Ministry of Education (Siksha Mantralaya), Govt. of India
funded course on
DECARBONIZATION OF STEEL INDUSTRY AND POWER GENERATION
under the aegis of
Global Initiative of Academic Networks (GIAN)
organized by
National Institute of Technology Durgapur
during June 10-14, 2025

Overview

This course will discuss the concept of decarbonization towards making steel and power. The current scenario of decarbonization status in the world as well as in India will be covered. Various scenarios and the sensitivity of key variables to meet this target will be described and presented. Considering both the challenges and the opportunities, it will analyze the key technologies and processes that would enable substantial CO_2 emission reductions in these sectors.

The sessions are intended to induce thoughtful discussions and stimulating exchanges. Participants will be conversant with Decarbonization in Steel making and power generation process after completing the course.

Objectives

After successful completion of this short course, participants will be able to:

- Get an idea about the fundamentals of conventional processes as well as lower-emission alternatives
- Learn about using biomass as a fuel or feedstock as a financially more attractive alternative
- Understand the most economical option for industrial decarbonization like CCS
- Develop new ideas and logical explanations for carbon-free energy
- Assessment techniques for the evaluation of technologies
- Develop an understanding of the life cycle costing of hydrogen production (e.g. levelized cost of hydrogen) and the potential recycling aspect of electrolyzers and fuel cell stacks at their end-of-life.

Dates	**June 10-14, 2025**
Venue	Lectures will be delivered in In-Person mode at NIT Durgapur.
Modules	MODULE I: Why Decarbonization and why now? What is the relevance for India? Green Steelmaking concept MODULE II: Alternative/renewable energy sources, and its potentiality for green steelmaking. How hydrogen can be relevant for Indian scenarios? MODULE III: Calculate the greenhouse gas footprint of conventional power generation/ steel making. MODULE IV: Emission in Thermal power plant MODULE V: Technologies to reduce Emission in Thermal power plant MODULE VI: Develop techno-economic calculation spreadsheet model for a PEM based hydrogen production case study MODULE VII: Biomass as sustainable energy source for iron making MODULE VIII: Emission in Iron and Steel sectors MODULE IX: Practice and Problem solving using SimaPro demo software to determine carbon footprints of iron and steelmaking using green technologies MODULE X: Technologies to reduce GHG in iron and Steel sectors MODULE XI: How life cycle assessment tool can be used in the context of Green Steel production MODULE XII: Life cycle assessment of hydrogen production technologies MODULE XIII: Hydrogen production using solid oxide electrolyzers MODULE XIV: Green DRI production experiments with Biomass MODULE XV: Green ammonia production technologies and potential application as a reductant. MODULE XVI: Smelting reduction experiment with hydrogen plasma MODULE XVII: Evaluation of Learning Outcomes (Examination/Test, Feedback) & Certificate distribution
You Should Attend If…	•Executives, engineers and researchers from manufacturing, power generation and other allied areas and government organizations including R&D laboratories. •Student students at all levels (B.Tech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions.
Fees	The registration fees (Excluding GST-18%) for the course are as follows: **Participants from abroad:** US $200. **Participants from India:** a. Students / Research scholars: Rs.1000. b. From Academic/Research organization: Rs.2000. c. From Industry: Rs.3000. The registration fee includes kit, instructional materials, internet facility, tea & snacks. The fee does not include accommodation. **No refund of registration fee will be made.** **Mode of Registration**: Registration fees are required to be paid via National Electronic Funds Transfer (NEFT) to "**CEP NIT DURGAPUR**" bearing **Account. No. 37850318679**, **STATE BANK OF INDIA, NIT CAMPUS, DURGAPUR, IFSC Code: SBIN0002108.** Complete the registration process by filling the required details in the link given below: https://forms.gle/CJCq7n3t7DtjLLtY6 **The last date of registration is 10th May, 2025.** **The number of participants for the course is limited to fifty.**

The Faculty

Dr Nawshad Haque

Dr. Nawshad Haque is a Principal Scientist and Research Team Leader of Commonwealth Scientific and Industrial Research Organization's (CSIRO) life cycle assessment (LCA) and techno-economic evaluation and hydrogen energy systems Team in Mineral Resources and Energy Business Unit in Australia. His current focus now as a project Leader to develop techno-economic and environmental modelling tools using LCA for future multibillion dollars hydrogen energy systems in Australia. He works on process flowsheet modelling, economic and environmental evaluation of process systems for mining, mineral processing and metal making industries using various tools, databases and software.

Dr Haque has extensively studied LCA of a variety of metals, including aluminium, magnesium, ferroalloy, gold and nickel to identify opportunities for CO_2 emission reduction. He has also evaluated projects such as energy systems, biomass-derived charcoal application in steel making with fossil coal blends to reduce environmental impact and the application for biocoke, bioanode, biopitch in aluminium production using LCA tools and techno-economic considerations. These studies have led to numerous publications, some of which have been used internally in CSIRO and by various external industry groups. Dr. Haque has developed over 10 software tools for drying industry applications.

Dr Haque commenced work as a materials scientist at New Zealand Forest Research Institute and in 2005 joined CSIRO. Dr Haque has been awarded a Ph.D. in Chemical Engineering from The University of Sydney, Australia in 2002. Dr Haque is an elected Fellow of the Australian Institute of Mining and Metallurgy, Australian Institute of Energy, and The Institute of Materials, Minerals and Mining (IOM3) UK. He was a Professional Engineer accredited by the Engineers Australia, a member of The Minerals, Materials and Metals Society (TMS) US, and a Director of the Board of the Australian Life Cycle Assessment Society. He has already offered one GIAN course at MNNIT Allahabad.

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Dr. Arup Kumar Mandal

Dr. Arup Kumar Mandal is an Assistant Professor in the Department of Metallurgical and Materials Engineering, National Institute of Technology Durgapur (India). He is now acting as Associate Dean (Academic & Examinations) from 2021 Dr. Mandal has over 20 years of teaching and research and industrial experience and is actively involved in research in the areas of Iron and Steelmaking, De carbonization of iron and steelmaking, green energy, waste recycling, and circular economy. He obtained his Ph.D. from IIT(BHU), Varanasi in 2017. Dr. Mandal has published over 35 research papers, 1 patent, 1 book chapter, and delivered several invited talks on a variety of technical and motivational topics. Dr. Mandal is presently working on several research projects sponsored by various government agencies as an investigator.

Dr. Satadal Ghorai

Dr. Satadal Ghorai is currently Associate Professor, Metallurgical and Materials Engineering Department, NIT, Durgapur since January 2019. Prior to that, he was with CSIR-NML as Scientist from august 2005 to January 2019. He was a Postdoctoral Fellow at The Center for Iron & Steelmaking Research (CISR), Carnegie Mellon University, Pittsburgh, USA during April 2008 to April 2009. He is working mainly in the field of iron & steel making and refining and ferrous raw material characterization as well as utilization of fines, waste materials and low grade ore. He has the experience in agglomeration process of fines/concentrates like pelletization and sintering. He has published 27 journal paper and 26 conference proceedings (National and International) to his credit. He has filled seven patents so far, out of which 4 has been granted. He has also completed eight projects (Tata Steel-05, Siemens – 01, KMML-01 and ABSTC ltd. – 01) as Principal Investigator and nine projects (Tata Steel-04, SDF-01, ABSTC ltd-01, Facor alloys-01 and Inhouse-01) as Co- Principal Investigator