

# GLOBAL INITIATIVE FOR ACADEMIC NETWORKS



National Coordinating Institute  
**INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR**

[www.gian.iitkgp.ac.in](http://www.gian.iitkgp.ac.in)

## TURBOMACHINERY FOR SUSTAINABLE POWER AND AVIATION: A SYSTEM APPROACH

### Overview

Energy is a topic of great global interest. Modern society is highly dependent on related technologies for electricity, land and air transportation and industry. This course will focus on a class of machines, called turbomachines, which are the principal prime-movers for power generation and aviation. These machines are some of the most complex machines that humans have ever developed. The primary complexity of these machines comes from highly multi-disciplinary nature of the underlying principles, where accurate design trade-offs among multiples of these disciplines are necessary to develop a working machine. This course will cover the fundamentals related to these disciplines, namely thermodynamics, aerodynamics and fluid mechanics, mechanical properties of materials, materials and manufacturing, heat transfer, combustion, and vibrations and rotordynamics.

### Objectives

The primary objectives of this course are as follows:

- Exposing participants to the various engines and turbomachineries used for power generation and aviation, including gas turbines and steam turbines.
- Explaining the fundamentals of thermodynamics, aerodynamics and fluid mechanics, mechanical properties of materials, materials and manufacturing, heat transfer, combustion, and vibrations and rotordynamics, as applicable to these machines.
- Discussing the needs of accurate trade-offs among the various disciplines as noted above.
- Providing a system-level or holistic approach to explain the inner working principles of these machines.

#### Modules

**A: Duration : December 11 – December 15**

**B: Venue : Indian Institute of Technology Kharagpur**

Number of participants for the course will be limited to 40.

#### Who Should Attend

- Engineers, managers/executives and researchers from turbine design and manufacturing companies for power generation and aviation, and from R&D laboratories
- Engineers and managers/executives for Utility or Electricity Generation companies
- Graduate students/ Final year undergraduate students from reputed academic and technical institutions at all levels seeking careers in power generation or aviation
- Faculty member from reputed academic and technical institutions

## Fees

The participation fees for taking the course is as follows:

<b>Participants from abroad :</b>	<b>US \$300</b>
<b>Participants from Industry:</b>	<b>₹ 10000</b>
<b>Faculty or Scientists of Research / Academic Institutions:</b>	<b>₹ 8000</b>
<b>Students of Academic Institutions:</b>	<b>₹ 1000</b>

The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

## The Faculty



**Dr. Jayanta Kapat** is currently the UCF Pegasus Professor in the Department of Mechanical and Aerospace Engineering at the University of Central Florida. He joined UCF in 1997 as an Assistant Professor. He received B.Tech. (Honors) from the Indian Institute of Technology Kharagpur in 1984 and Sc.D. from the Massachusetts Institute of Technology in 1991, with Masters from the Arizona State University in 1988. All of his degrees are in Mechanical Engineering. Over the years, his research interest has spanned Gas Turbines and various Power Generation systems and components; Miniature Engineering Systems; Flow and Transport at Nanoscales; and Characterization of Transition and Turbulence. Dr. Kapat has supervised and graduated 20 Ph.D., 48 MS and 16 BS Honors-in-Major (HIM) thesis students. He has published over 200 peer-reviewed papers in various journals and conference proceedings, and has 12 patents issued to his name with another 8 pending. He has been involved in sponsored projects worth a total of \$22M funded by various agencies and companies with \$15.2M credited to him as his individual contribution. In 2012, Dr. Kapat founded the Center for Advanced Turbomachinery and Energy Research, and is currently its director with another 10 faculty members and over 100 students contributing to CATER.



**Dr. Anandaroop Bhattacharya** is an Associate Professor of Mechanical Engineering at IIT Kharagpur. His research interests lie in the areas of electronics cooling, microfluidics, transport in porous media and gas turbine heat transfer. Prior to joining IIT, Anandaroop spent 12 years in the industry in USA and India working for Intel, General Motors and General Electric.



**Dr. Srinibas Karmakar** is an Assistant Professor of Aerospace Engineering at IIT Kharagpur. His research interests include droplet and spray combustion, combustion of solid fuels and propellant, and experimental methods in combustion.

## Course Co-ordinator

### Dr. Srinibas Karmakar

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## Registration Process

Registration for GIAN courses is not automatic because of the constraints on maximum number of participants allowed to register for a course. In order to register for one or multiple non-overlapping courses, you have to apply online using the following steps:

1. **Create login and password at [www.gian.iitkgp.ac.in/GREGN/index](http://www.gian.iitkgp.ac.in/GREGN/index)**
2. **Login and complete the registration form.**
3. **Select courses**
4. **Confirm your application and payment information.**
5. **Pay ₹ 500 (non-refundable) through online payment gateway.**

The course coordinators of the selected courses will go through your application and confirm your selection as a participant one month before the starting date of the courses. Once you are selected you will be informed and requested to pay the full fees through online payment gateway service.

