National Institute of Technology Rourkela

Progress Seminar

Seminar Title	: Design and Development of Artificial Materials for Acoustic Applications
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Venue	: CAD Lab
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Abstract	: This research ventures a literature survey on the design and development of 3D printed meta-materials for sound absorption however, a vivid study on the most significant parameter dictating the sound absorption performance of a porous material, airflow resistivity (AFR), is also done. Initially, a setup for direct measurement of the AFR is developed following the ISO-9053 standard, and then the results of few indirect measurement methods involving impedance and transmission loss (TL) tubes are compared with the former. The results are obtained in the mid-frequency broadband region unlike the ultra-low frequency narrowband regions common to previous methods. Next, a straightforward method for AFR measurement using the TL tube is proposed eradicating the need of evaluation of the secondary properties such as surface impedance and wave propagation constants for the estimation of AFR. Afterwards, different porous acoustic meta-materials, consisting of various unit cells such as Body centred cubic (BCC), face centred cubic (FCC) etc., are designed and manufactured using the Stereolithography (SLA) 3D printing technique. The AFRs of these meta-materials are measured using the indirect method proposed above and the data obtained is used in the finite element analysis (FEA) for creating better designs consisting the above-mentioned unit cells. Finally, a compact design for enhanced sound absorption is proposed and experimentally tested. The results show promising outcomes and high potential for further developments.