehicles. Despite their versatility, designing advanced hovercrafts presents challenges in terms of efficiency, stability, and control, making them an exciting area of research and development. Develop an advanced hovercraft system capable of efficient and controlled movement over various terrains, including land and water. The system should integrate multiple propulsion mechanisms, such as air-driven lift fans and directional thrusters, while optimizing for stability, and energy efficiency. Additionally, design a user-friendly control interface that enables precise navigation and intuitive operation of the hovercraft across different environments.

MECH05. Hybrid Vehicle with Smooth Mechanical-Electric Propulsion Transition

A person is driving a car based on an electric power supply and the battery is completely drained. In this emergency situation he can have an option to switch to a mechanical system where he can add fuel and reach a destination where his battery can be charged. The participants are required to construct a hybrid vehicle that incorporates both mechanical and electric propulsion systems, allowing for smooth and automated transitions between the two modes. The hybrid vehicle should offer improved fuel efficiency, reduced emissions, and enhanced overall performance while ensuring a seamless driving experience for users.

MECH06. Hybrid Aircraft: Vertical Takeoff Meets Horizontal Efficiency

The objective of this project is to design and develop an innovative aircraft that merges the vertical takeoff and landing (VTOL) capabilities of helicopters with the efficient horizontal takeoff and cruising characteristics of fixed-wing aircraft. The hybrid aircraft should offer versatile operational capabilities, enabling it to operate in confined spaces, remote locations, and traditional runways, while providing increased flexibility for various missions, such as search and rescue, cargo transportation, and surveillance.

MECH07. Voice control robot car

The candidates are required to construct a voice-controlled robot car that should be capable of understanding and responding to voice commands, allowing users to control its movements, perform specific tasks, and explore its surroundings without the need for manual intervention. The project aims to explore the integration of voice recognition technology with robotic systems, enhancing user experience and offering potential applications in areas such as home automation, surveillance, and entertainment.

MECH08. 360-Degree Fire Protection: Enhanced Safety and Rapid Response

Participants of this project need to construct a 360-degree fire protection system that offers advanced fire detection, suppression, and response capabilities. The 360-degree fire protector aims to address the challenges of detecting and combating fires in various environments, providing effective fire prevention, early detection, and swift suppression to minimize damage and ensure the safety of occupants. The project intends to revolutionize fire safety practices by integrating cutting-edge technologies and innovative design principles into a versatile and reliable fire protection solution.