



UNIVERSITÀ DI PISA

DIPARTIMENTO DI INGEGNERIA STRUTTURALE

*Dottorato in Ingegneria delle Strutture*

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## AVVISO DI SEMINARIO

*Nell'ambito delle iniziative promosse  
dal Corso di Dottorato in Ingegneria delle Strutture*

**mercoledì 23 giugno, alle ore 16.30,**

**il Prof. Roberto BALLARINI,**  
della *Case Western University, Cleveland (Ohio),*

terrà un seminario dal titolo

### **Breaking invisible specimens with zero force**

***Abstract.** Microelectromechanical systems (MEMS) devices have been developed to measure the strength, fracture toughness, and subcritical crack growth rates of polycrystalline silicon and silicon carbide at the micron scale. These devices have been fabricated using standard MEMS processing techniques, and so have characteristic dimensions comparable to typical MEMS components (notches, cracks and uncracked ligaments of several microns). The first device involves a specimen that is fully integrated with simultaneously fabricated electrostatic actuators that are capable of providing sufficient force to ensure failure under monotonic or cyclic loading. The second is a passive device that is loaded, upon release, by the residual stresses that develop during processing. For both devices the entire experiment takes place on-chip, eliminating the difficulties associated with attaching the specimen to an external loading source. The first part of this talk presents experimental results obtained on silicon and silicon carbide. The second part of the talk describes the progress made towards the development of similar on-chip (MEMS) devices to test the mechanical properties of collagen fibrils and carbon nanotubes.*

**Il seminario sarà tenuto nella sala riunioni del DIS.**

Pisa, 16 giugno 2004

Il Presidente del Corso di Dottorato  
(Prof. Stefano Bennati)