Nanostructured Steels

2nd to 6th April, 2018 --- IIT Delhi

Ministry of Human Resource Development
Government of India

Overview

This course starts with a description of the microstructural features that makes a steel nanostructured. Focusing first on the metallurgical phenomena such as martensitic and bainitic transformations, recrystallization and precipitation, we present criteria to turn common steels into nanostructured. Main emphasis is on the effects of key elemental additions, severe plastic deformation, heat treatment time and temperature. A wide range of nanostructures is available for ferrous alloys. When the surface to volume ratio of the nanostructure increases, interesting interactions between defects in the crystal structure such as dislocations, vacancies and interstitial atoms occur. These allow for the combination of extraordinary properties, such as 2-4 GPa strength, ductility up to 40% and fatigue life exceeding 10^9 contact cycles. The course will enlighten to obtain an enhanced understanding on the nanostructures responsible for such properties with emphasis on the physical modelling and computational skills.

The primary objectives of the course are as follows:

1. Become familiar with the different structures present at the nanometre scale in steels,
2. The processing routes required to obtain them and their advantages and disadvantages,
3. Develop the necessary understanding and skills to design new alloy grades using computational tools.

The topics covered in this course are relevant not only to academicians but as well to a wide-variety of industrial members. These include (but not limited to) producers and users of:

- Nanoprecipitation hardened maraging stainless steels; Rail and wheel steel.
- Ultra-high strength steels for valves and suspension car springs.
- Heavily drawn pearlitic wires, often exceeding strengths of 3 GPa.
- Bearing, gears and shafts steels.

Course details	**Duration:** 5 days (2nd to 6th April 2018); **Lectures:** 10 hours & **Tutorials:** 6 hours
Host Institute	**Indian Institute of Technology Delhi (IIT Delhi)**
You Should Attend If you are…	• An executive, engineer or researcher from materials and steel-related industries and R&D laboratories. • A student at all levels (BTech/MSc/MTech/PhD) or A faculty from reputed academic institutions and technical institutions.
Course Fees	The participation fees for taking the course is as follows: **Participants from abroad : US $400** **Industry/Research Organizations : ₹15,000** **Academic Institutions: Faculty : ₹10,000; Students: ₹5000** The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility.
Accommodation	The participants may be provided with accommodation, depending on the availability, on payment basis.
Register at	http://www.gian.iitkgp.ac.in/GREGN/index ; **Last date: 15th March 2018** **No. of participants: Limited to 30**

External Faculty

Prof. Pedro Rivera is the Royal Academy of Engineering Research Chair at Lancaster University since Sep. 2017. From 2009 to 2017 he was Assistant Director of Research at the Steel Technology Centre at University of Cambridge, where he taught and led a research group mainly focusing on ultra-high strength steels, but also working on titanium, magnesium and high entropy alloys. His research has resulted in a variety of novel steel grades leading to three international patents and over 130 articles in international journals. Several modelling approaches have been produced by his group; some of these have been implemented in commercial software. At present, his new group at Lancaster University focuses on 'Alloy and microstructure design for additive layer manufacturing'.

Host Faculty

Dr. Suresh Neelakantan is an Assistant Professor at the Materials group of Department of Applied Mechanics, Indian Institute of Technology, Delhi. His primary teaching and research is in materials engineering. Before joining IIT Delhi he had worked on phase transformations in titanium alloys during his PhD at TUDelft and on the mechanics of random fibrous metallic porous materials during his post-doc at university of Cambridge. His current research is focused on advanced mechanical behavior studies in metallic fibrous porous materials, titanium alloys, auxetic materials and high entropy alloys.

Lancaster University

IIT Delhi

Course Coordinator

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