

MECHANICAL ENGINEERING MSc SEMINAR (30 min.)

Thursday, November 13, 2025, at 13:30-14:00, D. Dan and Betty Kahn Building, Room 217

Zoom link: <https://technion.zoom.us/my/izhak>

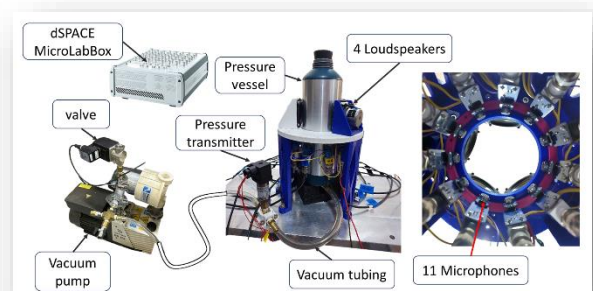
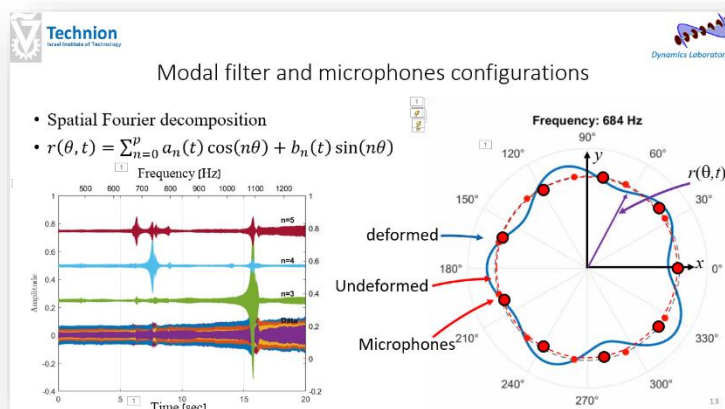
Buckling Prediction using vibrating mode tracking correlated with an imperfect numerical model

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One of the key parameters in designing a pressure vessel subjected to external pressure is shell buckling. Shell buckling is a critical failure mode in which a shell deforms under external pressure, potentially leading to catastrophic failure. Although both analytical and numerical methods are available to estimate the buckling load, the actual buckling load is highly sensitive to manufacturing tolerances and boundary conditions. Static buckling tests can verify a structure's buckling load, but they are unpredictable and require destroying the structure. This study introduces a combined finite-deformation numerical model and an experimental approach for predicting the buckling pressure of thin-walled cylindrical structures. Using modally tuned acoustic excitation and sensing, it is demonstrated experimentally that buckling occurs at 40% of the linearly calculated pressure. An iterative finite-deformation numerical model can accurately predict the critical pressure when geometric imperfections are projected onto the dominant buckling mode shape. The multi-sensor experiment isolates individual vibrating modes in real time, which are closely related to the buckling shapes. Finally, a revised formula is provided to predict changes in resonance frequencies with loading pressure and the extrapolated critical pressure, showing good agreement with experimental results.

Note: the seminar will be given in Hebrew



Seminars Coordinator: Prof. Sefi Givli

