OBJECTIVE

The workshop aims at introducing some of the concepts of nonlinear oscillations/vibration theory in the context of weakly and strongly nonlinear single and multi-degree of freedom dynamical systems. The workshop begins with a basic introduction to the nuances of nonlinear vibration theory and some of the well-known analytical methods in qualitatively and quantitatively describing their dynamics. Further, it introduces the canonical perturbation theory and action-angle variables for Hamiltonian systems and their applicability in the analysis of this class of dynamical systems. This is followed by a discussion on nonstationary dynamics and the introduction of the concept of limiting phase trajectories in coupled nonlinear oscillators. The analysis of non-smooth systems requires the introduction of non-smooth time transformations and the stability of solutions in such systems need the idea of saltation matrix. The final part of the workshop discusses some interesting aspects of wave propagation phenomena in nonlinear lattices like Hertzian granular chains, binary collision models and would provide a flavour of some interesting analytical methodologies and recent results.

Some of the topics discussed in this workshop are not part of the conventional academic curriculum but are extremely useful tools in this domain of research. The workshop aims at giving a flavour of some of these ideas.

WORKSHOP CONTENT

Basics of nonlinear oscillations and introduction to perturbation methods (quasilinear systems)

General properties of Hamiltonian systems, Action Angle variables, canonical perturbation theory

Localization in nonlinear systems and Nonlinear Normal Modes (NNMs)

Nonstationary dynamics, transient processes, beating phenomena, Limiting Phase Trajectories (LPTs)

Stability of periodic solutions and Floquet theory.

Non-smooth systems, NNMs, localization, nonstationary responses, stability (saltation matrix)

Dynamics of nonlinear lattices (Hertzian chains), solitary waves

INSTRUCTORS

Prof Oleg Gendelman (Technion, Israel)
Prof Yuli Starosvetsky (Technion, Israel)
Prof K R Jayaprakash (IITGN, India)

WORKSHOP INTENDED FOR

- Faculty from engineering institutions
- Students at all levels (BTech/MSc/MTech/PhD) from academic/technical institutions across all disciplines
- Scientists from government and private organisations and R&D Labs