AEROSPACE & MECHANICAL ENGINEERING

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INFORMAL COFFEE PERIOD BEFORE THE SEMINAR IN ROOM 365 FITZPATRICK HALL

UNIVERSITY OF NOTRE DAME, NOTRE DAME, INDIANA 46556

SPEAKER: **Professor Veera Sundararaghavan**
Aerospace Engineering
University of Michigan
Ann Arbor, Michigan

TOPIC: **STATE-OF-THE-ART IN FINITE ELEMENT MODELING OF MICROSTRUCTURAL DESCRIPTORS**

DATE: Tuesday, January 17, 2012

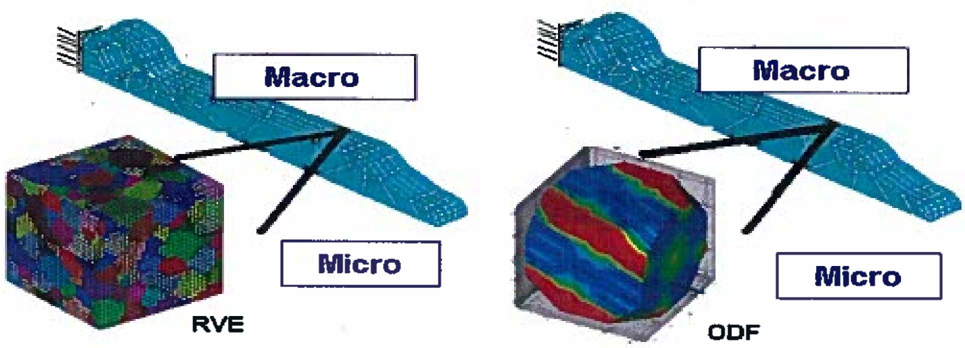
TIME: 3:30 p.m.

PLACE: 138 DeBartolo Hall

ABSTRACT

Finite element models of microstructural representative volume elements (RVEs) are not of practical use in multiscale simulations due to their large computational cost. An alternate class of methods has been developed in the recent years that describe microstructural deformation by evolving descriptors rather than the actual microstructure itself. In this talk, the state–of–the–art in finite element approaches for modeling the orientation distribution function (ODF), the grain size orientation distribution function (GSODF) and the conditional orientation correlation function (COCF) will be described. The ODF, GSODF and COCF are probabilistic functions describing the key one-point or two-point features of the underlying microstructural RVE. For example, the COCF is defined as the probability density of occurrence of a crystal orientation g' at a distance r from a given orientation g. In the finite element representation, the COCF is described using three interconnected layers of finite element meshes in the **g'**, **r** and **g** spaces. As the microstructure evolves, the reoriented neighborhood and strain field close to an orientation is captured by updating probability fields in these finite element meshes. Novel Lagrangian approaches have been developed that allow evolution of these probability fields during deformation. The texture and strain prediction achieved by these probabilistic approaches are compared to finite element deformation analysis of a polycrystalline microstructure. Examples that illustrate efficiency of such approaches in designing metallic (polycrystalline) components with tailored stiffness, strength and magnetic properties will be shown.

Illustrative picture:



NOTE: ***If you are interested in meeting individually with Prof. Sundararaghavan, please contact Evelyn at 631-5431***