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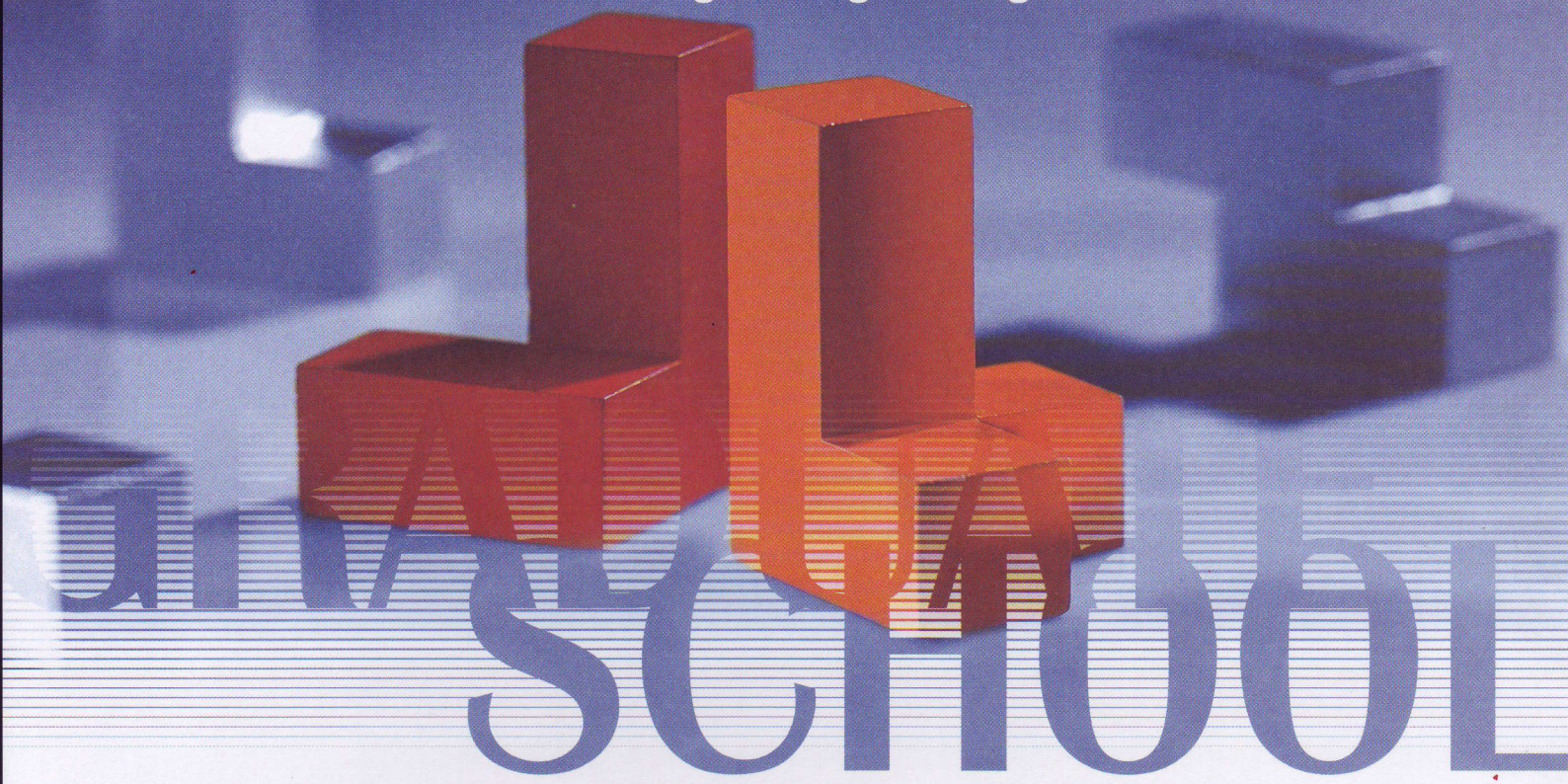

SCHOOL

Dipl.-Ing. Bjoern Kiefer
Department of Aerospace Engineering, Texas A&M University

Modeling of the Variant Reorientation in Magnetic Shape Memory Alloys under Multi-Component Magnetomechanical Loading

- Date : September 8, 2006
- Time : 15.00 – 17.00
- Place : Mechanical Engineering Building I, E21, Campus North

- Abstract :

This work is concerned with modeling the complex magnetomechanical response of magnetic shape memory alloys (MSMAs). These materials have recently drawn considerable interest due to their ability to produce recoverable magnetic field-induced strains of at least one order of magnitude larger than piezomagnetic or magnetostrictive materials, while exhibiting a much broader bandwidth than conventional shape memory materials. A thermodynamics-based phenomenological model for MSMA is presented with special emphasis on the behavior caused by the stress- and magnetic field-induced reorientation of martensitic variants. The evolution of the crystallographic and magnetic microstructure and associated dissipative effects are taken into account through internal state variables. A new reorientation diagram is proposed which visualizes the activation surfaces for the variant reorientation process. A calibration scheme has been devised to obtain model parameters from experimental data. Model predictions are presented for several loading cases and are compared to experimental results. Another aspect of this presentation deals with finite element solutions of magnetomechanical boundary value problems for MSMA.