Workshop on Virtual Manufacturing and Testing of Composites

The MUL^2 Group and the Italian Association of Aeronautics and Astronautics are pleased to invite you to a 1-day workshop in the framework of the Joint Project for the Internationalization of Research "Multiphysics models for virtual testing and process of advanced materials" with the University of British Columbia

7 June 2019, Salone d'Onore, Castello del Valentino, Torino, Italy

09:00	***Welcome address*** Professor Francesca Verga Vice-Rector for International Affairs, Politecnico di Torino Professor Erasmo Carrera Head of the MUL^2 Group, Politecnico di Torino
09:15	***Overview of the POLITO/UBC project, results, and perspectives*** Dr. Marco Petrolo and Enrico Zappino Assistant Professors, MUL^2 Group, Politecnico di Torino Manish H. Nagaraj Ph.D. Student, MUL^2 Group, Politecnico di Torino
09:45	***Global-local analysis of composite structures based on an element-wise method*** Dr. Alberto Garcia de Miguel and Ibrahim Kaleel Post-Doc, MUL^2 Group, Politecnico di Torino, Italy
10:15	*Q&A*
10:30	*Coffee-Break*
11:00	***Advances in manufacturing simulation of composite structures and the implication on future design approaches*** Professor Anoush Poursartip Director of the Composite Research Network, University of British Columbia
11:45	***Testing and validation of XXL-wind turbine blades*** Dr. Steffen Czichon Head of Rotor Blades, Fraunhofer Institute for Wind Energy Systems IWES
12:30	*Q&A*
12:45	*Lunch*
13:45	***Efficient methodologies for virtual testing of composite structures and their potential integration with virtual manufacturing*** Professor Reza Vaziri Scientific Director of the Composite Research Network, University of British Columbia
14:30	***Virtual testing applied to predict the shaker test responses*** Dr. Pietro Nali Innovation Point of Contact, Thales Alenia Space
15:15	***Large-deflection and post-buckling analyses of highly flexible composite structures by Carrera Unified Formulation*** Dr. Bin Wu Post-Doc, MUL^2 Group, Politecnico di Torino
16:00	*Q&A*

Registrations via email to marco.petrolo@polito.it, enrico.zappino@polito,it - No Registration Fees
Deadline: 31 May 2019

Short Abstracts

M. Petrolo, E. Zappino, M.H. Nagaraj, *Overview of the POLITO/UBC project, results, and perspectives*
This project aims at unleashing a synergy between the complementary modeling capabilities of POLITO – structural modeling for multiphysics – and of UBC – fundamental manufacturing and material science. Focus is on damage models for multilayered structures and virtual evaluation of residual stress from the curing process. The aim is to establish a framework with superior computational efficiency and 3D stress field capabilities and extend it to complex structural configurations.

A.G. de Miguel, I. Kaleel, *Global-local analysis of composite structures based on an element-wise method*
A novel approach for the global-local stress analysis of generic laminated structures is proposed. The technique is based on the use of layer-wise models based on the Carrera Unified Formulation and allows it to obtain the 3D solutions and failure indexes across the laminate thickness using only the inputs and outputs of the FEM software (Nastran or Abaqus). The user interfaces are installed as a plug-in in these software tools for the easy utilization by engineers and researchers. A demonstrator of the tool will be shown, including example cases of industrial composite structures.

S. Czichon, *Testing, and Validation of XXL-Wind turbine blades*
Wind turbine blades are the largest FRP structures in the world. The continuing increase in rotor diameters of wind turbine blades pushes the structural load carrying capabilities of the blades to the limit. Hence, more realistic numerical models and more representative testing are required. At the same time, time to market is a key competitive factor in wind energy, putting pressure on test duration. This talk explores novel concepts for testing wind turbine blades longer than 100m.

P. Nali, *Virtual Testing applied to predict the shaker test responses*
Virtual Testing (VT) is a promising technique to perform highly accurate test predictions. With VT, several phenomena which are often neglected can be taken into account. Such phenomena can play a substantial role, depending on the peculiarities of the test facility in use and on the properties of the test item. More specifically, the presentation will be focused on the advantages and applications of the VT for mechanical tests involving a shaker: Virtual Shaker Testing (VST).

B. Wu, *Large-deflection and post-buckling analyses of highly flexible composite structures by Carrera Unified Formulation*
In this presentation, the capabilities of unified formulations of geometrically nonlinear refined beam/plate theory based on CUF and a total Lagrangian approach will be confirmed to predict the large-deflection and post-buckling equilibrium curves as well as the stress distributions with high accuracy. Furthermore, the physical nonlinear have also been incorporated into the geometrically nonlinear CUF beam theory to study the large-deformation response of slightly compressible elastomeric structures subjected to uniaxial tension.