



Topics and faculty

The summer school Nonlinear Life focuses on a converging sciences approach to engineering themes related to human health.

This year the summer school reaches its fourth edition: the first two took place in Riga, Latvia in 2017 and 2018 and the third one was organized in Trieste, Italy in 2019, all with successful participation of European and Extra-European students. The previous editions covered a wide range of new technologies for human health – virtual and augmented reality for medicine, medical physics in oncology, smart textiles in motion capture, new generation biomedical fibers and their production technologies, artificial intelligence in medical physics research, chaos and orderliness, structural biology, nanotechnology, big data in health.

The summer school **Nonlinear Life | 4th edition** taking place online will be on **“Advances in materials for medicine”**, focusing on the following macro-areas:

1. Metallic biomaterials
2. Polymeric biomaterials
3. Ceramic biomaterials and coatings
4. Composite materials, nanostructured, engineered tissue and characterization of materials.

1. Metallic biomaterials

- 1.1. Biocompatibility of metallic materials: corrosion resistance and ion release (M. Cabrini, University of Bergamo, Italy)
- 1.2. Materials for total knee joints prosthesis (A. Piavani, Gruppo Bioimpianti, Italy)

- 1.3. Trabecular titanium and additive manufacturing for biomedical devices (L. Fedrizzi, University of Udine, Italy)
- 1.4. Magnesium alloys for bioresorbable metallic devices (H. Gerengi, Duzce University, Turkey)
- 1.5. Experiences of Quarenghi Institute in neuromotor rehabilitation (M. Simonini, Istituto Clinico Quarenghi, Italy)

2. Polymeric biomaterials

- 2.1 New polymeric biomaterials (S. Farè, Politecnico di Milano, Italy)
- 2.2 Natural polymers of bacterial origin in tissue engineering (I. Roy, University of Sheffield, UK)
- 2.3 Innovative bio-hybrid silk fibroin/polyurethane vascular prostheses for the endogenous regeneration of tissues (S. Riboldi, A. Caldiroli, Bioengineering Laboratories, Italy)
- 2.4 3D printing of polymers for biomedical devices (R. Levato, University Medical Center Utrecht, The Netherlands)
- 2.5 Nanostructured biomimetic coatings for mimicking hard tissue and improving biological interactions (G. Graziani, Istituto Ortopedico Rizzoli, Italy)

3. Ceramic biomaterials and coatings

- 3.1 Osteoconductive and antibacteric coatings (R. Chiesa, Politecnico di Milano, Italy)
- 3.2 Bioceramics (F. Zivic, University of Kragujevac, Serbia)
- 3.3 Biocompatibility testing and development phases of medical implants (F. Zivic, University of Kragujevac, Serbia)
- 3.4 Thermal bioceramics coatings for hard tissue applications (P. Robotti, Eurocoating, Italy)
- 3.5 Oxide ceramics: state of the art and perspectives (C. Piconi, Istituto di Scienza e Tecnologia dei Materiali Ceramici, Consiglio Nazionale delle Ricerche, ISTECCNR, Italy)
- 3.6 Bioglass (O. Tsigkou, University of Manchester, UK)

4. Composite materials, nanostructured, engineered tissue and characterization of materials

- 4.1 Tissue engineering (C. Campiglio, University of Bergamo, Italy)
- 4.2 Chemical functionalization of textile fibers (G. Rosace, University of Bergamo, Italy)
- 4.3 Weak electrons nonlinear emission: great impact to characterize nanomaterials (Y. Dekhtyar, Riga Technical University, Latvia)
- 4.4 Non-invasive health monitoring in experimental medical environments (A. Katashev, Riga Technical University, Latvia)
- 4.5 Polysaccharide-based antimicrobial nanomaterials for medical applications (U. Bunyatova, Baskent University, Turkey)