סמינריון

הנך מוזמן/ת להרצאה סמינריונית **במסגרת הדוקטורט** של הפקולטה להנדסת מכונות

שתתקיים ביום ד׳ 5.02.2020 (י׳ בשבט, תש״פ), בניין דן קאהן, חדר 217, 13:30.

מרצה: ליאור אשבל

מנחה: פרופ״מ רנה ואן האוט

מנחה שותף: פרופ׳ דוד גרינבלט

על הנושא:

Tomographic PIV measurements in the wake of a stationary and a tethered sphere undergoing VIV

The seminar will be given in English

תקציר ההרצאה :

Vortex induced vibrations (VIV) of structures exposed to flows may be both detrimental to their structural integrity as well as beneficial in the case of energy harvesting applications. Spheres may be considered prototypical bluff bodies. Although many qualitative dye visualisations of the flow in the wake of a stationary sphere have been performed, little quantitative data are available. Furthermore, the amplitude response of tethered spheres is well studied, however, little is known about the 3D flow field in the wake of an oscillating tethered sphere.

In this work, the 3D flow field in the wake of a stationary held sphere (D = 8 mm) as well as a tethered sphere (D = 6 mm, $m^* = m/m_f = 7.77$) undergoing VIV in a water tunnel, was measured using tomographic particle image velocimetry (tomo-PIV). The position and orientation of the tethered sphere was simultaneously tracked to link the characteristic structures in the wake of the sphere to its dynamics. Reduced velocities and Reynolds numbers ranged between $1.9 < U^* (= U/f_N D) < 22.8$ and $230 < \mathrm{Re} (= UD/\nu) < 2{,}696$, respectively. Measurements in the wake of the stationary sphere provided insight into the generation of secondary vortices that were never seen in dye or smoke visualizations. For the tethered sphere, characteristic vortices that exert forces on the sphere, changed significantly for different U^*, in correspondence to the changing sphere oscillation dynamics. At $U^* = 3.6$, "omega-shaped" vortices having a symmetry plane parallel to gravity were shed periodically while the sphere remained stationary. At $U^* = 5.8$, "hairpin-like" vortices having a symmetry plane perpendicular to gravity were alternately shed, while the sphere experienced VIV. These pinched-off as interconnected vortex rings further downstream. Transient measurements in the tethered sphere's near wake have shed light on the wake instability upon crossing the Hopf bifurcation. Results of this study will help in optimizing energy harvesting applications using tethered bluff bodies.

בברכה,

פרופ״א מתי סאס

מרכז הסמינרים