

Computational Modelling of Turbulent Combustion

Overview

Analysis of turbulent reacting flow remains one of the most challenging areas of thermo-fluid mechanics due to the wide range of length and time scales encountered in typical turbulent reacting flows. This scale separation is a strong function of turbulent Reynolds number and the complex interactions that occur between chemical reactions, turbulence, heat and mass transfer. To resolve details between the smallest and largest length and time scales requires the resolution of a rich variety of multi-physics phenomena.

The proposed course focuses on the science of combustion modelling, which is necessary for computational simulations of turbulent combustion processes in engineering applications. The topics, which will be covered in the proposed course, will not only provide an exposure to the conventional methods of turbulent combustion modelling but also to some of the newly developed methodologies which have started to yield promising results. It will discuss the current state-of-art of combustion modelling in the context of both RANS and LES, and the fundamental physical principles which underpin these model developments. It will also be demonstrated in this course how the fundamental understanding obtained from DNS feeds into the development of high-fidelity RANS and LES combustion models.

Objectives

The primary objectives of the course are as follows:

- Recapitulation of the fundamental physics of fluid turbulence and combustion;
- Exposure to the different simulation methodologies for turbulent reacting flows
- Awareness of alternative methodologies of turbulent combustion modelling for both premixed and non-premixed combustion;
- Enhancing the capability of the participants to identify appropriate combustion model, and simulation techniques, formulate new models and solve challenging turbulent reacting flows problems.

Dates	December 8, 2016 – December 21, 2016
Host Institute	Jadavpur University
No. of Credits	2
You should attend if	<ul style="list-style-type: none">• You are a combustion engineer or research scientist interested in designing combustion devices• You are a combustion researcher who wants to understand the details of turbulent combustion• You are a student or faculty from an academic institution interested in learning about turbulent combustion
Registration Fee	<p>The participation fees for taking the course is as follows:</p> <p>Student Participants: Rs. 1000/- Faculty Participants: Rs. 3000/- Government Research Organization Participants: Rs.5000/- Industry Participants: Rs. 10000/-</p> <p>The above fee is towards participation in the course and the course material. Mode of payment: Demand draft in favour of “Registrar, Jadavpur University” payable at Kolkata. The demand draft is to be sent to the Course Coordinators at their address.</p>
Accommodation	<p>The participants may be provided with accommodation, depending on the availability, on payment basis.</p>

Course Faculty



Prof. Nilanjan Chakraborty, PhD from Cambridge University, joined the School of Mechanical and Systems Engineering of Newcastle University in July 2011 where he heads the Fluid Dynamics and Thermal Systems research group. Previously he was a senior lecturer at the School of Engineering of the University of Liverpool.

His research interests include Direct Numerical Simulation (DNS) of Turbulent Combustion, Large Eddy Simulation (LES) combustion modelling and many more. In September 2005, he was awarded the prestigious Gaydon Prize along with his co-authors for the most significant UK contribution to the 30th International Combustion Symposium, 2004. In September 2007, he was awarded the Hinshelwood Prize for 2006 by the British Section of Combustion Institute for his contribution to combustion science. A paper co-authored by Prof. Chakraborty presented in the 32nd International Combustion Symposium was given the distinguished paper award by the Combustion Institute. He is the nominated leader and Principal Investigator of the UK Consortium on Turbulent Reacting Flows, as well as a steering group member of N8 Supercomputer shared by Russell group universities in the north of England. Prof. Chakraborty is one of the recipients of the prestigious Hind Rattan award 2015 for outstanding contribution in his field of work by the Non-Resident Indian Welfare Society of India, under the umbrella of the Indian Government.



Dr. Achintya Mukhopadhyay is a Professor of Mechanical Engineering at Jadavpur University, Kolkata. He also served as Professor of Mechanical Engineering at IIT Madras. He also held visiting positions at Technical University of Munich where he was an Alexander von Humboldt Fellow and University of Illinois at

Chicago. He obtained his Bachelors, Masters and doctoral degrees from Jadavpur University, Indian Institute of Science, Bangalore and Jadavpur University, all in Mechanical Engineering. Dr. Mukhopadhyay's current research activities include droplet and spray combustion, structure and dynamics of partially premixed flames, nonlinear dynamics and chaos in combustion systems, instability of liquid sheets and atomization, spray impingement heat transfer and electrokinetic and thermomagnetic microscale flows. Dr. Mukhopadhyay has over 250 research publications including over 85 international journal publications and has advised a number of masters and doctoral thesis.



Prof. Swarnendu Sen is in teaching and research for more than 27 years in Department of Mechanical Engineering, Jadavpur University. He received his PhD (Engineering) from Jadavpur University. He did his post doctoral work at University of Illinois at Chicago, USA; Virginia Tech, USA and at Technical University

of Munich Germany. He was awarded with DAAD fellowship. His research area covers reacting & multiphase flow, magnetic fluid & nanofluid transport, heat transfer augmentation and nano-structure synthesis.

Course Coordinators:

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