AUT UNIVERSITY COMPUTER + MATHEMATICAL SCIENCES

Mathematical Sciences Seminar Series

Title : **Configurational forces and structural stability**

Speaker : **Dr. Francesco Dal Corso**

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Abstract: The concept of configurational force has been introduced by Eshelby to describe the motion of massless (for instance voids, microcracks, vacancies, or dislocations) or heavy (for instance inclusions) defects within a solid body as the result of mechanical or thermal loading. This concept has been exploited through the years to model the crack-driving force in fracture mechanics, the Peach-Koehler force of dislocations, or the material force developing on a phase boundary in a solid under loading.

The action of configurational forces on elastic structures is theoretically and experimentally proven in the presence of a specific movable constraint: a frictionless, perfectly smooth and bilateral sliding sleeve. In particular, the presence of an outward configurational force at the exit of the sliding sleeve is disclosed both via variational calculus and independently through an asymptotic approach.

The analysis of structural system constrained by configurational constraints discloses some intriguing behaviour. With reference to an elastic rod constrained by a frictionless sliding sleeve ending with a linear spring and subject to a dead load at the other end, it is found (i.) an increase of buckling load at decreasing of elastic stiffness; (ii.) a finite number of buckling loads; (iii.) more than one bifurcation loads associated to each bifurcation mode; (iv.) a restabilization of the straight configuration after the second bifurcation load associated to the first instability mode. Moreover, in the case that the constraint is tilted with respect to the dead load direction, an "asymptotic self-restabilization" in the following sense: although bifurcation does not occur because the system is imperfect, the deflection initially grows and subsequently decays up to vanish during a monotonically increasing loading.

The presented structural systems are modelled as nonlinear elastic structures and solved analytically. Physical models have been designed, realized and tested, confirming the theoretical predictions.

Time : **11:00-12:00 Thursday 8th February 2018**
Place : **WT121, AUT**

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