



## **MECHANICAL ENGINEERING MSc SEMINAR (30 min.)**

**Wednesday, December 10, 2025 at 13:30-14:00**, Lady Davis Building, Auditorium 250

### **Detecting Defects in Layered Composite Materials with the use of Controlled Vibrations**

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The research focuses on detecting hidden flaws in layered structures, such as composite materials, through non-destructive dynamic testing (NDT). These flaws, including delamination, gaps, and internal voids, are not visible from the outside and are considered to be dangerous. Various NDT methods are regularly used but have moderate to low success rates.

The study presents a digitally controlled tapping cantilever that automates the manual coin-tapping test, where a technician listens for sound anomalies when a coin strikes a defect. An auto-resonance feedback algorithm, combined with multiple signal analysis techniques, is explored to identify defects early and assess their severity before they cause failure.

This seminar covers resonance-tracking methods to improve the detection of multiple contacts associated with layer separation. Responses from the tapping sensor and the structure are analyzed in real time by separating signal components using the Hilbert Vibrating Decomposition transform (HVD), frequency-domain harmonic analysis and measured response properties. The approaches are tested through detailed simulations involving various defect severities, supported by extensive experimental testing. Results indicate high sensitivity to early-stage defects, providing valuable features for data-driven modeling.

Note: the seminar will be given in Hebrew