

**Course offered for the PhD program  
in Civil, Chemical and Environmental Engineering  
Curriculum in Structural and Geotechnical Engineering, Mechanics and Materials  
a.y. 2013/2014 (XXIX ciclo)**

(course is open for participation of students from other PhD cycles or programs)

**1. Title**

Nonlinear Models of Elastic Beams and Cables

**2. Course Description**

The course discusses some mono-dimensional models of elastic beams and cables. Models are 'direct', formulated by a 1D continuum immersed in a 3D space. Kinematics is exact, the balance equations are deduced from the Virtual Power Theorem; constitutive laws are identified by the 3D models through an energy equivalence based on an approximate kinematics. Special emphasis is given to the introduction of internal constraints, in the spirit of mixed and displacement formulations. We consider both locally rigid beams (1D models of undeformable-section 3D beams) and locally-deformable beams (deformable-section models of thin-walled beams). Models of flexible cable, eventually equipped with flexural-torsional stiffness, are also formulated.

**3. Course Organization**

The course is addressed to the deduction of the equations of motion. Besides specific cases (carried out by Dr Daniele Zulli) applications will be referred to another course, presumably to be held the next academic year.

Contents faithfully reproduce the book *Mathematical Models of Beams and Cables*, by Angelo Luongo & Daniele Zulli, ISTE-Wiley, 2013, which will serve as teaching support.

**4. Teacher**

Angelo Luongo, University of L'Aquila

**5. Duration and credits**

30 hours (6 credits)

**6. Activation mode and teaching period**

The course will take place on Thursday afternoon/Friday morning from January 23, 2014 until February 14, 2014 (4 weeks). Applications can be made via email by writing to [giuseppe.piccardo@unige.it](mailto:giuseppe.piccardo@unige.it).

**7. Deadline for registration**

It will be possible to register up to January 21, 2014.

**8. Final exam**

The final exam is oral (unless otherwise agreed with the teacher) and may be held on the last day of the course (Friday, February 14) or later by appointment.