## MECHANICAL ENGINEERING MSc SEMINAR (30 min.)

**Thursday, May 29 2025 at 14:00-14:30**, D. Dan and Betty Kahn Building, Room 217

**Also online: https://technion.zoom.us/j/94861738642**

# Distributed Oscillator Arrays for Optimal Damping of Spatial Vibrating Structures


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The use of Tuned Mass Dampers (TMDs) is a well-established method to reduce vibration in a range of structural systems, from skyscrapers to bridges. These systems are typically designed as single-degree-of-freedom devices, each tuned to reduce a single natural frequency.

The study presents an optimization method for tuning a multi-TMD (MTMD) system to reduce structural vibrations in a wider band of frequencies and several natural modes. The damping is achieved using a magnetic braking based on eddy current induction, demonstrating a way to use an MTMD array while enabling a passive, contactless, and maintenance-free damping mechanism.

To tune the MTMD system, an analytical model was introduced, and an experimental setup was constructed to validate the model. A strong correlation between the analytical model projections and the experiment was observed. This enabled the numerical optimization of the problem using the Nelder-Mead method to find the optimal distribution and arrangement of the TMDs. The optimization goal was to minimize the mean squared response over a selected frequency range.

Finally, sensitivity analyses were conducted to evaluate the effect of several key parameters on the damping performance of the MTMD array. Specifically, the analysis addresses the number of TMDs, their mass distribution, spatial layout, and damping formulation.

The research confirms the effectiveness of optimized TMD arrays for multi-mode damping and lays the groundwork for future applications in complex structural systems.


Note: the seminar will be given in English

Seminars Coordinator: Assoc. Prof. Shmuel Gal.