

Large Eddy Simulation of Turbulence: Fundamentals and Applications

Overview

Most of the industrial and environmental flows are turbulent. In numerous applications, it is a major challenge to be able to perform precise and efficient numerical simulations of turbulent flows in order to properly predict their behavior and control their effects. Due to the constant improvement in the performances of industrial devices (turbines, airplanes, cars, heat exchangers, turbojet engines etc.), this prediction has to be more and more refined. This is at the origin of the astonishingly rapid development of the Large-Eddy Simulation (LES) technique over the last few years. After the introduction of the basic concepts, this course will present a global overview of the various progress in subgrid-scale models for LES from the pioneering work of Smagorinsky to the most recent ones. It will address both incompressible and compressible turbulent flows. The course will also provide some hints about the practical implementation of LES in numerical codes. It will also highlight the current challenges linked to a proper prescription of boundary conditions and to a rigorous verification and validation procedure of the results. It will also show the complementarity of the LES approach with other approaches trying to reproduce the flow unsteadiness such as Detached Eddy Simulation (DES) or Unsteady Reynolds Average Navier-Stokes (URANS) based on Scale Adapted Simulation (SAS) techniques for instance. Various industrial applications will be discussed with a special focus on the renewable energy domain.

Course participants will learn these topics through lectures and its applications to various problems. Also case studies and assignments will be shared to stimulate research motivation of participants.

Dates for the Course	October 30, 2017 to November 3, 2017
Host Institute	IIT Madras
No. of Credits	1
Maximum No. of Participants	30-40
You Should Attend If...	<ul style="list-style-type: none">• The course is open to students and faculty members with background in Aerospace, Applied Mathematics, Automobile, Biotechnology, Biomedical, Civil, Chemical, Engineering Design, Metallurgy, Mechanical, Mechatronics and Ocean Engineering.• Engineers engaged in power and process equipment design, with some general background in heat transfer and fluid mechanics can attend this course.
Course Registration Fees	<p>The participation fees for taking the course is as follows: Student Participants: Rs.1000 Faculty Participants: Rs.5000 Government Research Organization Participants: Rs.5000 Industry Participants : Rs.10000</p> <p>The above fee is towards participation in the course, the course material, computer use for tutorials and assignments, and laboratory equipment usage charges.</p> <p>Mode of payment: Demand draft in favour of "Registrar, IIT Madras" payable at Chennai The demand draft is to be sent to the Course Coordinator at the address given below.</p>
Accommodation	<p>The participants may be provided with hostel accommodation, depending on the availability, on payment basis. Request for hostel accommodation may be submitted through the link: http://hosteldine.iitm.ac.in/iitmhostel</p>

Course Faculty



Professor **Olivier Métais** is Professor at the Grenoble Institute of Technology, France and is a recognized expert in the area of turbulence in fluids. He has been conducting research in that field for nearly thirty five years ranging from the most fundamental aspects to various industrial and environmental applications in collaboration with numerous private and public partners. He has actively contributed to the development of the numerical simulation and modeling of complex turbulent flows and is one of the founders of a research group which is internationally well-known for its pioneering works on Large Eddy Simulation technique. He is the co-author of nearly one hundred and fifty publications and of a book "Large-Eddy Simulations of Turbulence" published by Cambridge University Press. He has been acting as Director of two engineering schools at Grenoble Institute of Technology for eleven years. He was first the Director of the engineering school of Hydraulics and Mechanics and then was one of the founders of the school of Energy, Water and Environmental Sciences (1000 students) and its first Director. During his term, he strongly promoted the links between top-level training, research and industry as well as international openness. He is presently the holder of the Industrial Chair *Hydro-Power* sponsored by ALSTOM Power and General Electric (GE) Renewable Energy. Professor Métais was awarded a CNRS (French National Center for Scientific Research) medal in 1989, received a Grand Prize of the French Academy of Sciences in 2011, the Grand Prize of the French Hydrotechnical Society in 2015 and was named **Knight of the French National Order of Merit** in 2015.

Website:

<http://www.legi.grenoble-inp.fr/web/spip.php?rubrique188>



Dr. K. Arul Prakash is an Associate Professor in the Department of Applied Mechanics at Indian Institute of Technology Madras. His research interests include Computational Fluid dynamics and Heat transfer, Cooling Technologies, Thermal Hydraulics, Large Eddy Simulation and related techniques. To his credit in research, he got 27 International journal publications in high-impact factor journals and more than 30 publications in conference proceedings and 02 chapters in edited books. His research is mainly funded by DST, DRDO, AR&DB etc. Dr. Arul Prakash is a recipient of DAAD fellow from Germany and India – UK exchange fellowship from Royal Academy of Engineering, UK.

Website:

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Course Coordinator

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