Computational Methods with Applications to Fluid Dynamics

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Overview

Computationally modelling fluid flow has been a topic of intensive research of the last five decades. The progress has been excellent and approximate flow modelling through and over complex geometries is now possible. Although challenges remain in tackling large-scale turbulence and coupled problems, a large number of commercial and open-source codes have been successfully employed in modelling flow in aerospace, civil, mechanical and chemical engineering industries. Using such codes often needs an excellent fundamental knowledge in fluid dynamics, some basic understanding of computational methods and boundary conditions. The proposed course provides advanced knowledge for developing an understanding of computational algorithms and boundary conditions to study fluid dynamics problems. This proposed course covers important computational methods and applications to fluid dynamics problems. Further the specialised application of unstructured computational methods to solve fluid flow problems will be demonstrated. The physical problems of interest include compressible, incompressible and thermal flows. The methods of discretization include mainly finite volume and finite element methods. Initial few lectures will cover some fundamentals but the course will evolve towards more state of the art coupled problems including highly non-linear fluid-structure interaction problems. The modern and emerging method of isogeometric method will also be covered. The course will also provide practical instructions on verifying boundary conditions, approximate solutions and numerical instabilities in addition to introduction on implementation issues. Pre-requisites for this course include a basic course in fluid mechanics and numerical methods for partial differential equations. Some basic programming knowledge is desirable.

Course Objectives

The primary objectives of the course are as follows:

i) Introduction to computational modeling and numerical methods – Finite Difference Method; Finite Volume Method & Finite Element Methods.
ii) Exposing participants to the fundamentals of computational fluid dynamics (CFD) and coupled problems.
iii) Providing the participants with the state of the art knowledge on computational methods used in solution of CFD equations.
iv) Developing a clear understanding of how computational methods, algorithms and boundary condition chosen affect the approximate solution.
v) How computational treatment differs if CFD is coupled with solid mechanics. Introduce participants to inter and multi-disciplinary problems.
vi) Introducing the participants to the new computational approaches such as isogeometric and scan based methods, implementation and verification issues.

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

Modules	**Duration : 14 – 18 August, 2017** **Venue : Department of Civil Engineering, IIT Bombay** **Number of participants for the course will be limited to fifty.**
You Should Attend If…	▪ You are a student or faculty from academic institutions dealing with Computational Methods/ Fluid Dynamics/ CFD; ▪ You are a civil, mechanical, or aerospace engineer who is dealing with CFD; ▪ You are a person from industry/research org., and interested in learning computational methods and CFD.
Fees	The participation fees for taking the course is as follows: **Participants from abroad: US $500/-** **Industry/ Research Organizations: INR: 20000/-** **Academic Institutions/ Faculty: INR: 8000/-** **Students & Research Scholars: INR: 3000/-** The above fees include all instructional materials, computer use for tutorials and assignments, laboratory usage charges, free internet facility. The participants will be provided with accommodation on payment basis. (for details of fee payment – please see page 3)

The Faculty

Dr. Perumal Nithiarasu is Professor and Head of Zienkiewicz Centre for Computational Engineering, Swansea University, United Kingdom. His research interests include: Computational biomedical engineering, cardiovascular and respiratory mechanics, computational fluid dynamics, porous medium flows, finite element method, heat and mass transfer.

Dr. Eldho T.I. is Institute Chair Professor, Department of Civil Engineering, IIT Bombay. His research interest includes: Groundwater Flow and Pollution, Computational Fluid Dynamics, Coastal Hydrodynamics, Watershed Management, Applications of Numerical Methods in Water Resources and Environmental Engineering Areas.

Dr. Yogesh M. Desai is Chair Professor, Department of Civil Engineering, IIT Bombay. His research interest includes: Finite element method and applications in Engineering, composite and structural mechanics.

For Registration

First register at GIAN site: http://www.gian.iitkgp.ac.in/GREGN

Then sent Application with Fees to Course coordinators:

Prof. Eldho T.I. / Prof. Y.M. Desai,
Course Coordinators,
Department of Civil Engineering,
Indian Institute of Technology Bombay,
Powai, Mumbai – 400 076
Phone: (022) – 25767339 / 25767333
Fax: (022) –25767302 / 25723480
Email: **eldho@civil.iitb.ac.in**
desai@civil.iitb.ac.in

Deadline for submitting application:25 July, 2017
Notification of acceptance: 26 July, 2017

- Incomplete application forms will not be entertained.
- For additional copies of the registration form, please xerox or type in the format given. For further details:http://www.iitb.ac.in/~cep/

Boarding & Lodging

Limited accommodation is available in the Institute Guest house/ Hostels for a very limited number of participants on payment as per actual and with advance request.

Gorverment of India
Ministry Of Human Resource Development

GIAN
GLOBAL INITIATIVE OF ACADEMIC NETWORKS

INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
ज्ञानम् परमम् ध्येयम्

Course Coordinators

Prof. Eldho T.I & Prof. Y.M. Desai
Phone: 022-25767339/ 25767333
E-mail: eldho@civil.iitb.ac.in;
desai@civil.iitb.ac.in

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

http://www.cep.iitb.ac.in/brochures/2017/TIE-YMD-CEP-2017-GIAN-27June17.pdf

GIAN Short Term Course on

Computational Methods with Applications to Fluid Dynamics

14 – 18 August 2017

Registration Form

Name(in block letters): _____
_____

Qualification:

Designation: _____

Organization:_____

Mailing Address:_____
_____
_____
_____
Mobile:_____
Fax:_____

Email:_____

Payment: Rs:_____

DD No.:_____Dt: _____

(DD in favour of "Registrar, IIT Bombay – CEP a/c")

Or NEFT/ RTGS
(Please furnish the foll. details if NEFT/RTGS)
Name of A/c Holder
UTR NO./Transaction ID
Name of Bank & Branch
Date of Payment
Amount

IIT Guest House/ Hostel accommodation required: YES / NO

Signature of Applicant:_____

Date:

Venue for Classes
Classes will be held in Seminar Hall of Department of Civil Engineering, IIT Bombay.

Lecture Notes
To fully realize the objectives of the course, the lecture notes will be made available at the time of registration at IIT Bombay.

Date & Time of Registration:
14th August 2017, 9.00 AM at Civil Department, IIT Bombay.

COURSE FEE
Participants from abroad: US $500/-

Industry/ Research Organizations:
INR: 20000/-

Academic Institutions/ Faculty/ NGO: INR: 8000/-

Students & Research Scholars:
INR: 3000/-

The above fees include all instructional materials, computer use for tutorials and assignments, laboratory usage charges, free internet facility. The participants will be provided with accommodation on payment basis.

The fees may be paid by demand draft drawn in favour of "**The Registrar, IIT Bombay - CEP Account".**

Or through NEFT/RTGS:

Name of beneficiary: Registrar, IIT Bombay

Account name: IIT Main Account

Name of Bank: State Bank of India, IIT Powai

Beneficiary A/C No: 00000010725729128

Bank MICR Code: 400002034

IFSC Code: SBIN0001109

SWIFT Code: SBININBB519