הטכניון TECHNION
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הפקולטה
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Faculty of
Mechanical
Engineering

SEMINAR - סמינר

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ב׳ 22.02.21
(י׳ באדר תשפ״א), בשעה 14:30 באמצעות הזום :https://technion.zoom.us/j/93364764286

מרצה:

David Bassir, PhD
École Normale Supérieure - Paris-Saclay University
david.bassir@ens-paris-saclay.fr

על הנושא:

New parameter identification for optimal design of materials and structures

The seminar will be given in English

להלן תקציר ההרצאה:

Integration of advanced materials in complex structures often requires parameter identification of the material constitutive models. This process, also called update of model parameters, represents a challenge in modelling and optimizing these parameters. Building the best model coefficients is based either on observations, testing or simulations. The mathematical models ensuing from this parameter identification lead to complex optimization problems to be solved. Many methods and strategies were developed, based either on sensitivity analysis, heuristic methods, artificial neural networks, artificial intelligence or coupled approaches. Some methods were also re-designed to use high-performance computing and image post-treatment analysis to better understand and predict the material's mechanical behavior at different scales, including Nano, Meso and Macro scales. Applications can vary from aeronautic, automotive, civil engineering to other fields where engineering decisions require sensitivity analysis of the input parameters.

This presentation will focus, first, on the "Genetic Algorithm with Parallel Selection GAPS" that I developed, being inspired by the Darwin evolution theory. Coupled with Artificial Neural Network (ANN), GAPS allowed solving complex mechanical and material engineering problems.

Second, I will present two main applications on advances in composite materials. One is related to a composite with long fibers held at both low and high temperatures. The second application is linked to additive manufacturing or 3D printing which is nowadays, an expanding research field, because of its flexibility to manufacture complex geometries and rapid prototyping. Among the wide variety of thermoplastic materials, we have investigated the eco-friendly materials due to their great future integration within the international sustainable development.

Finally, extensions of the above works to parameter's characterization of reinforced thermoplastic materials with natural fibers will be outlined. Characterization of other features and processes involved in these materials, such as the matrix and fiber interface, the fibers orientations, the manufacturing process which includes: heating and cooling during the filament casting, the thicknesses of the layers and the velocity of the deposit. These works will guide us to predict the porosity content, and are among the key challenges in the material's structure optimization.

David Bassir is Professor at the French University of Technology and Senior Researcher at ENS Cachan/ Université Paris-Saclay. He holds MSc and PhD in structural optimization from University of Franche-Comte and Doctor Honoris Causa from, Yuzuncu Yil University, Turkey. His administrative positions and duties included Dean at University Institutes of Technology, University of Lorraine, Consul of Science and Technology at the French Embassy in China, General Director of Research at the ESTP-ENSAM (Paris) and more. Prof. Bassir was an invited visiting professor in leading universities, including TUDelft, Shanghai Jiaotong, Northwestern Polytechnical (Xian), University of Oviedo and Chinese Academy of Sciences (Guangzhou). He published over 120 papers in journals, books and conference proceedings on various subjects of Composites materials, Parameter identification, Additive manufacturing, Structural Optimization and Multiscale modelling and analysis.

מארח : פרופ׳ מיכאל שפירא

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