

# CHALLENGES FOR WELDING AND FABRICATION OF CSEF STEEL STRUCTURES FOR LOW POLLUTING ULTRA-SUPERCRITICAL POWER PLANT APPLICATIONS

## Overview

The proposed course sponsored by MHRD under GIAN Scheme is aimed at educating researchers, scientists, engineers, faculties and students working in the field of Mechanical/Manufacturing/Materials Engineering with special emphasis on welding and fabrication of creep strength enhanced ferritic steel structures for high temperature and pressure applications such as in low polluting ultra-supercritical power plants.

The next generation low polluting ultra-supercritical (USC) thermal power plants are aimed at operating with efficiency exceeding 50% which requires high operating temperature and pressure as high as 300 bar and 650 °C respectively. Most of the highly polluting coal fired thermal power plants in India of yesterday's technology are about to be upgraded to ultra-supercritical thermal power plants. The creep strength enhanced ferritic (CSEF) steels that can withstand such high pressure and temperature such as Grade P 92 and Grade P 91 are the material of choice for supercritical thermal power plants. However, the CSEF steel welds are susceptible to hydrogen assisted delayed cracking (HIC) due to high welding residual stress, loss of strength due to inadequate heat treatment procedures, hydrogen embrittlement and propensity of microstructure to crack. The present course is aimed at providing insights into successful joining and fabrication techniques and challenges faced while producing CSEF welded structures.

<b>Modules</b>	<b>A: Application of CSEF steels in ultra-supercritical power plants</b> <b>B: Welding metallurgy thermal cycles and welding inspection</b> <b>C: Weld design and microstructure evolution of CSEF steel</b> <b>D: Weld defects and residual stresses</b> <b>E: Heat treatment of CSEF steels and residual stress determination</b> <b>Number of participants for the course will be limited to fifty.</b>	<b>July 09-13, 2018</b>
<b>Who Should Attend...</b>	<ul style="list-style-type: none"> <li>• Senior undergraduate students, graduate students pursuing M. Tech/MS and Ph. D. Programme in the Mechanical/Manufacturing/Materials engineering Departments would benefit most.</li> <li>• Proposed course has been designed to update knowledge and improve understandings of the faculty members in new IITs, IISERs, NISER and other academic institutions in the country about the best practices and recent advances in the field;</li> <li>• Practicing engineers and scientists working in thermal power plants, as well as, in government research organizations will also be benefited.</li> </ul>	
<b>Fees</b>	The participation fees for taking the course is as follows: <b>Participants from abroad : US \$250</b> <b>Industry/ Research Organizations: Rs 8,000</b> <b>Academic Institutions: Faculty - Rs 3,000 and Students – Rs 1,000</b> The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.	

# The Faculty



**Professor Leijun Li** is Professor of Physical Metallurgy at University of Alberta. He received his BS in Welding Engineering from Hua-Zhong University of Science and Technology, and his PhD in Materials Engineering from Rensselaer Polytechnic Institute. Dr. Li focuses on fundamental and applied research in microstructure characterization and properties evaluation of welded structures for the energy and steel industries. He is a Principal Reviewer for the Welding Journal of American Welding Society (AWS), and a Key Reader for the Metallurgical and Materials Transactions of ASM/TMS. He is past chair of the Joining Critical Technologies Committee of the ASM International. Dr. Li is a recipient of the Adams Memorial Award and W.H. Hobart Memorial Award from the AWS. He is an elected Fellow of American Society for Metals (ASM International), Fellow of Canadian Welding Association (CWA), and Fellow of AWS.



**Dr. Manas Mohan Mahapatra** is Associate Professor in the School of Mechanical Sciences, IIT Bhubaneswar. His research interests includes arc welding, solid state joining, modelling and measurement of welding residual stress, welding distortions, laser and thermal spray coating life prediction and manufacturability of in-situ metal matrix composites.



**Dr. Pandu R Vundavilli** is Assistant Professor in the School of Mechanical Sciences, IIT Bhubaneswar. His research interests include robotics, development, analysis, modelling and optimization of manufacturing systems and materials processing.

## Course Coordinators

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