VENUE INFORMATION

This is a course offered to Graduate students interested in current research in solid and fluid mechanics. The course runs September 15-17, 2019, just before the conference ECCOMAS MSF 2019, which is held September 18-20, 2019 (for more details, please visit conference webpage: <u>http://www.gf.unsa.ba/eccomas-msf-2019/</u>).

Despite a reduced fee, the course students will also be admitted to the conference scientific program, but not to all social events. The course students are, in general, not expected to make presentation at MSF 2019.

The ECCOMAS MSF Conference Course venue is the capital of Bosnia and Herzegovina *Sarajevo*. The city urban area provides homes to the population of close to half a million over a spread of more than 20 km along the river Miljacka. Sarajevo, which is located in the center of the country, has been the major crossroad on migrations path and conquests by Eastern Roman Empire, Slavs, Jews from Spain, Turkish and Austro-Hungarian Empires, each leaving their imprints and contributing to the rich cultural heritage and a number of monumental buildings that still remain in the city.

In more recent time, city of Sarajevo is famous for 1984 Winter Olympic Games, and sadly famous for suffering during long war after the break-up of Yugoslavia. The 'ambiance' is quite different now, and Sarajevo has become a new tourist 'must-see' destination. Month of September is the period just after the massive arrival of tourists, and weather is still sufficiently mild for a very pleasant visit.

Conference course venue/ contact address: **Gradjevinski fakultet** (see Figure below) (with sign: *ECCOMAS-MSF 2019*) exact address: Patriotske lige 30, 71000 Sarajevo, Bosnia – Herzegovina E-mail: eccomas@gf.unsa.ba



COURSE OBJECTIVES

The main objective of this course is to provide graduate students and researchers, with an extensive review of numerical models for computational solid and fluid mechanics, and pertinent modern developments in model probability aspects and uncertainty reduction. quantification. It presents the current state-of-the-art in finite element, finite volume and discrete element modeling of nonlinear problems in solid and fluid mechanics, and their coupling with thermal fields and interaction. It will illustrate the difficulties (and their solutions), which appear in a number of applications from mechanical, aerospace and civil engineering or material science. All the sources of nonlinear behavior are presented in a systematic manner, related to kinematics, equilibrium, constitutive equations, or boundary and coupling conditions. Special attention is paid to dealing with a class of problems with nonlinear constitutive behavior of materials, large deformations, and rotations in solid and fluid mechanics.

In addition, a detailed presentation of modern probability aspects is given, which is of great interest for current research for quantifying the epistemic uncertainties pertinent to the material heterogeneities, and aleatoric uncertainties pertinent to evolution problems.

Our second objective is to provide the participants with a solid basis for using the FEM, FVM or particle based models and software in trying to achieve the optimal design, and/or to carry out a refined analysis of nonlinear behavior of structures or multibody systems in real-life simulations. The course finally provides a basis to account for any pertinent multi-physics and multi-scale effects, which are most likely to provide significant innovations and break-through in a number of industrial applications.

Course Textbooks:

Nonlinear Solid Mechanics: Theoretical Formulations and Finite Element Solution Methods (2009), Springer url: <u>http://springer.com/978-90-481-2330-8</u>

Computational Methods for Solids and Fluids: Multiscale Analysis, Probability Aspects and Model Reduction (2016), Springer

url: http://www.springer.com/fr/book/9783319279947

ECCOMAS MSF 2019 Conference Course

(3 ECTS)



Course Announcement & Call for participants

Short Course at 4th ECCOMAS MSF 2019 Current Research on Solids & Fluids: Computations, FE Code Coupling, Model Reduction, Probability...



Sarajevo, Bosnia and Herzegovina

co-organized by: UT-Compiègne/ Sorbonne Universities, France University of Sarajevo, Bosnia and Herzegovina



REGISTRATION

The course fees cost **250** Euros, if paid before March 31, 2019 (with cost increase to **350** Euros **after that date**). Mail or fax in the completed registration form (available at the web-site) with check, or copy of money transfer order. Early registration is suggested because enrollment is limited. Visit website: <u>http://www.gf.unsa.ba/eccomasmsf-2019/</u>.

COURSE PROGRAM OUTLINE

1. Nonlinear solid and structural mechanics, multibody dynamics: solution methods and software; 2. Thermodynamics-electromagnetic coupled problems; 3. Probability aspects and uncertainty quantification; 4. Fluid mechanics, multi-phase flows and fluid-structure interaction with immersed boundary method.

COURSE HISTORY & MATERIAL

The course material, beside the previously mentioned graduate textbooks, contains the selected book chapters, review paper, copies of lecture notes and copy of computer code CO-*FEAP* providing interface to multiscale parallel-computer implementation of well-known code FEAP, written by Prof. Robert L. Taylor at UC Berkeley, by using the Component Template Library (*CTL*), developed at TU Braunschweig. This course is an enlarged form of the course organized at ECCOMAS MSF 2017, Ljubljana, attended by more than 30 participants (photo below)



COURSE PROFESSORS

Adnan Ibrahimbegovic is Professor Classe Exceptionnelle, Member Senior IUF-Institut Universitaire France and Chair for Computational Mechanics at University of Technology Compiègne, a member of Alliance of Sorbonne Université (created with merger of Paris-Sorbonne and Université Pierre Marie Curie). He has obtained his engineering education in Sarajevo, PhD at the University of California Berkeley, USA and Habilitation at University Pierre Marie Curie in Paris, France. He has held professorships and research positions at four different universities (including UC Berkeley, USA; EPFL, Switzerland; ENS-Cachan, France and currently UTC, France). He is the past Chairman of ENS-Cachan Teaching and LMT-Cachan Research Departments and Head of Master Program MaiSE. He has received a number of international distinctions, including IACM Fellow Award, Humboldt Research Award for Germany, Research Award for Slovenia, International Fellow NSERC Award for Canada, 'Claude Levy-Strauss' Chair for Univ. Sao Paulo, Brazil, 'Asgard' Chair for NTNU, Norway, KAIST Invited Professor, South Korea, 'Hôte Académique' Award for EPFL, Switzerland. He has published close to 200 papers in scientific journals and 8 textbooks and monographs.

Hermann G. Matthies has obtained his initial degree from the TU Berlin, Germany; and his PhD degree in mathematics at MIT, Cambridge, USA in 1978, working on FEM and plasticity. Subsequently he has worked in Research Division of Germanischer Lloyd, Hamburg, Germany, dealing with industrial research and engineering in diverse fields such as wind, offshore, and ice engineering. Since 1995 he joined academia as the Head of the Institute of Scientific Computing at the TU Braunschweig, Germany; and from 1996 to 2006 he served as the director of the University Computing Centre. His current research is oriented towards the uncertainty quantification. Bayesian identification and updating. coupled and interaction problems, plasticity and scientific computing. He has received several international distinctions, among them the Fellowship Award of the IACM and Gay-Lussac-Humboldt Award for France. He has published over 150 papers in scientific journals, as well as close to 300 conference publications and topical special issues.

Nikolaos Limnios, is Professor Classe Exceptionnelle at University of Technology Compiègne (UTC) and former Director of the Laboratoty of Applied Mathematics. He has obtained his diploma in 1979 at AUTh Greece, PhD in 1983 and Doctorat d'Etat in 1991 at UTC France. In 1988, he was appointed Lecturer (Maitre de Conférences) and in 1993 a Professor at UTC in Laboratory of Applied Mathematics. His research interests include stochastic processes and statistics and their applications to different domains, such as: structure reliability, statistical seismology, biology, etc. He has published more than 150 journal papers and 10 books on theory and applications of stochastic processes. Florian De Vuyst is Professor at University of Technology Compiègne (UTC). He has obtained his initial degree and his doctoral degree in mathematics at University Pierre Marie Curie, Paris in 1994. He was Professor in Applied Mechanics at Ecole Centrale Paris, ENS-Cachan before joining UTC. He is currently the Director of Laboratory of Applied Mathematics, and holder of Chair 'Vitrage de Future' an interdisciplinary platform regrouping 4 laboratories at UTC, and several industrial partners, including St. Gobain, Renault and Valeo. His current research is oriented towards high performance computing, multi-phase and free-surface fluid flow and model reduction methods. He has published close to 100 papers in scientific journals in fluid mechanics and applied mathematics.

Abdellatif Ouahsine is a Professor and member of management board at University of Technology Compiègne (UTC). He has obtained his doctoral degree and Habilitation in Fluid Mechanics from University of Science and Technology Lille. Since 2001, he serves as Head of Laboratory of Computational Hydraulics (LHN), a joint team UTC and CETMEF (French national technical institute of the Ministry of Ecology, Sustainable development and Energy). His current research interests pertain to environmental and computational fluid dynamics (CFD), with special emphasis on fluid-structure interaction. He has published close 100 papers, and organized several conferences on hydrodynamic modeling, currents and waves in coastal area and river management.

Jose L. Perez Aparicio is Professor at the Polythecnic University of Valencia, Spain. He got his Mechanical engineering diploma in 1982 from the Polythecnic University of Catalonia Barcelona. Both his Master degree in 1987 and PhD degree in 1992 were obtained from Stanford University, USA, with major in Mechanical Engineering and minor in Aeronautics and Astronautics. He has held professor positions at ICAI (Madrid), research professorship from University of Granada, followed by the current appointment as full professor at the Polythecnic University of Valencia. His research interests are related to active materials. electromagnetics-thermodynamics coupling and aeronautical design. He has published over 100 papers.