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Πανεπιστήμιο Πατρών

ΘΕΜΑ: **A Boundary Element Method (BEM) for solving elastic problems with microstructure**

ΤΟΠΟΣ: Αίθουσα Σεμιναρίων ΙΤΕ/ΕΙΧΗΜΥΘ

ΗΜΕΡΟΜΗΝΙΑ: Τετάρτη, 6 Ιουλίου 2005

ΩΡΑ: 17:00

ΠΕΡΙΛΗΨΗ

Older and recent experimental observations have shown that some materials are significantly affected by their microstructure and exhibit a mechanical behavior which is different than that expected classically. Polycrystals, polymers, metallic foams, granular materials, nanomaterials, concrete, bones and particle/fiber reinforced composites are some examples of such materials. These microstructural effects become more pronounced especially when the size of the tested specimens becomes small as well as in cases where generated wave lengths have the same order of magnitude with the microstructure of the considered materials.

The classical theory of linear elasticity fails to describe such a behavior since it is a continuum theory associated with concepts of homogeneity and locality of stresses. When the material exhibits a non homogeneous behavior, microstructural effects are important and the state of the stresses has to be defined in a non local manner. Thus, due to the lack of internal length scale parameters, classical elasticity fails to predict wave dispersion in non homogeneous materials, to interpret size effects even in materials with common microstructure and to provide finite stress fields at crack tips and dislocation lines where the microstructural effects are essential. There are, however, other generalized continuum theories, like those of couple stresses or micropolar elasticity, non-local elasticity and higher order strain gradient elasticity, where microstructure effects are taken into account and thus materials with microstructure can be successfully modeled in a macroscopic manner

In this presentation, a BEM in its direct form is addressed for the solution of three-dimensional elastic problems in the framework of a simple higher order gradient theory. For the sake of simplicity, the present version of the implementation of the method is confined to smooth boundaries and computation of boundary displacements and stresses. Several problems that demonstrate the accuracy of the proposed BEM and the advantages of higher order gradient theories are presented.