Advances in Combustion and Gasification Technology

Overview

In the recent past, more emphasis is being given to produce clean energy from various renewable sources due to rise in crude oil price and greenhouse gas emission. Moreover, the sustainable economic development with green environment is a prime focus for the world which has been discussed in global summit held in Paris. In order to mitigate the greenhouse gas emission and other environmental problem and to utilize the available carbon neutral resources like biomass effectively, various technologies and processes have been developed around the world. The co-firing of biomass with coal at low percentages in the thermal power plant avoids the characteristic operating problems of biomass combustion such as ash sintering and fouling of heat exchanger surfaces, along with significant reduction in emission of pollutants. Hence, biomass fuel could substitute more expensive coal and contribute in lowering CO_2 emission. Coal and biomass can also be used for both combustion and gasification applications. With the advancement of reactor technology a higher degree of conversion efficiencies with improved emission characteristics is achieved. The quality of combustion and gasification is also dependent on the type of fuel used and behavior with time when heated to a range of temperatures.

This course will provide deeper insight into combustion and gasification processes and technologies which finally contribute to the understanding of this important topic. The course content includes a brief introduction on gasification and combustion principles, fundamentals of nonhomogeneous reaction kinetics, advanced combustor, advances gasifier system and processes (Fluidized bed, plasma, microwave), fuel characterization, modelling and simulation. Furthermore, the course will be extremely useful for executives, engineers, researchers from manufacturing, service and government organizations including R&D laboratories, scientists, research scholars and graduate students, who are working in the areas of thermochemical conversation of fuel more specifically on gasification and combustion.

Objectives

The primary objectives of the course are as follows

- Exposure to the fundamentals of combustion and gasification processes and devices.
- Providing exposure to practical problems and their solutions, through case studies, modeling and live projects.
- Expose participants to the state of the art technologies for efficient conversions of solid fuels and how this can be utilized for both academic and professional.

29th October 2018 – 2nd November 2018

Tentative Schedule

Day 1		
Lecture 1	*2 hrs*	Fundamentals of combustion and gasification
Tutorial 1	*2 hrs*	Model development for investigation of product gas composition of gasification
Day 2		
Lecture 2	*2 hrs*	Fundamentals of nonhomogeneous reaction kinetics
Day 3		
Lecture 3	*1 hrs*	Recycling of low rank biomass by hot water treatment, carbonization and gasification
Lecture 4	*1 hrs*	Advanced gasifier systems and processes (plasma, microwave)
Tutorial 2	*2 hrs*	Problem solving session with examples: Advanced combustor, plasma and microwave gasification
Day 4		
Lecture 5	*1 hrs*	Fuel characterization and methods, Task Coordination and Integration
Lecture 6	*1 hrs*	Understanding the heat transfer and hydrodynamics of a circulating fluidized beds
Tutorial 3	*2 hrs*	Investigation of reaction kinetics of biomass and coal for co-gasification
Day 5		
Lecture 7	*1 hrs*	Environmental technology of microwave plasma , Lecture 8: 1 hrs: Modelling and simulation of gasification systems
Tutorial 4	*2 hrs*	Problem solving session with examples: modelling and simulation
Tutorial 5	*2 hrs*	Design of a 1 kWe fluidized bed unit when coal and biomass blends are used as fuel.

Who can attend?

- Executives, engineers and researchers from manufacturing, service and government organizations including R&D laboratories.
- Student at all levels (B. Tech /M.Sc. /M. Tech /Ph.D.) and faculty from reputed academic institutions and technical institutions.

Fees

Student:	**INR 1000/- (Refundable)**
Participants from abroad:	**US $500/-**
Industry/Research Organizations:	**INR 15000/-**
Academic Institutions (Faculty):	**INR 7500/-**

- The fee is to be paid using Demand Draft. The Demand Draft for the students (only) will be returned back to them if and when they physically attend the course.
- Hostel accommodation and lodging necessities will be provided for students, at per day per person cost of approximately INR 250 /-.
- Faculties and industry persons would be provided IITG Guest House rooms (twin sharing / single rooms depending on availability) at per day per person cost of approximately INR 500 /- (Charges may vary). Participants may avail food/meals inside or outside the IITG campus, wherever they prefer, on their own expenses.

Course coordinator	**Dr. Pankaj Kalita** Assistant Professor Centre for Energy Indian Institute of Technology Guwahati Guwahati 781039 Assam, India E-mail: pankajk@iitg.ernet.in Tel: +91-361-2583129; Fax: +91-361-2690762
Registration Procedure	*Please follow the following steps for registration:* 1. Go to GIAN website (http://www.gian.iitkgp.ac.in/GREGN/index) First time users need to register and pay a one - time fee of **INR 500/-** 2. Select course: "**Advances in Combustion and Gasification Technology"**. Once you enroll for the course, an **Enrolment/Application number** will be generated, and the course coordinators will be notified. The course coordinators will shortlist the candidates out of the applicants. The shortlisted candidates will be notified by email. 3. The selected candidates must pay the applicable fees using **Demand Draft (DD)** drawn in favour of "**Registrar, INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI", payable at IIT Guwahati**. Please write your Name and Enrolment / Application number at the back of the DD, and post/courier it, to reach **by 31st August 2018.** 4. Fill the course registration form in GIAN portal. Email the course registration form to the Course coordinator along with DD **by 31st August 2018.**

The Faculty

Professor Yoshinori Itaya is faculty of Environmental and Renewable Energy Systems Division at Gifu University, Japan. Currently, he is director of research center on renewable energy as well as a vice dean of engineering school, Gifu University, Japan. His research areas include gasification of carbonaceous resources, recycling of low rank biomass by hot water treatment, carbonization and gasification, heating up of waste low temperature heat by absorption heat pump system, environmental technology of microwave plasma, desulfurization by adsorption from syngas and self-energy sewage treatment system combined by compost/drying of sludge.

Dr. Pankaj Kalita is currently working as Assistant Professor of Centre for Energy at Indian Institute of Technology Guwahati. He has completed his M.Tech in Mechanical Engineering and PhD in Energy from IIT Guwahati, India. His research interest includes of fluidized bed combustion and gasification, solar thermal, energy management and energy storage.

Prof. Pinakeswar Mahanta is currently working as Professor in the Department of Mechanical Engineering at IIT Guwahati. He has been associated with IIT Guwahati as a faculty member since 2001. He had completed his PhD degree from IIT Guwahati itself in 2001. His research interests are thermal radiation with participating media, fluidization, energy conservation and renewable energy.