Technion-Israel Institute of Technology
Faculty of Mechanical Engineering

הטכניון-מכון טכנולוגי לישראל
הפקולטה להנדסת מכונות

סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ה' 29.06.17 (ה' בתמוז, תשע"ז), בניין דן-קאהן, אודיטוריום 1 , 13:30.

יצה: יאיר אדלשטיין

מנחה: פרופ' אלי אלטוס

על הנושא:

Optimal load distribution for maximal sensitivity of local stiffness variations

The seminar will be given in Hebrew

להלן תקציר ההרצאה:

Development of tools for assessing local variations of stiffness in structures is important in discovering cracks in structures, lumps with exceptional stiffness suspected as malignant and more. Most diagnostic instruments are based on collecting wave returns from several places, e.g. X-ray and ultrasound. In most cases density changes are achieved rather than moduli changes.
The objective of our research is to carry out a study of using the optimal distribution of external static loads in order to find the structure's maximal sensitivity for heterogeneity. We define sensitivity as the ratio between the energy of a heterogeneous problem to the energy of a homogenous one for the same set of external loads. Heterogeneity is defined as a small local variation in the structure's moduli. A couple of simple beam problems were solved, for which the structure's response was examined and heterogeneity's characteristics were found. Information received from a zero sensitivity case enables us to reveal the location of the heterogeneity. Those former comprehensions brought us to formulate a generalized parametric study of the problem, from which an analytical study of the relationship between heterogeneity characteristics (location, width, and moduli difference) and changes in sensitivity was developed.
The numerically solved problems and a detailed parametric description lead to a model of a generalized eigenvalue problem. The eigenvalues of the problem are the optimal sensitivities of the structure, while the eigenvectors contain the set of loads yielding those sensitivities. As well, the dimension of the problem is defined by the number of external loads. More loads will provide more information regarding the characteristics of the heterogeneity. There is a limitation on the amount of local heterogeneities with regard to the number of loads in order to be able to reveal the heterogeneity's characteristics.
The above model offers optimal sensitivity examination analytically, which has a potential in many emerging fields of engineering, e.g. damage identification of structures.

בברכה,

פרופ"א שאול אזולאי

מרכז הסמינרים