Only those candidates who applied in Pingala for MS(R) admission (2024-25 First Sem) will be considered for project-sponsored MS(R) positions.

Last date of application: 30-6-2024

Serial no	MS (Research) Project description (2024-25, First Sem)
AS1	**Project title:** Experiments on acoustic dampers **Project Number:** 2023196 **Name of faculty: Dr. Aditya Saurabh** **Project brief description:** Project on experiments to determine acoustic properties of various sound absorbing structural elements such as acoustic liners and resonators. The research fellow will be expected to design experiments, perform experiments, analyze obtained data, and perform numerical simulations (COMSOL/Matlab). Relevant skills and experience are expected from applicants.
AM1	**Project title:** Development of acoustic materials for controlling vibration-induced damage in space structures. **Project Number:** STC/ME/2023664N **Name of faculty:** Dr. Akhilesh Mimani **Project Expiry Date:** 01-02-2026 **Project brief description:** **Abstract:** A spacecraft at launch is subjected to a very harsh acoustic and vibration environment resulting from the passage of intense acoustic energy created during the lift-off of a launch vehicle, through the vehicle's payload fairing. In order to ensure the mission success of the spacecraft, it is extremely necessary to reduce the resulting acoustic sound pressure levels (SPLs) both in interiors as well as those observed on the exterior surfaces through the usage of acoustic attenuation systems. A controlled acoustic environment is likely to offer significant protection to appendages installed on the spacecraft which includes flexible membrane-type parabolic antenna reflectors (Fig. 1) because a reduced acoustic loading directly translates to a reduction in the amplitude of structural vibrations or minimizing the risk of structural failure. Often, linings made of acoustic absorbent materials such as high-density polyurethane (PU) and melamine foams protected by perforated panels are used to attenuate the interior acoustic field. However, it comes at a cost of a significant increase in mass, thereby putting constraints on the payload capacity. The motivation of the present work, is, therefore, to develop a new class of vibroacoustic metamaterials that are light-weight and simultaneously offer an enhanced acoustic attenuation that can be directly used to provide necessary protection to the spacecraft structure, and in particular, to the hardware installed on space-structures designed and used by ISRO. The focus of this proposal is demonstrating the capability of such newly developed vibroacoustic materials on the prototype model of appendages carried by an ISRO satellite. The continuous demand for materials that simultaneously fulfill a diverse range of functions has resulted in the development of engineered materials, colloquially known as metamaterials which have certain desired physical properties. Of late, acoustic and elastic metamaterial (AM/EM) have received great attention for their unique dynamic material

	properties with one of the primary objectives being the creation of frequency band gaps within which the acoustic or elastic waves exhibit a large attenuation. The proposal will develop a smart AM/EM with the aim to achieve enhanced acoustic and vibration control in space applications. Building upon a recent work on the lattice-based dome-shaped metastructure, the proposal will develop similar metastructure(s) with desired acoustic absorption and vibration transmissibility spectra. To this end, we propose a combined analytical-numerical and experimental campaign. The mechanical and vibrational properties will be evaluated using extensive finite-element (FE) simulations while the acoustics aspect will be analytically studied using the simple plane wave propagation approach (possibly, incorporating thermo-viscous loss modelling at lattice openings) as well as the more accurate FE-based solver. From the experimental side, the metamaterial stiffness will be determined by the load-deflection characteristics on a UTM while the vibrational response will be measured on a laser doppler vibrometer. Impedance tube tests using high-quality microphones will be carried to measure the acoustic absorption characteristics. It is anticipated that the proposed class of metastructure will be useful in applications where lightweight and tunable properties with broadband vibration suppression and wave attenuation abilities are necessary.
BB1	**Project title:** Design and Development of Model Cargo-Hyperloop using Pipe Following Robot **Project Number:** CMPDI/ME/2023625 **Name of faculty: Dr. Bishakh Bhattacharya** **Project brief description:** The traditional transportation system of coals accrues material loss and uncertainty in delivery time, enhancing the chances of air pollution in the environment. The proposed project aims to develop an alternate means of transporting coal/coal slurry from open-cast mines to the user agencies by designing a compressed air-based pipeline to carry a series of cargo modules powered by the drag force. The primary objective of this research is to assess the feasibility of such a transport system for its technical novelty, economic viability, and environmental impact and carry out mathematical modeling for the system to analyze its dynamics and energy requirements. The research also aims to assess the possibility of using the air-levitation concept to conduct operations in a frictionless environment inside the pipeline and carry out its mathematical modeling.
BB2 (02 Positions)	**Project title:** Design and Development of an Integrated Inspection Framework comprising of UGVs(Unmanned Ground Vehicles) with deployable UAVs(Unmanned Aerial Vehicles) for Critical Power infrastructure inspection **Project Number:** SPO/CPRI/ME/2024003 **Name of faculty: Dr. Bishakh Bhattacharya** **Project brief description:** The proposed system consists of two essential components that forms the backbone of the integrated framework of the Non-destructive inspection of critical infrastructure viz. an autonomously guided vehicle (AGV/UGV) acting as a base station where UAVs can be deployed as the task demands. The UGV/Robot can navigate autonomously using SLAM in any given environment of a sub-station. The drones will be housed within the robot acting as a base station. The drones can be deployed remotely in circumstances where certain any specific ROIs fall outside the Field of View of the navigating robot. On deployment the drones can navigate autonomously (manual control by user) to the specific ROI and capture the requisite data and relay it back to the robot (base station). The captured data can then be uploaded in local server via WAN or to the cloud. The entire operation occurs in real-time with simultaneous data streaming to multiple nodes within the network.