



MECHANICAL ENGINEERING MSc SEMINAR (30 min.)

Thursday, November 20, 2025, at 14:00-14:30, D. Dan and Betty Kahn Building, Room 217

Scattering phenomena in classical systems

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This research focuses on the scattering of particles on a nonlinear potential well in both conservative and dissipative regimes. In a one-dimensional conservative case involving two coupled particles, scattering can lead to two distinct outcomes: transition and reflection, with the outcome itself demonstrating a strong correlation with energy transfer processes within the system. In general, the system exhibits strong sensitivity to initial conditions, causing the outcomes to vary wildly with small alterations in system parameters. Under asymptotic conditions, the system yields robust and predictable results, particularly for small coupling-free length or large initial velocities, where analytical approaches accurately predict energy transfer trends within the system.

In the two-dimensional case, with a single particle, the scattering outcomes become non-binary, and the particle may end up in an infinite number of possible trajectories outside the well. A method for calculating the scattering cross-section for potential wells (and hills) is presented, along with several potential forms for which analytical solutions can be derived.

Numerical methods are applied to explore the motion of the systems, enabling detailed examination of their trajectories and scattering outcomes. The analytical treatment in both cases proves to be challenging, as perturbation methods, commonly applied in studies of escape dynamics, are not suitable for scattering problems, where particles are initially located outside the well.

Note: the seminar will be given in Hebrew