GLOBAL INITIATIVE FOR ACADEMIC NETWORKS

Ministry of Human Resource Development
Government of India

सत्यमेव जयते

GLOBAL INITIATIVE FOR ACADEMIC NETWORKS

National Coordinating Institute
INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

www.gian.iitkgp.ac.in

IMMERSED BOUNDARY METHODS FOR TURBULENT INCOMPRESSIBLE FLOWS

Overview

Over the past 15 years immersed-boundary (IB) methods have been constantly gaining popularity and are increasingly expanding to new areas of applications in computational mechanics. Of particular importance is their application to modeling of complex multiphysics phenomena, such as fluid structure interactions in nature and engineering, which had a significant impact in multiple science and engineering disciplines. A common feature of all immersed boundary methods is that the grid lines are not always aligned with the body and the boundary conditions are imposed using a forcing function or through local reconstructions. The objective of all immersed boundary variants is to approximate the no-slip boundary condition by either assuming elastic or viscoelastic properties on incompressible solids and deriving their equations of motion in a continuum setting, or imposing kinematic constraints on the surrounding Eulerian points, or the surface markers themselves. The required forces to impose boundary conditions are computed directly from the momentum equations, or can be obtained using Lagrange multipliers on the set of the equations governing the fluid-structure interaction problem. A great advantage of immersed boundary method is that it completely eliminates the complex grid generation processes and hence reduces the cost of computation for flow over moving/deformable bodies. Therefore, this method can be advantageous for solving flow and heat transfer problems in complex/moving domain using a simple rectangular mesh framework. However, this technique is usually not covered in computational fluid dynamics courses at undergraduate or graduate levels. The proposed course will provide an in-depth analysis of immersed boundary methods and will give students and professionals in the computational mechanics community an opportunity to get a good grasp of the topic through a series of coordinated lectures and tutorials.

Modules	**Dec 18 – Dec 22**
Who Should Attend	• You are a practicing engineer or R&D scientist from industry or research labs working in the field of heat and fluid flow using computational methods. • You are computational scientists from industry or research labs interested in development of CFD solvers. • You are a student or faculty from academic institution interested in computational fluid dynamics.

Fees

The participation fees for taking the course is as follows:

Participants from abroad :	**US $500**
Industry/ Research Organizations:	**₹ 20000**
Academic Institutions:	**₹ 2000**

The above fee include 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. Elias Balaras is a Professor and the Director of Graduate Affairs, at the Mechanical and Aerospace Engineering department at The George Washington University, Washington DC, USA. His research interest involves development of robust numerical techniques for large-scale simulations of multiscale, multiphysics problems in physical and biological systems, with emphasis on largeeddy and direct numerical simulations in complex fluid-structure interaction problems.

Dr. Somnath Roy is an Assistant Professor of Indian Institute of Technology Kharagpur. His research interest is turbulence, arterial flows, moving boundary flow simulation, high performance computing using cluster and GPGPUs.

Course Co-ordinator

Dr. Somnath Roy
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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**
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.