

Mini-symposium on

## MECCANICA E MATERIALI 2019, GMA (MECHANICS AND MATERIALS 2019, GMA)

XXIV Congresso Associazione Italiana di Meccanica Teorica ed Applicata, AIMETA  
Roma, 15-19 Settembre 2019, <http://www.aimeta2019.it/>

The mini-symposium “Mechanics and Materials 2019, GMA” is promoted by the AIMETA group Mechanics of Materials (Gruppo Meccanica dei Materiali, GMA). The goal of the GMA is to encourage and foster research and development in the broad field of materials and to provide a forum for networking and technical information exchange among scholars interested in material mechanics, science, and engineering.

The aim of the mini-symposium is to bring together scientists from different fields and communities with the purpose of discussing fundamental advances and concepts, towards identification of future developments. Contributions are sought on both basic and applied topics and presentations are encouraged on:

- Mechanics of new advanced materials with novel or improved properties
- Materials modelling and simulation with focus on multi-scale and multi-physics phenomena
- Smart materials and structures
- Integrated design and optimisation of multi-functional materials/structures for sustainable growth
- Inspiration by nature: promotion of eco-design, bio-inspiration, natural materials
- Control of the material performance during life cycle

Three **thematic sessions** will be organised within the mini-symposium (see next page for details):

“Recent advances in the mechanical modelling of metamaterials and periodic structures”  
organisers: A. Bacigalupo, F. Dal Corso, M.L. De Bellis, A. Piccolroaz

“Mechanics and shape control of active structures”  
organisers: G. Noselli G., A. Lucantonio

“Soft smart materials”  
organisers: M. Gei, L. Bardella

*The organisation of other thematic sessions will be welcome.*

### Mini-symposium Organisation:

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### **“Recent advances in the mechanical modelling of metamaterials and periodic structures”**

Organisers: Andrea Bacigalupo, Francesco Dal Corso, Maria Laura De Bellis, Andrea Piccolroaz  
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IMT School for Advanced Studies, Lucca; University of Trento, Trento

The thematic session aims at providing a forum for the presentation and discussion of the most recent theoretical, numerical and experimental results in the field of the mechanical modelling of composite materials, metamaterials and periodic structures. The topics include but are not limited to:

- Identification of equivalent homogeneous solids;
- Material instabilities;
- Behaviour under extreme conditions;
- Sonic wave propagation, polarization and scattering;
- Wave propagation control;
- Nonlocal constitutive modelling and advanced homogenization techniques;
- Mechanics of defects;
- Strain localization phenomena;
- Multi-field problems;
- Thermal, plastic and viscous phenomena.

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### **“Mechanics and shape control of active structures”**

Organisers: Giovanni Noselli, Alessandro Lucantonio  
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Natural structures typically exhibit non-trivial shapes which are determined by processes such as growth, swelling, or biological activity. Examples range from the morphogenesis of plants and animal tissues to the emergence of complex shapes in thin structures made of stimuli-responsive polymers. In these structures, the interplay between mechanics and geometry has profound implications on their function, and a more quantitative understanding of these connection has just started to emerge. Recently, there has been an impetus in developing strategies to control the shape of synthetic structures, sometimes replicating natural principles, and a major thrust in research is driven by technological applications in the fields of soft-robotics and biomedicine. This thematic session aims at gathering researchers from different disciplines sharing the interest in the following topics:

- mechano-biology of growth in plants and animal tissues;
- stimuli-responsive polymers and gels;
- shape control of thin structures;
- fabrication techniques for programmable materials.

### **“Soft smart materials”**

Organisers: Massimiliano Gei, Lorenzo Bardella  
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The class of soft smart materials gathers various types of material whose strain response following non-mechanical input is nonlinear. Their features are mainly utilised to realise soft devices working at large deformations such as actuators, sensors, and energy harvesters. A non-exhaustive list of members of this class includes: dielectric and magneto-sensitive elastomers, ionic electro-active polymers, liquid crystal elastomers, hydrogels, and biological tissues. Although each type of material possesses its own activation mechanism(s), the experimental, theoretical, and computational methodologies to face and solve research challenges in this area should rely on a common ground. The proposed thematic session aims at convening scholars expert in nonlinear effects in active materials with the goal of sharing the latest research outcomes in the field.