

Spectral Methods for Transport Phenomena Processes in Industry and Academic Research

Overview

Transport Phenomena plays an important role in enhancing and optimizing the performance of industrial processes. This hence forms an important area of academic research especially in the engineering disciplines. The numerical modeling of these systems is of increasing interest. Spectral methods are capable of capturing the wide range of space and time scales present in the dynamics of the system. These methods are generically geared for attaining this objective. This is due to the intrinsically global nature of these methods in contrast with the local treatment of the derivatives in the largely used numerical approaches.

This course is organized in the form of a set of morning lectures and afternoon lab sessions. The goal is to provide the participants with both the theoretical concepts and the practical knowledge which will allow them to construct a 2D/3D incompressible Navier-Stokes solver for computing a fluid flow in a lid-driven cavity, the quintessential problem on closed flows. The course will proceed by (1) beginning with the construction and resolution of the one dimensional/two dimensional, steady first and then unsteady, diffusion operators, and (2) analyzing the decoupling procedure between the pressure and velocity for preparing the construction of a Stokes solver. The Navier-Stokes solver will then be used to obtain the solutions of engineering interest.

Dates for the Course	October 31st - November 11th, 2016
Host Institute	I.I.T Madras
No. of Credits	2
Maximum No. of Participants	40
You Should Attend If...	<ul style="list-style-type: none"> ▪ You have a good background on Applied Math, ODE's and PDE's in particular. ▪ You have a good understanding of Transport Phenomena (molecular diffusion or conduction, advection). ▪ You have a preliminary experience on scientific computation, language and coding. ▪ You have access to Mathematica and a preliminary experience on using this tool.
Course Registration Fees	<p>The participation fees for taking the course is as follows: Student Participants: Rs.2000 Faculty Participants: Rs.6000 Government Research Organization Participants: Rs.10,000 Industry Participants: Rs.20,000</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</p> <p>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 availability, on payment basis. Request for hostel accommodation may be submitted through the link: http://hosteldine.iitm.ac.in/iitmhostel</p>

Course Faculty

Dr. Gérard LABROSSE is a permanent invited member of LAMPS, University of Perpignan (UPVD, France) and CEO of TchebyFlow, a start-up company in mathematical modeling and scientific computation for industry. He has 35 years of teaching and research experience in Fluid Dynamics and Computational Fluid Dynamics.

Dr. S. Pushpavanam has 25 years of teaching and research experience. He is a Professor of the Department of Chemical Engineering I.I.T Madras. His research interests are in the area of non-linear dynamics, mathematical modeling and simulation of multiphase flow systems. The primary focus is on seeking semi-analytical solutions.

Dr. T. Renganathan has more than 10 years of teaching and research experience. He is an Assistant Professor in the Department of Chemical Engineering I.I.T Madras. His research interests are in the areas of fluidization, coal gasification and Transport Phenomena.

Course Coordinator

Name: S.Pushpavanam
Phone: +91-44-22574161
E-mail: spush@iitm.ac.in

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URL: <http://www.che.iitm.ac.in/~spush>