Finite Elements in Fluids

Overview

The topics of fluid dynamics and heat transfer play a significant role in influencing nature, living organisms and industrial applications. An understanding of fluid dynamics and heat transfer can provide economical and efficient solutions to complex industrial situations and substantially improve productivity. Computational Fluid Dynamics (CFD) is an important topic that has tremendously influenced and changed aerospace industry and currently making very strong inroads into hydrodynamic and healthcare industries. The history of CFD shows that the Finite difference method (FDM) was the backbone of early developments and lately the more flexible finite volume method (FVM) become the choice of industrial development. Majority of the commercial CFD software use the FVM method as the basis. The finite element method (FEM) on the other hand made a significant impact in structural mechanics industry but it was adapted to solve CFD problems much later than FVM. When linear approximations are employed, the difference between FVM and FEM is not significant. However, FEM offers a great deal of advantages at boundaries and when higher order approximations are employed.

This course covers specialized applications of how to employ the finite element method to solve fluid and thermal flow equations. The course will cover the equations governing the flow and provide a detailed discussion on discretization and modern methods of implementation to accelerate computation. The course will also highlight how to avoid potential mistakes in applying boundary conditions. All different applications including aerospace flows, incompressible flows, thermal flow and coupled problems such as fluid-structure interaction will be discussed.

Course participants will learn these topics through lectures and hands-on exercise problems. Also case studies and assignments will be shared to stimulate research motivation of participants.

Dates for the Course	**August 1, 2016 – August 5, 2016**
Host Institute	**IIT Madras**
No. of Credits	**1**
Maximum No. of Participants	**30-40**
You Should Attend If…	• 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	The participation fees for taking the course is as follows: **Student Participants:** Rs.1000 **Faculty Participants:** Rs.3000 **Government Research Organization Participants**: Rs.5000 **Industry Participants :** Rs.10000 The above fee is towards participation in the course, the course material, computer use for tutorials and assignments, and laboratory equipment usage charges. **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.
Accommodation	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

Course Faculty

Professor Perumal Nithiarasu, Head of Zienkiewicz Centre for Computational Engineeirng, Swansea University is a very active researcher in the area of computational fluid dynamics, biomedical engineering, heat transfer and computational mechanics. His contribution to the development of the characteristic based split scheme, in collaboration with Professor O.C. Zienkiewicz, is widely acknowledged. Professor Nithiarasu has led and developed a patient-specific modelling platform for carrying out cardiac and respiratory flow studies in Swansea. His research is mainly funded by EPSRC, RS, Leverhulme Trust and NISCHR. Co-author of nearly two hundred publications, Professor Nithiarasu is the chief editor of the *International Journal for Numerical Methods in Biomedical Engineering* and co-chairs three international conferences. He has worked closely with NASA contractors on flow solvers, visited twice CSIR labs as a distinguished foreign scientist. Prof Nithiarasu was awarded the ICE Zienkiewicz silver medal in 2002, ECCOMAS young scientist award in 2004 and an EPSRC advanced fellowship in 2006. He is a fellow of the Institution of Mechanical Engineers UK, Institute of Mathematics and Applications, UK and Institute of Physics and Engineering in Medicine, UK.

Website:
http://www.swansea.ac.uk/staff/academic/engineering/nithiarasuperumal/

Dr. K. Arul Prakash is an Associate Professor 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. Dr. Arul Prakash is a recipient of DAAD fellow from Germany and India – UK exchange fellowship from Royal Academy of Engineering, UK.

Website:
http://home.iitm.ac.in/arulk/

Course Coordinator

Name: Dr. K . Arul Prakash
Phone: 044-22574066
E-mail: arulk@iitm.ac.in

.....

URL: http://www.gian.iitkgp.ac.in/