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׳
30.11.2017 (י״ב בכסלו, תשע״ח), בניין דן-קאהן, אודיטוריום 1 , 13: 30.

מרצה: אלי חנוכה

מנחה: פרופ׳/ח ספי גבלי

על הנושא:

Analytical and semi-analytical approaches applied to the nonlinear mechanical behavior of 3-D structures

The seminar will be given in Hebrew

להלן תקציר ההרצאה:

Analytical solutions for the behavior of 3-D structures may be extremely useful but are usually very difficult to obtain. The main goal of this research is the development of new approaches that promote analytical or semi analytical insights. In this talk, I will present two different applications. (i) The first involves the free-vibration of three-dimensional non-rectangular parallelepiped, aiming at providing closed form expressions for the natural frequencies by means of a systematic approximation. We show that our second order closed form solution for the cube significantly improves currently available analytical approximations. In addition, based on a fourth order approximation, we derive a simple explicit expression for the fundamental (lowest) frequency covering the entire range of Poisson's ratios. Moreover, we obtain, for the first time, closed form expressions, based on a second order approximation, for the fundamental frequencies of rectangular bricks and of skewed rhombohedra. These solutions cover the entire range of aspect ratios, from thin plates through a cube to slender beams, and the entire range of skew angles. (ii) We present a new approach to compute the mass matrix of solid finite elements which allows a significant reduction in the number of integration points. The method is based on exploiting information regarding the mathematical form of the integrand. This enables higher degree of precision for the same number of integration points compared to standard quadrature use. The approach is general and can be applied to both consistent and lumped matrices of all element types. Here, we focus on the consistent mass matrix of the widely used 10-node tetrahedral 8-node and 20-node hexahedral elements; we demonstrate the superiority of the new approach over conventional quadrature use. In addition, we develop a novel approach for direct computation of the inverse mass matrix of 8-node hexahedral elements. This new approach requires a computational effort equivalent to standard numerical integration and eliminates the high computational cost associated with matrix inversion.

בברכה,

פרופ״מ מתי סאס
מרכז הסמינרים