National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Prediction of the natural frequency of the multiwalled carbon nanotube-filled woven glass fibre and metal laminated structure using Artificial Neural Network
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Supervisor	: Prof. Saurav Datta, PIC (Departmental Seminar)
Venue	: Seminar Room, Mechanical Engineering Department
Date and Time	: 06 Sep 2024 (10:30 AM)
Abstract	: The current research explored the predictive model for the natural frequencies of multiwalled carbon nanotube (MWCNT)-incorporated woven glass fibre and metal laminated structures through Artificial Neural Networks (ANNs). The MWCNTs incorporated woven glass fibre laminated structures are prepared by hand layup technique. The engineering constants of the aluminium and MWCNTs-filled woven glass fibre are determined through the uniaxial tensile test as per ISO 527-5 standards. A set of experiments is performed using the modal impact hammer method to capture the natural frequencies of the proposed MWCNTs-FML plates. The numerical simulation is performed through the finite element software ABAQUS by adopting shell elements (S58R) having five degrees of freedom per node by utilizing the obtained engineering constants from the tensile test. The natural frequencies obtained from the experimental technique and numerical simulation are consistence. The ANN model is trained on a comprehensive dataset derived from experimental results and finite element analysis simulations. Later, the laminate sequences, aspect ratio, and side-to-thickness ratio on the natural frequencies are investigated. The ANNs demonstrate high accuracy in predicting the natural frequency, showcasing its potential as a reliable tool for the design and optimization of advanced composite materials. This approach significantly reduces the computational effort and time required for frequency analysis, enabling efficient exploration of material configurations and performance predictions in engineering applications. Keywords: - Natural frequency, multiwalled carbon nanotube (MWCNT), woven glass fibre, Artificial Neural Network (ANN).