ADMISSION

The webinar will be hosted on the Microsoft Teams platform.

The registration fee is 100.00 Euro + VAT*, where applicable (bank charges are not included).

CISM will financially support students participating in the Advanced Webinar by providing free registration to a number of PhD student and early stage researchers.

Online registration is available at https://www.cism.it/en/activities/courses/E2014

A message of confirmation will be sent to accepted participants.

The application deadline is November 30, 2020.

For further information, please visit CISM website.

* Italian VAT is 22%.

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CISM

COMPUTATIONAL BIOMECHANICS

ADVANCED MODELS AND METHODS

Advanced Webinar
Coordinated by

Wolfgang A. Wall
Institute for Computational Mechanics & Center
for Computational Biomedical Engineering
Technical University of Munich, Germany

Bernhard A. Schrefler
CISM and Department of Civil, Environmental
and Architectural Engineering
University of Padua, Italy

December 2 - 4 2020

COMPUTATIONAL BIOMECHANICS - ADVANCED MODELS AND METHODS

Mechanics plays a dominant role in many biological systems and biomedical scenarios. Because of the complexity of those systems, often advanced models and computational methods are mandatory to provide essential insight and unravel complex situations. This advanced webinar will cover a broad range of highly up-to-date topics in computational Biomechanics, where each individual topic is presented by an international leading scientist in the respective field.

LECTURERS

Marek Behr
Chair for Computational Analysis of Technical Systems, RWTH Aachen University, Germany

Dominique Chapelle
Inria and Institut Polytechnique de Paris, France

Christian Cyron
Helmholtz-Zentrum Geesthacht
& Hamburg University of Technology, Germany

Antonio De Simone
SISSA-MathLab, Scuola Internazionale di Studi Avanzati, Trieste, Italy & The BioRobotics Institute and Department of Excellence in Robotics and AI, Scuola Superiore Sant'Anna, Pisa, Italy

Bernhard A. Schrefler
CISM and Department of Civil, Environmental and Architectural Engineering, University of Padua, Italy
& TUM Institute for Advanced Studies, Munich, Germany

Wolfgang A. Wall
Institute for Computational Mechanics & Center for Computational Biomedical Engineering, Technical University of Munich, Germany

PROGRAMME

Session I - Wolfgang A. Wall
Lectures on "Respiratory Biomechanics"

Topics covered: Introduction to the respiratory system; biomechanical aspects/questions and modeling approaches wrt human lungs; computational methods for resolved and reduced dimensional respiratory models; concrete clinically relevant scenarios and Covid-19 relevant aspects.

Session II - Dominique Chapelle
Lectures on "Cardiac Biomechanics"

Topics covered: Introduction to cardiac physiology; active and passive behavior in cardiac tissue; Huxley's sliding filament theory; coupling with blood circulation; experimental and clinical validations.

Session III - Christian Cyron
Lectures on "Growth and Remodeling of Biological Tissues"

Topics covered: Introduction into mechanobiology; basics of soft tissue mechanobiology and bone mechanobiology; computational modeling of growth and remodeling.

Session IV - Marek Behr
Lectures on "Shear Stress and Blood Damage in Biomedical Devices"

Topics covered: Physiological modeling in cardiovascular flow simulation; constitutive models for blood; computational prediction of hemolysis; numerical design of biomedical devices.

Session V - Antonio De Simone
Lectures on "Biomechanics of Cell Motility"

Topics covered: Introduction to cell motility; mathematical modeling of cell motility; controlled motility by controlled shape change; applications to unicellular swimmers and to bio-inspired swimming micro-robots.

Session VI - Bernhard A. Schrefler
Lectures on "Computational Oncophysics"

Topics covered: Modelling of tumor growth as a two phase system; as a three (+) phase system; modelling of angiogenesis; modelling of drug delivery and drug efficiency.

SCHEDULE

Wednesday, December 2

08.40 - 09.00 **Welcome**

09.00 - 10.30 Session I - Wolfgang A. Wall

11.00 - 12.30 Session I - Wolfgang A. Wall

14.00 - 15.30 Session II - Dominique Chapelle

16.00 - 17.30 Session II - Dominique Chapelle

Thursday, December 3

09.00 - 10.30 Session III - Christian Cyron

11.00 - 12.30 Session III - Christian Cyron

14.00 - 15.30 Session IV - Marek Behr

16.00 - 17.30 Session IV - Marek Behr

Friday, December 4

09.00 - 10.30 Session VI - Bernhard A. Schrefler

11.00 - 12.30 Session V - Antonio De Simone

14.00 - 15.30 Session V - Antonio De Simone

16.00 - 17.30 Session VI - Bernhard A. Schrefler