# MECHANICAL ENGINEERING STUDENT SEMINAR

**Wednesday, March 12 2025 at 13:30**, D. Dan and Betty Kahn Building, Room 217.
**Online:** https://technion.zoom.us/j/98135150186

## Investigation of Unladen and Fiber-Laden Coaxial, Round Water Jets

David Hasin

**Adviser: Assoc. Prof. René van Hout**

Coaxial jets are extensively used in industrial and biomedical applications. They consist of inner and outer jets and exhibit wake or shear layer instabilities depending on the ratio between the outer and inner jet exit velocity, $r_u$. The first part of this research focuses on unladen coaxial jet flows and in particular the effect of increasing Reynolds number on the spatial distributions of mean velocities, Reynolds stresses, and terms of the turbulent kinetic energy budget were evaluated. Measurements were performed using time-resolved, planar particle image velocimetry (PIV) at three values of $r_u$. In addition, vortex characteristics in the near-field of the coaxial jet were analyzed based on the vorticity, and swirling strength distributions.

The second part of this research focused on the interaction between inertial, nylon fibers and the vortices in the near-field of a coaxial water jet. When fibers are introduced, their inertial effects are governed by the Stokes number (St), which is defined as the fiber response time relative to a suitable flow time scale. The fibers were issued from the inner jet and simultaneous measurements of instantaneous flow field and fiber motion were performed. Results indicated that fiber translational and rotational motions were strongly influenced by the instantaneous flow field and in particular by the strong toroidal vortices residing in the inner shear layer at high $r_u$. Abrupt changes in velocity and orientation occurred as fibers interacted with those vortices. This study provides a detailed analysis of fiber-flow coupling, focusing on flow regime characteristics, fiber slip characteristics, and fiber tumbling rates. These findings reveal how the inner shear layer in a spatially developing coaxial jet affects fiber motion and provide valuable insights into fiber-flow interactions in these complex turbulent environments.

Note: the seminar will be given in English

Seminars Coordinator: Assoc. Prof. Gal Shmuel.