Dipartimento di Strutture per l'Ingegneria e l'Architettura (DiSt)

Nell'ambito delle attività del **Corso di Dottorato** in **Ingegneria Strutturale Geotecnica e Rischio Sismico**

24-27 settembre 2019, ore 10-12 e 14-16

Prof. Elio Sacco

(DiSt - Università degli Studi di Napoli Federico II)

terrà un corso breve dal titolo

Micromechanics homogenization and multiscale analysis of composite materials

Composite materials are increasingly spreading in several areas of engineering, thanks to the remarkable mechanical performances and the reduced production costs and installation. The analyses of structural elements, made of composite materials, require the development of multiscale approaches able to consider the complex nonlinear response of the composites. The multiscale technique consists in the modeling of the structure taking into account two different scales: the macro-scale, i.e. the scale at the structural level, and the micro-scale, i.e. the scale at the material level, where the heterogeneity can be distinguished in the material. If the heterogeneity size is significantly smaller than the structural size, the two scales can be considered separated and it is possible to solve the micromechanical problem at each point of the structure and to perform a homogenization process in order to derive the constitutive response for the structural analysis.

A major problem in the multiscale analysis is the development of an effective, i.e. simple and accurate, solution of the micromechanical problem. In fact, the multiscale problem can be solved using nonlinear finite element (FE) analyses both at the material and at the structural level, i.e. the FE2 multiscale scheme. The FE2 is adopted inducing a large number of historical variables that can lead to very high computational burden and time. In order to improve the multiscale approach and to reduce the number of historical variables, the nonlinear overall response of the composite can be derived adopting homogenization techniques. In literature, several techniques have been presented for solving the homogenization problem of nonlinear composites.

The Course introduces the multiscale analysis of composite structure discussing the problems of the micro-modeling of the composites and illustrating the homogenization techniques. In particular, the case of elasto-plastic and visco-plastic composites is considered; moreover, the problem of the cracking of the matrix and the debonding of the fiber from the matrix is also treated.

Via Claudio, 21 – edificio 6, aula Manfredi Romano (1° piano)

Tutti gli interessati sono invitati a partecipare

Il Coordinatore del Dottorato
Prof. Ing. Iunio Iervolino