

**Course offered by the PhD program
in Civil, Chemical and Environmental Engineering
a.y. 2025/2026 (41 cycle)**

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

1. Title

Lattice-type Models and Lattice-like Materials

2. Course Description

Lattice models in mechanics. Local and non-local interactions. Mechanistic vs phenomenological description, Central and non-central interactions. Pairwise interactions. Cauchy relations, Voigt model. Born model and rotational invariance. Micro-macro moduli correspondence scheme.

Lattice-like materials, square and hexagonal periodic microstructures. Chiral and non centrosymmetric microstructures. Theoretical isotropy and auxetic behavior. Lagrangian description and Equilibrium equations. Identification of equivalent local and non-local continua. Material symmetries.

Introduction to continuum-molecular models and peridynamic theory. Bond-based and state-based models. Micropolar formulation. Anisotropy, influence functions, and meshfree discretization. Analogies between continuum-molecular models and lattice materials.

3. Course Organization

The course consists of 15 hours of lectures. The contents are developed directly by the teacher and the slides of the course are available for the students.

4. Teacher

Vito Diana

5. Duration and credits

The course is developed in two or three weeks in accordance with the students. The number of credits is 3.

6. Activation mode and teaching period

The course is given in the period June-July.

Application: email message to the teacher (vito.diana@unige.it)

7. Deadline for registration

One month before the beginning of the Course.

8. Final exam

Home assignment