National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Conference Return Seminar : Effects of Extraterrestrial Soil Simulant Properties on Rover Wheel Performance- A FEM analyses.
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Venue	: CE Seminar Hall
Date and Time	: 24 Dec 2024 (0300 pm)
Abstract	: The growing global interest in space exploration has spurred increased research and development of extraterrestrial rovers. Given that rovers are traditionally tested on Earth using soil simulants, a significant challenge arises due to the disparity in gravitational forces experienced on other celestial bodies. This paper presents a review of the variance in rover performance, particularly traction, under different gravitational conditions, such as those on the Moon and Mars. In general, a notable average traction reduction of 20% under lunar gravity and 5–10% under Martian gravity compared to Earth's gravity is observed, which impacts rover mobility on the fine granular regolith prevalent on these surfaces. Reduced traction, enhanced soil mobilization, and increased sinkage critically impair rover mobility and highlight the need for a detailed evaluation of rover performance on Earth. The current models, primarily based on terrestrial soil mechanics, often fail to accurately represent the lunar or martial environments, where the soil's cohesiveness, friction, and density can differ significantly, thus affecting rover wheel performance. This paper presents a study about the simulation of rover wheel performance on extraterrestrial surfaces and proposes the development of the Finite Element Method (FEM) to analyze the problems related to rover wheel performance over extraterrestrial surfaces e.g.; slippage-sinkage etc.