KTH SOLID MECHANICS SEMINAR; Thursday, October 31st, 13.15; KTH Solid Mechanics Seminar room

Michel Grédiac

"Full-field measurements: from the development of efficient measuring tools to the reliable identification of material properties"

Prof. Michel Grédiac obtained his doctoral degree in 1989 from the University of Lyon, France. He was promoted to full professor in 1997 at the "Université Clermont Auvergne", France. He has been an associated editor of Experimental Mechanics since 2010. His research field is the development of full-field measurement techniques and their use for the characterization of materials and structures. He is a fellow of the Society for Experimental Mechanics and the recipient of several international prizes, including the SEM M. Hetényi and the B. J. Lazan awards.

Full-field measurement systems are now widely used in experimental solid mechanics, mainly because they provide, within certain limits, displacement and strain fields that occur on the surface of specimens subjected to thermo-mechanical loads. Even measurements in the bulk are available in some cases. These fields can be advantageously used to observe and detect various phenomena due to the local response of materials, in particular through localized strain gradients. These fields can also be used to identify parameters governing constitutive equations. The benefit in this case is to rely on a wealth of data, and to consider heterogeneous strain distributions involving a greater number of sought parameters than homogenous strain fields occurring in classic tests. Specific identification procedure must however be used in this case, no closed-form expressions linking measurements and unknown parameters being generally available. This type of approach potentially reduces the number of tests to be performed to retrieve the whole set of constitutive parameters, and also enables experimentalists to identify local properties of heterogeneous materials.

In this context, this presentation will be a walktrough of several contributions in both the development of full-field measuring tools, and their use in suitable identification procedures. Concerning the first point, we will discuss more specifically optimal patterning to measure displacement/strain fields, as well as recent numerical tools such as deconvolution that can be used to enhance strain maps. Various examples will be shown concerning these points. Concerning identification, the main features of the so-called Virtual Fields Method, an identification method specifically developed for this purpose, will also be given and illustrated.