

GLOBAL INITIATIVE OF ACADEMIC NETWORKS (GIAN)

Course # 171003L18

Welding Metallurgy and Weldability of Steels and Stainless Steels

11.12.2017 – 15.12.2017 (09:00 AM to 12:00 PM)

Mechanical Sciences Block (MSB), Room # 360, IIT Madras

Overview

The nature of weld thermal cycles, the basic principles of heat flow in welding, and the origin of residual stresses in welds will be discussed. The fundamentals of weld metal solidification will be reviewed. The mechanisms of various types of weld cracking will be examined. The concept of weldability and the various methods of weldability testing will be discussed. In the second part of the course, the physical metallurgy and then the welding metallurgy of steels and stainless steels will be discussed in detail. The main problems in fusion welding of various classes of industrially relevant steels and stainless steels will be examined and how they can be overcome by careful process development and judicious filler selection and by employing suitable post-weld heat treatments will be described. Welding of steels to stainless steels and cladding of steels with stainless steels will also be briefly covered.

Who should attend?

- Students of bachelor's, master's, or doctoral programs interested in understanding welding metallurgy and weldability of steels and stainless steels.
- Faculty members engaged in teaching and research aiming to advance their understanding of welding metallurgy and weldability of steels and stainless steels.

- Engineers in public and private sector companies and researchers in national laboratories and other R&D institutions seeking expert knowledge in welding metallurgy and weldability of steels and stainless steels.

Course fee

Category	Amount [#]
Students	Rs. 2000
Faculty members	Rs. 6000
Engineers/Researchers	Rs. 10000
International participants	USD 300

[#]*Inclusive of 18% GST*

Instructions for paying the course fee are provided at the end. Participants are required to first register on GIAN portal by paying a one-time fee of Rs. 500. For more details, visit <http://www.gian.iitkgp.ac.in/GREGN/index>

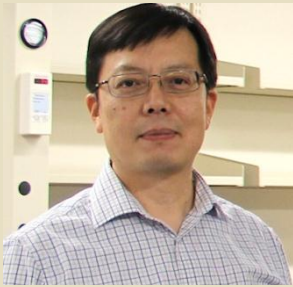
Participation in this course is limited and is on FCFS basis. The last date for course registration is 10.11.2017.

Accommodation

Subject to availability, participants may be provided hostel accommodation in IIT Madras on payment basis. Interested participants may request for hostel accommodation through <http://hosteldine.iitm.ac.in/iitmhostel>

Faculty

Prof. Leijun Li, University of Alberta



Prof. Leijun Li obtained his Ph.D. from Rensselaer Polytechnic Institute in Troy, New York. From 2000 to 2002, he served as a tenure-track assistant

professor of manufacturing at the University of Northern Iowa. From 2002 to 2013, he served as a tenure-track and then tenured professor in the Department of Mechanical and Aerospace Engineering at Utah State University. Currently, he is a Professor of Materials Engineering at the University of Alberta. Prof. Li has a worldwide reputation for his expertise in welding metallurgy and modeling of welding phenomena. He is a Fellow of ASM International, a Fellow of American Welding Society, and a Fellow of The Canadian Welding Association.

Dr. G.D. Janaki Ram, IIT Madras



Dr. G.D. Janaki Ram obtained his Ph.D. in Metallurgical and Materials Engineering from IIT Madras. From 1998 to 2005, he served as a Scientist in

Regional Centre for Military Airworthiness (Materials). In 2005, he went to Utah State University, USA, for his post-doctoral work in the field of additive manufacturing. In 2008, he returned to India to begin a faculty position at IIT Madras. Since then, Dr. Janaki Ram has been actively engaged in teaching and research in the fields of welding and additive manufacturing.

Lecture schedule & contents

Day 1: Weld Thermal Cycles (Prof. Li)

Basic principles, weld zones, analysis of heat flow, effects of welding variables, significance of thermal effects, origin of residual stresses

Day 2: Weld Metal Solidification (Prof. Li)

Solidification theory, solute redistribution and segregation, solidification modes, epitaxial and competitive growth, grain structure and sub-structure, control of weld metal solidification

Day 3: Cracking Phenomena in Welds (Dr. Janaki Ram)

Solidification cracking, liquation cracking, reheat cracking, cold cracking, lamellar tearing, metallurgical and mechanical factors influencing cracking, weldability testing

Day 4: Welding Metallurgy of Steels (Prof. Li)

Physical metallurgy, classification of steels, weldability, filler selection, fusion zone and HAZ phenomena, control of heat input, preheating and post-heating, post-weld heat treatment

Day 5: Welding Metallurgy of Stainless Steels (Dr. Janaki Ram)

Classification of stainless steels, physical metallurgy, weldability, filler selection, fusion zone and HAZ phenomena, weld mechanical properties and corrosion susceptibility, control of heat input, preheating and post-heating, post-weld heat treatment, welding of steels to stainless steels, cladding of stainless steels

Course Coordinator

Dr. G.D. Janaki Ram

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Instructions for course fee payment

- The course fee may be paid by online bank transfer to the account of Centre for Continuing Education (CCE) at IIT Madras given below. Please fill the Payment Intimation Form and email to the Course Coordinator by 18.11.2017.

Account Name : CCE IIT Madras
Account Number : 36401111110
Bank Name : State Bank of India (SBI), IIT Madras Branch, Chennai
SWIFT Code : SBININBB453
Bank IFSC Code : SBIN0001055
TAN Number : CHE304464F
PAN Number : AAAAI3615G
GST Number : AAAAI3615GSD001

- Alternatively, the course fee may be paid by demand draft (DD) drawn in favor of “CCE IIT Madras” payable at Chennai. Please mail the DD along with the Payment Intimation Form to the Course Coordinator so as to reach by 18.11.2017.
- IIT Madras is exempted under section 10(23c) (iii ab) of the Income Tax Act and as such no tax has to be deducted at source.
- Course fee receipts will be provided by CCE, IIT Madras.

Payment Intimation Form

Course title: Welding Metallurgy and Weldability of Steels and Stainless Steels

Course # 171003L18

Payment type (Individual/Group):

Fee category (Student/Faculty/Engineer/Researcher/International):

Participant's name(s):

Address, email, phone:

By bank transfer

Bank's name, branch, place:

UTR/Transaction #

Date of transaction:

Amount transferred:

By DD

Amount:

DD #

Date:

Bank's name, branch, place: