

# A Global Initiative of Academic Networks (GIAN) Course on Environmental Degradation of Materials in Power Industry and its Control

**Dec 11-17, 2017@ NIT Tiruchirappalli**

## Overview

Power plant components are exposed to arduous service conditions during normal operation of the power plants. Interaction of the components with service atmosphere at high temperature results in various degradation mechanisms such as creep, corrosion, erosion, and fatigue. These degradation processes occur individually as well as in combination with each other depending on the materials and service environments, and ultimately lead to failure of components. For reliable and safe operation of the power plant, it is important to understand the degradation mechanisms of the components. Furthermore, extending the life of the critical components beyond their design life is considered necessary from an economic point of view. Such life-extension decisions are taken based on the remaining life assessment techniques. In order to develop a reliable remaining life assessment methodology, one should understand the degradation mechanism thoroughly. In general, the remaining life assessment methodology follows a fracture mechanics approach to account for the damage accumulation due to creep, and creep-fatigue interactions. The damage accumulation due to corrosion is significant in the power plant components. However, only empirical relations are available to account for the corrosion damage. Even though corrosion is a well-known phenomenon, the understanding at the design level is limited due to its complex nature.

The proposed course on the environmental degradation of power plant components and its control aims at educating and training the participants to acquire a broader understanding of various degradation mechanisms associated with the material-environment interactions, and use that knowledge in mitigating the degradation, and extend the life of the power plant components. Such training will help achieve safe and reliable operation of the power plants and decrease the operating cost which will lead to energy security of our country.

**KEYWORDS: Corrosion, Hydrogen and Stress Corrosion Cracking, Remaining life assessment, life extension techniques, Pressure vessels, Nuclear light water reactors**

## Objectives

- i) Exposing participants to the fundamentals of environmental degradation mechanisms, and mitigation methodologies;
- ii) Building confidence and capability amongst the participants in the application of various electrochemical tools for testing corrosion, evaluating the protection methods;
- iii) Providing exposure to practical problems and their solutions, through case studies and numerical examples of different types of degradation mechanisms for remaining life assessment;
- iv) Enhancing the capability of the participants to identify the degradation types, control the degradation, and extend the life of the components in the power plants.

<b>Modules</b>	<p>The course on “Environmental Degradation of Materials in Power Industry and its Control” from Dec 11-17, 2017 has 14 h lectures and 5 h tutorials. The lectures will cover the fundamentals of environmental degradation mechanisms, mitigation methodologies and extending the life of the components in the power plants.</p> <p>The number of participants for the course will be limited to 50.</p>
<b>You Should Attend If you are...</b>	<ul style="list-style-type: none"> <li>• Practicing Engineers, Managers, Consultants, Executives and Administrative officials in Power Industry from Government/Public/Private sectors and Research Organizations.</li> <li>• Undergraduate, Postgraduate, PhD students and Faculty in Engineering disciplines</li> </ul>
<b>Fees</b>	<p>The participation fees (Excluding Lodging &amp; Boarding) for attending the course is as follows:</p> <p>Student participants: Rs. 1,000/-  Faculty (Internal &amp; External) &amp; Scientists: Rs. 2,000/-  Persons from Industry/Consultancy firms: Rs. 6,000/-  Student participants from abroad: USD 100  Other participants from abroad: USD 200</p> <p>The above fee include all instructional materials, tutorials, assignments and internet facility. Fee does not include accommodation and food. On request, accommodation will be provided to the participants on payment basis.</p>
<b>How to Register</b>	<p><b>Stage-1:</b> Web (Portal) Registration: Visit GIAN Website at the link: <a href="http://www.gian.iitkgp.ac.in/GREGN/index">http://www.gian.iitkgp.ac.in/GREGN/index</a> and create login user ID and Password. Fill up blank registration form and do web registration by paying <b>Rs. 500/-</b> on line through Net Banking/ Debit/ Credit Card. This provides the user with life time registration to enrol in any no. of GIAN courses offered.</p> <p><b>Stage-2:</b> Course Registration (Through GIAN Portal): Log in to the GIAN portal with the user ID and Password created. Click on “Course Registration” option given at the top of the registration form. Select the Course titled “Environmental Degradation of Materials in Power Industry and its Control” from the list and click on “Save” option. Confirm your registration by Clicking on “Confirm Course”. Only Selected Candidates will be intimated through E-mail by the Course Coordinator. They have to remit the necessary course fee in the form of DD drawn in favour of “The Director, NIT, Tiruchirappalli – 620015” payable at NIT-Tiruchirappalli.</p>

# The Faculty



**Dr. K.S. Raja** is an Associate Professor of Chemical and Materials Engineering in the University of Idaho, Moscow, USA since August 2011. His previous affiliations are the University of Utah, Salt Lake City, USA and the University of Nevada, Reno, USA where he worked as a research faculty member focusing on nanomaterials and nuclear materials for energy conversion and storage. Prior to immigrating to the USA in 2001, Dr. Raja worked as a research associate in Fracture Research Institute, Graduate School of Mechanical Engineering, Tohoku University, Sendai, Japan from October 1997 to December 2000, and as a research executive in Larsen & Toubro Limited, Mumbai, India from 1993-1997. Dr. Raja is a licensed professional engineer in the Idaho State, USA, and a NACE International (National Association of Corrosion Engineers, USA) certified materials selection and design specialist. He has more than 110 peer reviewed publications in journals and conference proceedings that have been cited more than 2750 times with an h-index of 23. He was a recipient of the prestigious DARPA (Defense Advanced Research Projects Agency, USA) young faculty award in the year 2012. He has a bachelor's degree in Mechanical Engineering and master's and doctoral degrees in Metallurgical Engineering awarded by IIT, Madras (Chennai), India. His research Interests are design and synthesis of high temperature and auxetic ceramics, environmental degradation of materials, and synthesis and characterization of materials for energy conversion and storage.



**Dr. N. Ramesh Babu** is an Assistant Professor of Metallurgical and Materials Engineering at the National Institute of Technology Tiruchirappalli since April 2006. He has obtained MTech and Ph.D degrees from the Department of Metallurgical and Materials Engineering, IIT Madras. His PhD work is on Biomaterials and he received the Best PhD Thesis Award from IIT Madras in the year 2007. He has 50+ peer reviewed publications in Journals with 1100+ citations. He has presented 30 papers in National and International conferences in India and abroad and received best paper awards in two International conferences. His research Interests are Biomaterials, Plasma electrolytic oxidation coatings and Nanostructured processing. At NIT Trichy, he has guided 3 PhD's and 1 MS and currently guiding 4 PhD scholars in the area of plasma electrolytic oxidation coatings for Biomedical, Nuclear, Automotive, Aerospace and Defence applications. He has organized 10 workshops and short-term courses at NIT Trichy. As a Principal investigator and Co-Investigator he has completed 5 projects sponsored by the DST, DBT, Nano-Mission of DST and Naval Research Board of DRDO.

## Course Coordinator

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