Crystallographic Texture and Crystal Plasticity Modeling

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Overview

Modern engineering applications require efficient structures and components with improved safety properties and reduced impact on the environment. These requirements include production of specific components using ultra-light weight structural materials to advanced high temperature creep resistant materials to bulk nano-structured materials. Further, majority of the structural components involves plasticity as either a macro scale phenomena during their production or a micro scale phenomena in service. Understanding the micro-mechanisms of plasticity for a large class of materials has huge potentials in both the technological applications and unraveling the scientific mysteries. Particularly, for the technological applications, the efforts needed in achieving the required shape of an engineering component are dealt with the mechanics of deformation. Precisely predicting and observing the changes in relations between stress and strain during the shape change or plastic deformation. In this aspect, microstructure of the material takes a crucial role in deciding the flow behavior and functionalities. Classic models of plasticity have reached their limitation in various aspects, since they do not take in to account the effects of microstructures and micro heterogeneity. Crystal plasticity, involving the concept of microstructure in the form of crystallographic texture, is able to achieve a more sophisticated mathematical expression and thereby model the material behavior with higher accuracy. Therefore, in the proposed course, the area of crystallographic texture (a part of physical metallurgy) and crystal plasticity (a major aspect of applied mechanics) will be covered to familiarize the participants with the basic concepts to help them in solving some industrial problems. This course basically is the bridging gap between the mechanical and metallurgical engineering.

Course participants will learn these topics through lectures and hands-on tutorial sessions. There will be practice sessions, introduction to Visco-Plastic Self Consistent (VPSC) modeling code and case studies to stimulate research motivation of participants.

Modules	**34 hrs lecture and 14 hrs Tutorials 04th December – 14th December 2017 (09 days)** **Number of participants for the course will be limited to fifty. The selection is first come first serve basis.**
You Should Attend If…	▪ you are working on problems related to mechanics of plastic deformation, crystallographic texture, quantitative microscopy and EBSD. ▪ You are an engineer or researcher from materials science and metallurgical industry (such as Tata Steel, JSW, GE), and from research centers such as BARC, IGCAR, ISRO and DMRL. ▪ you are a student at post-graduate level (MTech/PhD) or early stage researchers (post-docs and faculty) from reputed academic or technical institutions.
Fees	The participation fees for taking the course is as follows: **Participants from abroad: US $ 300** **Participants from Industry: Rs. 10000** **Faculties and Scientists of Research / Academic Institutions: Rs. 8000** **Students and Research Scholars: Rs. 2000** The above fee includes all instructional materials use for tutorials and assignments, 24 hr free internet facility. The participants are requested to bring their own laptops. The participants will be provided with accommodation on payment basis.

The Faculty

Prof. LASZLO TOTH is the Founder Director of the Laboratory of Excellence "DAMAS" (Design of Alloy Metals for low-mAss Structures) and is an internationally known and highly distinguished professor in Mechanics and Metallurgy at the University of Lorraine, France. He is also the founder and previous director of 'Laboratory of Elaboration of Microstructures and Mechanics of Materials' (LEM3), UMR 7239, CNRS, University of Lorraine, France. He was awarded 'Knight of the French Superior Education' by Government of France in 2012. He also holds the Grand Prize of Research of the Industrial Society of East-France (2012). His present research interests are "Experiments and mechanical modelling of textures and microstructures of SPD materials, especially on quantitative modelling of grain refinement of SPD materials, especially on quantitative modelling of grain refinement." He has more than 168 peer reviewed research publications in his credit (h-index ~35). His research includes: Mechanics of materials, crystal plasticity, deformation textures, severe plastic deformation and physical metallurgy.

Dr. SOMJEET BISWAS is assistant professor in the Department of Metallurgical and Materials Engineering, Indian Institute of Technology Kharagpur. His domain of research is: (i) To carry out studies on quantitative microscopy, crystallographic texture and grain boundary engineering to understand the plastic deformation behavior of polycrystalline materials; (ii) Effect of these microstructural properties on strength, ductility, fatigue and fracture behavior; and (iii) Static and dynamic recrystallization mechanism of metals and alloys.

Course Co-ordinator

Dr. Somjeet Biswas
Phone: 03222-283264
E-mail: somjeetbiswas@metal.iitkgp.ernet.in

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