National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Numerical study and optimization of hydrodynamic herringbone micro-grooved journal bearing
Speaker	: Hara Prakash Mishra
Supervisor	: Prof. Saurav Datta (2524), PIC Departmental Seminar
Venue	: ME Seminar Hall (ME-001)
Date and Time	: 04 Jul 2025 (04:00 PM)
Abstract	: To enhance the static and dynamic characteristics of bearing under radial loading circumstances, a herringbone texture across the journal bearing surface has been proposed and optimized in this study. The non-linear Reynolds equation is developed for herringbone micro-grooved journal bearing (HMGJB) and numerically solved using the finite difference discretization method and the Successive Over-Relaxation (SOR) algorithm. The study evaluates static characteristics such as pressure distribution, film thickness, load-carrying capacity, frictional torque, coefficient of friction, and side leakage, as well as dynamic characteristics, including stiffness and damping coefficients. To assess the stability of the rotor-bearing system, critical mass and critical whirl frequency are also determined. The static performance of the HMGJB is enhanced by optimizing texture parameters such as groove angle, depth, width, and the number of grooves. An artificial intelligence-based optimization approach using Artificial Neural Networks (ANN) and Adaptive Neuro-Fuzzy Inference Systems (ANFIS) is employed to optimize static characteristics, identifying the most influential parameter affecting the bearing's real-time performance. ANN is used to train the distinctive datasets obtained from the numerical analysis, and the ANFIS surface plot provides the best suitable range of the bearing parameters. The study highlights the significance of numerical methodologies and AI-based optimization techniques in the effective design of HMGJBs, providing key insights for improving bearing performance.