
A GIAN course on

- **Energy, Environment and Sustainability:
Enabling advanced solutions using
aerosol science**

Brochure link: https://portal.iitb.ac.in/ceqipapp/courseDetails.jsp?c_id=1512.

Overview

Aerosol science and technology is a discipline that focuses on fundamentals of fine particle formation, growth and transport. This field is recognized as an enabling discipline that helps tackle global challenge problems related to energy, environment, health, medicine and advanced materials. Of specific interest is the nexus between energy and the environment. The progress of a developing country like India is closely linked to its energy security, and the ability to provide access to it in an environmentally benign manner. As is increasingly becoming evident in recent times, there is a very strong interaction between different elements of energy & environment, and the resulting impact of industrial and human growth on the environment (predominantly air and water quality).

Aerosols are defined as a suspension of particles in a gas; and they consist of both “bad” (unwanted) and “good” (desirable) particles. The unwanted particles are formed in a primary or secondary manner related to both energy and environmental systems. The understanding of the discipline may help minimize adverse effects of these particles, for example by controlling their emissions. Adverse air quality is a major global challenge facing many parts of the world today, but more so in an alarming nature in countries such as India and China. On the other hand, an understanding of aerosol science at the fundamental level can be useful in controlling air pollution, developing large scale mitigation technologies and in the design, operation and control of aerosol reactors, which enable the development of new and innovative applications related to nanoparticle technology, medicine and agriculture.

Starting with an overview of energy and environment nexus and factors that affect them, the course will critically examine the role of aerosols in impacting this nexus. The course will focus on the entire life-cycle of aerosols – from birth (formation) to their eventual fate. The course will delve into the fundamentals of aerosol science covering the following topics: a) characterizing a system of particles and concepts of size distribution, b) understanding their formation and growth; c) transport characteristics of these particles in natural and engineered settings; d) particle-particle interactions; and particle-light interactions impacting visibility. At each stage different applications will be discussed: a) instrumentation for measuring of particle size distributions, b) aerosol reactors for synthesis of nanoparticles for a variety of energy and environmental technological applications, c) applications in synthesis of catalysts, medicine for cancer treatment and in agriculture, and d) ambient and indoor air quality issues and how we may resolve these problems either by source control or using mitigation technologies.

The course will involve a combination of lectures and tutorial sessions, as well as hands-on sessions on different modeling tools for the design and analysis of aerosol systems.

Dates	February 4- February 8, 2019 Number of participants for the course will be limited to fifty (50).
You Should Attend If...	<ul style="list-style-type: none"> ▪ You are a consultant for industries or government organizations with a primary responsibility of assessing impact of aerosols on the energy-environment nexus. ▪ You are working in an industry associated with particle or powder related applications. ▪ Sectors such as pharmaceuticals, medicine, agriculture, energy and environmental technologies ▪ You are working with an NGO or citizen groups for understanding impact of aerosols on the environment or for a Government environmental agency personnel such as those from Pollution Control Boards ▪ You are a scientist/engineer working on developing novel or improved applications of fine particles and nanoparticles ▪ You are a student or faculty from academic institution interested in learning about aerosols as part of your teaching or research. ▪ Want to learn about the MAGEEP International Network and the Industrial Consortium, and participate in collaborative projects
Fees	<p>The participation fee (including taxes) for taking the course for different categories is as follows:</p> <p>Industry: INR 28,320 Government research organization and NGOs: INR 12,000 Academic institutes (faculty members): INR 8,000 Students: INR 5,000 Participants from abroad: INR 84,960</p> <p>The above fee includes all instructional materials, computer use for tutorials and assignments, 24 hr free internet facility, lunch and tea during session breaks.</p> <p>The participants will be provided with accommodation on payment basis subject to availability.</p>

The Faculty



Dr. Pratim Biswas, the Lucy and Stanley Lopata Professor, Chair of the Department of Energy, Environmental and Chemical Engineering and Assistant Vice Chancellor at Washington University in St. Louis will be the primary lecturer. He has 35 years of experience in this field and published more than 385 refereed journal papers with his 52 PhD graduates. He is internationally recognized as a leader in the field of aerosol science and technology, and has won awards such as the Fuchs Award, Sinclair Award, Whitby Award and Distinguished Faculty and Alumni Awards from Washington University, St. Louis and IIT Bombay.



Dr. Ravindra Gudi is Professor and Head at the Department of Chemical Engineering, Indian Institute of Technology Bombay. He has been on the faculty of IIT Bombay since 1995. His research interests are in the areas of process systems engineering with applications to energy, environment and CO₂ valorization. Prof. Gudi obtained his PhD from the University of Alberta, Canada, and has been a visiting professor at the University of Wisconsin, Madison and Washington University at St. Louis.



Dr. Y S Mayya is an adjunct professor in the Department of Chemical Engineering at the Indian Institute of Technology Bombay. He has co-authored 156 refereed Journal papers, two books and several conference papers on wide ranging topics in the fields of Aerosols, Radon and Radiation Physics. He has mentored many young researchers at the Bhabha Atomic Research Centre and at IIT Bombay in the areas of aerosol modeling, experimentation and instrumentation. He received the K.G. Vohra Memorial award from the Indian Association for Radiation Protection, and was nominated as an *Aerosol Pioneer* during the International Aerosol Conference (2018) organized by the American Association for Aerosol Research.



Prof. Virendra Sethi

Dr. Virendra Sethi is a Professor at the Centre for Environmental Science and Engineering, IIT Bombay since 2000. He has a B-Tech. in Chemical Engineering from IIT Bombay, and MS and PhD in Environmental Engineering from the University of Cincinnati. He has worked with ONGC and USEPA. His areas of research interests include air quality assessment, satellite remote sensing for air quality applications, combustion aerosols, particle transport, and indoor air quality.

Detailed Course Outline

Day	9:30 to 11:00	11:30 to 13:00	14:00 to 15:30	16:00 to 17:30
1	Energy and Environment Nexus (PB) Overview of Sustainability (RDG)	Aerosol Characterization (PB)	Aerosol Formation (Nucleation) & Growth (Condensation). (PB)	Hand-on sessions on Preliminaries. Computer problem solving
2	Aerosol Transport Mechanisms. Instrumentation (PB)	Particle-Particle Interactions (YSM)	Tutorial and Hands on Session on Problem Solving	Aerosol Reactors – Designs and Examples (PB)
3.	Particle – Light Interactions: Visibility and Optical Devices ; Instrumentation (PB)	Particle Control Devices (YSM)	Tutorial/ hands-on sessions, Computer Codes	State of the Art Aerosol Instruments: High Flow DMAs, Aerosol Mass Spectrometers (PB)
4	PM Sensor Networks: Big Data and Artificial intelligence (PB)	Atomization and Electro spray Systems (YSM)	Hands-on session on aerosols modeling	Drinking Water Distribution Systems (RDG)
5.	Nanoparticle Technology Applications: Cancer Treatment to Agriculture (PB)	Ambient and Indoor Air Quality (VS)	More Computer Models EPANET, Aerosol Dynamic Models	MAGEEP Network & IITB-Wash Univ Shared Facility. Industry Network Summary of the Course (PB)

Lectures will be accompanied by active learning interactive sessions to promote learning. Interactive sessions will involve group problem solving, group discussion, working on packaged software and simulation systems to analyze energy and environmental impact analysis.

Course Faculty:

PB **Pratim Biswas**
RDG **Ravindra D Gudi**
YSM **Y S Mayya**
VS **Virendra Sethi**

All communications including the completed registration form (please see next page) may kindly be mailed to: Prof. Ravindra D. Gudi, Department of Chemical Engineering, IIT Bombay, Powai, Mumbai 400076; Tel: +91-22-25767231. E-mail: ravigudi@che.iitb.ac.in

GIAN Short Term Course

on

Energy, Environment and Sustainability: Enabling Advanced Solutions using Aerosol Science

February 4-8, 2018

Registration Form

Name(in block letters): _____

Qualification: _____

Designation: _____

Organization: _____

Mailing
Address: _____

Mobile: _____

Fax: _____

Email: _____

Payment: Rs: _____

IIT Guest House/Hostel stay needed (will be arranged as per availability on a payment basis): YES / NO

(Please contact the course co-ordinator for the availability details).

Signature of Applicant: _____

Date:

COURSE FEE: (inclusive of GST)

Participants from abroad:	INR 84,960
Government research organization and NGOs:	INR 12,000
Industry/ Research Organizations:	NR 28,320
Academic Institutions/ Faculty/ NGO:	INR 8,000
Students & Research Scholars:	INR 5,000

The above fees include all instructional materials, computer use for tutorials and assignments, laboratory usage charges, free internet facility.

Subject to availability, the participants will be provided with accommodation on payment basis. This payment will be made separately by the participant at the accommodation venue.

The course fees are being paid by (Please tick appropriate option on the next page)

- (i) Logging in at <https://portal.iitb.ac.in/ceqipapp>.
You will have to create a login ID, look up this course and fill up a registration form. After approval of the faculty co-ordinator, you can pay the fees. Please include the transaction details here:

Date:

Transaction number:

Transaction amount:

OR

- (ii) Demand draft drawn in favour of "**The Registrar, IIT Bombay - CEP Account**". If payment is by DD, please furnish the following details:

DD No.: _____

Dt: _____

All completed registration forms **with bank transaction details** may be mailed to: Prof. Ravindra D Gudi, Department of Chemical Engineering, IIT Bombay, Powai, Mumbai 400076.