GIAN courses in the area of Ferrous/Non-Ferrous Extractive Metallurgy/ Iron and Steel-making (September – December 2016)

Hosted by: Dr. Ajay Kumar Shukla *Department of Metallurgical and Materials Engineering, Indian Institute of Technology – Madras, Chennai, India*
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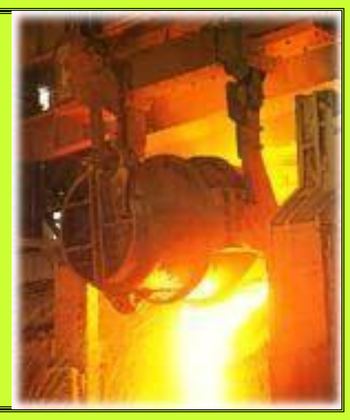


Under GIAN scheme of Ministry of Human Resource Development, Govt. of India, a number of courses will be delivered by world prominent experts in the area of Ferrous/Non-ferrous Extraction Metallurgy. List of the courses to be offered are as follows:

1. **Prof. David G.C. Robertson, Former Director and Prof. Emeritus Steel Manufacturing Center, Missouri Institute of Technology, USA (Course proposed:(Process Engineering Principles and Software for Pyrometallurgical Processes for Metal Extraction). Schedule: 02nd December, 2016 to 16th December, 2016).**

2. **Prof. Geoffery Brooks, Director, High temperature laboratory for ferrous/non-ferrous extraction, University of Swinburn, Australia (Course proposed: (Fundamentals of Slag Chemistry), Schedule: 25th September, 2016 to 01st October, 2016).**

3. **Prof. Olena Volkova, Director Iron and Steel Institute, TU Bergakademie, Freiburg, Germany (Course proposed: Thermochemical Modeling of Steelmaking Process). Schedule: 11th October to 17th October 2016).**

Process Engineering Principles and Software for Pyrometallurgical Processes for Metal Extraction

Overview

This course is designed to cover the important field of Pyrometallurgy – smelting and refining at high temperatures. The steel industry uses these processes exclusively to make steel and they are also dominant in the production of copper, aluminium, ferro-alloys, titanium, and many other metals. All aspects of our work in teaching and research at Universities have been transformed by the digital revolution, and powerful software packages are now available to assist engineers to improve and optimize existing processes and to design new ones. However this in no way mitigates the need for a good understanding by the process engineer of the fundamentals of chemical thermodynamics and chemical engineering – it will be assumed that the fundamentals have already been covered by the students in their "standard" undergraduate courses. By combining application of the fundamentals with the use on the software packages the students will understand and actually visualize how processes work, and they will work on assignments that reflect the complexity of actual processes.The course will involve inputs on fundamental aspects of pyrometallurgy applied to high temperature metal extraction process on one hand and application involving computing approach using software like METSIM/FactSage/FlowBaletc on the other hand. The students will be taught about how to use the FREED, Therbal, Flowbal, FactSage, METSIM and Steel University software packages, and apply them to processes for smelting and refining of metals, especially in iron and steelmaking/non-ferrous extraction. Fundamentals will be covered as necessary during the software instruction.Course participants will learn these topics through lectures and hands-on experiments. Also case studies and assignments will be shared to stimulate research motivation of participants.

Dates for the Course	**02nd December, 2016 to 16th December, 2016**
Host Institute	**IIT Madras**
No. of Credits	**2**
Maximum No. of Participants	**40**
You Should Attend If…	▪ Shop floor engineers, managers, and R&D professionals working in the area of iron and steel production as well as non-ferrous extraction/production. ▪ Student orfaculty fromacademic institution working in the area of process metallurgy/iron and steelmaking/metal extraction. ▪ Scientists and Engineers working in applied industrial based research organizations involved in the area of metal extraction and refining.
Course Registration Fees	The participation fees for taking the course is as follows: **Student Participants:** Rs.2000 **Faculty Participants:** Rs.5000 **Government Research Organization Participants**: Rs.8000 **Industry Participants:** Rs.10000 The above fee is towards participation in the course, the course material, computer use for tutorials and assignments, and laboratory equipment usage charges. **Mode of payment: Demand draft in favour of "Registrar, IIT Madras" payable at Chennai**
Accommodation	The participants may be provided with hostel accommodation, depending on the availability, on payment basis. Request for hostel accommodation may be submitted through the link: http://hosteldine.iitm.ac.in/iitmhostel

Dr. David G. C. Robertson graduated from Imperial College, London, in 1963, and then attended the University of New South Wales, Sydney, Australia, where he obtained his Ph.D. in 1968. He then joined the faculty at Imperial College and remained there until 1986, when he became Director of the Center for Pyrometallurgy at the University of Missouri-Rolla (now the Missouri University of Science and Technology). Dr. Robertson's teaching has focused on the application of engineering principles to metallurgical processes for smelting, refining, and solidification. Since 2005 Dr. Robertson has travelled widely to give lectures, take part in Conferences, and visit companies. In 2006, Dr. Robertson worked at the BHP Billiton Newcastle Technology Center, as a Senior Principal Engineer in the Technical Marketing Team. In 2008 he visited Anglo Platinum for six weeks and was a Visiting Professor at Tohoku University for four months. In 2009 he was Visiting Professor at the University of Science and Technology Beijing (USTB) for two weeks and at Chongqing University (CQU) for two months. In 2009-10 Dr. Robertson was Visiting Professor at IIT Kanpur for five months

Fundamentals of Slag Chemistry

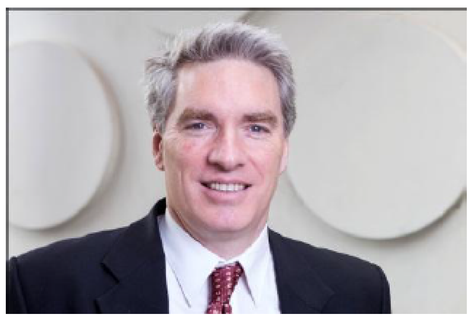
Overview

The course will provide an overview of the underlying science of slag chemistry and explain howthese scientific principles relate to important industrial problems in iron, steel and copper production.The course is designed to explain to the students how the chemical behavior and properties of molten oxides can be related to chemical bonding and structure of molten slags. These concepts will then be linked to the thermodynamics of the system and methods for making useful calculations relating to important industrial problems will be shown. Case studies from iron-making, steelmaking and copper production will be used to illustrate these principles.

The syllabus of the course will contain overview and description of metallurgical slags, structure and chemical bonding of molten oxides, concept of basicity, properties of molten oxides, thermodynamics of oxide systems, Ellingham and phase diagrams in addition to the application of thermodynamic modeling for various ferrous/non-ferrous extraction processes. Few case study based problems like behavior of Phosphorus in steelmaking process, slag formation in copper smelting and design of Iron-making Slags would also be demonstrated.

Course participants will learn these topics through lectures and hands-on experiments. Also case studies and assignments will be shared to stimulate research motivation of participants.

Dates for the Course	**25th September, 2016 to 01st October, 2016**
Host Institute	**IIT Madras**
No. of Credits	**1**
Maximum No. of Participants	**40**
You Should Attend If…	▪ Shop floor engineers, managers, and R&D professionals working in the area of iron and steel production as well as non-ferrous extraction/production. ▪ Student orfaculty fromacademic institution working in the area of process metallurgy/iron and steelmaking/metal extraction. ▪ Scientists and Engineers working in applied industrial based research organizations involved in the area of metal extraction and refining.
Course Registration Fees	The participation fees for taking the course is as follows: **Student Participants:** Rs.1000 **Faculty Participants:** Rs.3000 **Government Research Organization Participants**: Rs.4000 **Industry Participants:** Rs.5000 The above fee is towards participation in the course, the course material, computer use for tutorials and assignments, and laboratory equipment usage charges. **Mode of payment: Demand draft in favour of "Registrar, IIT Madras" payable at Chennai**
Accommodation	The participants may be provided with hostel accommodation, depending on the availability, on payment basis. Request for hostel accommodation may be submitted through the link: http://hosteldine.iitm.ac.in/iitmhostel



Professor Geoff Brooks is Pro-vice Chancellor (Future Manufacturing) at Swinburn University of Technology. He is responsible for co-ordinating and developing manufacturing related research and education across Swinburne University of Technology. His own expertise is in the field of process metallurgy and he has published over 150 papers on various aspects of steelmaking, aluminium and magnesium production. Geoff has held senior positions at University of Wollongong, McMaster University in Canada, CSIRO and is now Head of the High Temperature Processing group at Swinburne University of Technology. He received his PhD at the University of Melbourne in 1994; he has a Degree in Chemical Engineering at RMIT and a Bachelor of Arts (HPS, Media) from Swinburne. In 2013, Geoff was awarded the John Elliott Lectureship by the AIST, acknowledging his contribution to process metallurgy. He is a Fellow of the Institute of Engineers. He has also won major international awards from the ASM, TMS, ISS and MetSoc.

Thermochemical Modeling of Steel Making Process

Overview

Steel production and per capita consumption is directly linked to the prosperity of a nation.The Government of India is aiming to scale up steel production in the country to 300 MT by 2025 from 81 MT in 2013-14. (http://www.ibef.org/industry/steel.aspx) . It is one of the major areasin national interest which is directly related to 'Make in India' program.

The steelmaking processes involve dynamic interactions among various phases (slag, metal and gas) along with chemical reactions, fluid flow and heat and mass transfer. Understanding of underlyingbasic principles of steelmaking helps to design, optimize and control the large scale industrial process of steelmaking in an effective manner.The course will consist of lectures in scientific base of steelmaking (Thermodynamics as well as kinetics) as well as application to the actual process by developing mathematical models employing a combination of commercial packages (like FactSage/METSIM/HSC/MATLAB). Overall the course will have following content: (a) Thermochemical equilibrium calculation (molten metal - slag - gas), reactions, energy and material balances, phase transitions in multicomponent systems, phase diagrams, introduction to software for the thermochemical equilibrium calculation (FactSage, HSC,METSIM). Calculation examples from the area of steelmaking converters, Electric arc furnace, Secondary Steelmaking, interface steelworks / blast furnace,Focus is on the application of thermochemical modeling on the subject-specific problems of steelmaking.(b) Basis of thermochemical calculations through various Example : Control of steel composition and temperature in converter steelmaking during blowing process, End point prediction and control (T_Melt>>T_End), Calculation of liquidus temperature,melting of different scrap in electrical arc furnace,Use of various scrap (coolant) in converter steelmaking process,Heat transfer in steel ladle and temperature prediction with and without lid, Influence of the cold ladle on the steel melt temperature, melting and dissolution rate of different alloys during steelmaking process,Composition and temperature control during secondary steelmaking, Inclusion Engineering, Change of chemical composition of pig iron with the temperature, Interface steel plant and blast furnace - temperature of pig iron,use of different alloys or slag bilinder in converter process, Phase diagram of slag systems and so on.Course participants will learn these topics through lectures and hands-on notes. Case studies and assignments will also be shared.

Dates for the Course	**11th October, 2016 to 17th October, 2016**
Host Institute	**IIT Madras**
No. of Credits	**1**
Maximum No. of Participants	**100**
You Should Attend If…	▪ Shop floor engineers, managers, and R&D professionals working in the area of iron and steel production as well as non-ferrous extraction/production. ▪ Student orfaculty fromacademic institution working in the area of process metallurgy/iron and steelmaking/metal extraction. ▪ Scientists and Engineers working in applied industrial based research organizations involved in the area of metal extraction and refining.
Course Registration Fees	The participation fees for taking the course is as follows: **Student Participants:** Rs.1000 **Faculty Participants:** Rs.4000 **Government Research Organization Participants**: Rs.5000 **Industry Participants:** Rs.6000 The above fee is towards participation in the course, the course material, computer use for tutorials and assignments, and laboratory equipment usage charges. **Mode of payment: Demand draft in favour of "Registrar, IIT Madras" payable at Chennai**
Accommodation	The participants may be provided with hostel accommodation, depending on the availability, on payment basis. Request for hostel accommodation may be submitted through the link: http://hosteldine.iitm.ac.in/iitmhostel

Professor Dr.-Ing Olena Volkovais Head of Institute of Iron- and Steeltechnologie, TU Bergakademie Freiberg, Germany. A graduate from National Metallurgical Academy of Ukraine and doctorate from TU Bergakademie Freiberg, She has been extensively involved with applied industrial research and process development activities related toiron and steelmaking for over last 20 years. She also served as the Head of Level-2 and Optimization group at ThyssenKrupp Steel Europe and Project Manager at ThyssenKrupp Steel Brazil for many years. (http://tu-freiberg.de/fakult5/iest/institut)

Dr. Ajay Kumar Shukla, is Assistant Professor in the Department of Metallurgical and Materials Engineering, IIT Madras. He received his B.Tech and Ph.D. from IIT Kanpur. His research interests include process modeling, control and optimization of iron and steelmaking as well as non-ferrous extraction.He has spent almost one decade in steel industry at various managerial and technical capabilities (nine years in SAIL-Durgapur Steel Plant and almost one year at National Metallurgical Laboratory, Jamshedpur).He is currently involved with number of applied industrial research based projects with various steel plants.

Requesting for maximum participation in these courses. These courses may be of interest to those working in the area of Process Metallurgy/Chemical Engineering/High Temperature Process/Reactor design/Heat and mass transfer/ Chemical Thermodynamics and Kinetics related to metal extraction and production.