הטכניון – מכון טכנולוגי לישראל
הפקולטה להנדסת מכונות

TECHNION – Israel Institute of Technology
Faculty of Mechanical Engineering

SEMINAR - סמינר

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ב' 23.02.15 (ד' באדר, תשע"ה), בבניין דן-קאהן, קומה 0, באודיטוריום 1, שעה 14:30.

<u>ירצה</u>:

Prof. Jim Gregory

The Ohio State University
Presently Fulbright scholar at the Technion's Faculty of Mechanical Engineering

<u>על הנושא</u>:

Unsteady Pressure Measurements on Rotor Blades using Fast Pressure-Sensitive Paint

<u>להלן תקציר ההרצאה</u>:

This presentation will detail the development and application of Pressure-Sensitive Paint (PSP) for pressure measurement on rotating helicopter blades in forward flight. Pressure-sensitive paint is an optical technique for measuring surface pressure over a model of interest. The technique offers the advantages of very high spatial resolution, relatively low cost, and easy application. These features make PSP ideal for investigating complex flow phenomena encountered on a rotor, such as three-dimensional dynamic stall and blade-vortex interaction. There are several challenges that must be overcome for successful use of PSP on rotating helicopter blades. First, the unsteady pressure phenomena occur at frequencies (> 100 Hz) that are well beyond the frequency response of traditional PSP. Second, the rotating blade exhibits cycle-to-cycle variations in blade position and orientation for a given phase within a rotation, which precludes cycle averaging. Furthermore, the blade rotation speed is fast relative to typical exposure times, leading to blurring of the blade image and loss of spatial resolution. Finally, the dynamic pressures on a rotor blade in low-speed forward flight are low, leading to low signal-to-noise ratio of the PSP measurement. This presentation details the development of PSP formulations, data acquisition, and data analysis methods to overcome these challenges. Relatively new porous PSP formulations are discussed, along with calibrations of their dynamic response. A new data acquisition method based on single-pulse excitation of the PSP was developed to overcome cycle-to-cycle blade position errors. Inverse algorithms for image deblurring were created to effectively deblur the rotor images, leading to restoration of data at the blade leading and trailing edges. The culmination of this work is application of the technique to a small-scale rotor investigation at Ohio State and large-scale rotor work in external labs.

בברכה,

המארח: פרופ'/ח דוד גרינבלט

פרופ'/א אמיר שת
מרכז הסמינרים