Ministère de l'Enseignement Supérieur et de la Recherche Scientifique
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Université de Gabès
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Institut Supérieur des Systèmes Industriels de Gabès

SÉMINAIRE DE RECHERCHE À L'ISSIG

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Vous êtes cordialement invités au séminaire en Mécanique à l'ISSIG, le jeudi 15 Mai à partir de 14 heures à l'amphi Hatem Ben Taher

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Présentation :

le professeur Tarak Ben Zineb, Université de Lorraine

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Titre de la présentation :

Advanced Design of SMA Devices through Finite Element Structural Analysis

Résumé : Shape Memory Alloys (SMAs) are widely considered for large range of applications in various domains as biomechanics, aeronautics, automotive, civil engineering, etc… Design of such smart (adaptive) applications is mainly based on experimental analysis. In fact, most of commercial finite element codes did not offer a specific constitutive model for SMAs in their material standard databases despite the large progress made by research in this area. In fact, many interesting thermo-mechanical behavior models, well adapted to SMAs, were proposed by recognized research groups (among them Lexcellent's, Auricchio's, Patoor's, Lagoudas's group, and Moumni's groups …). Those models are based either on micromechanical or on phenomenological approaches, well describe all the specificities of SMAs behavior and were successfully implemented in various commercial codes as Abaqus, Marc, Castem 2000, FemLab. This allowed analyzing by finite element method the response of applications in SMAs (stents, endodontic file, micro-actuators, springs, connection systems, damping systems). A global review of an example of a research activity illustrating these progresses in finite element based SMA application design is developed. A family of macroscopic constitutive models based on micromechanical approach and considering macroscopic material parameters and internal variables is detailed. The implementation of these models in the Abaqus finite element code via the subroutine UMAT is presented. The obtained tool was considered for design of SMA based applications in various domains as biomedical (endodontic file), connection (tightening rings, fish plates for rails) and micro-actuators showing how finite element analysis contributes in the design of such applications.