

Introduction

An important initiative has been taken by IIT Bombay to work with Engineering Colleges in the country, to enhance the teaching skills of our faculty colleagues in core Engineering and Science Subjects. This initiative has now become a part of the National Mission on Education through ICT (NMEICT) supported by MHRD. We have conducted two-week ISTE workshops on 'Effective teaching/ learning of Computer Programming', 'Database Management Systems', 'Thermodynamics in Mechanical Engineering', 'Basic Electronics', 'Heat Transfer', 'Software Development Techniques for Teachers of Engineering and Science Institutes', 'Solar Photovoltaics', and 'Writing Effective Conference Papers.' These workshops were attended by over 9,900 participating teachers across the country, at 78 remote centers, through distance mode, using the internet.

The participating teachers attended live lectures, given by IIT faculty, at a remote center close to their own college. Tutorial and lab sessions were conducted in the same centers. Each center had a Course Coordinator, who supervised the conduct of tutorials and labs. All the lectures and tutorial sessions were recorded, and the final edited audio-visual contents, along with other course material will be released under Open Source. These contents can be freely used later, by all teachers and students.

The resounding success of these workshops, has encouraged us to organize another 2-week workshop on Computational Fluid Dynamics which is scheduled from 12th – 22nd June, 2012. This will include the delivery of live lectures through AVIEW mechanism of interaction with participants and the local conduct of tutorials and labs, using Internet.

The 10-day ISTE workshop on '**Computational Fluid Dynamics,' from 12th to 22nd June 2012**, will be conducted simultaneously at 48 "remote centers" distributed across the country, in the distance mode. Every remote center will have about 30-40 participants. The workshop will include the delivery of live two-way lectures from IIT Bombay, and locally organized tutorial and laboratory sessions. The course will be networked to the remote centers via the internet, using specially developed software called 'AVIEW.'

Teaching Faculty

Prof. Bhalchandra Puranik,
Department of Mechanical Engineering, IIT Bombay
<http://www.me.iitb.ac.in/wiki/doku.php?id=puranik>

Prof. Atul Sharma,
Department of Mechanical Engineering,
IIT Bombay
<http://www.me.iitb.ac.in/wiki/doku.php?id=atulsharma>

Course Contents

Part I: Essentials of Fluid Mechanics and Introduction to Finite Difference Method.

1. Introduction, Mathematical background.
2. Integral analysis of fluid dynamics and its applications to a few problems.
3. Kinematics of fluid motion: Eulerian and Lagrangian approaches, rates of change, graphical descriptors of fluid motion, kinematic decomposition of fluid motion.
4. Differential analysis of fluid dynamics: derivations of governing equations (mass, momentum, energy), sub-models for simplified situations, non-dimensionalization of the governing equations.
5. Some analytical solutions to the Navier-Stokes equations in cartesian and cylindrical geometries.
6. Introduction to the Finite Difference Method of numerical solution: Application to diffusion equation - explicit and implicit methods of solution, Application to Laplace equation - iterative method of solution.

PART II: Finite Volume Method for Fluid Dynamics and Heat Transfer Governing Equations.

1. 1-D and 2-D Unsteady State Heat Conduction: Finite Volume Discretization; Explicit and Implicit methods; Implementation details; Solution algorithm.
Special topics: Multi-solid and non-linear Heat Conduction. Example problems.
2. 1-D and 2-D Unsteady State Heat Advection and Convection: Finite Volume Discretization; advection schemes; Implementation details; solution algorithm; Example Problems.
3. 2-D Unsteady State Fluid Flow and Heat Transfer: Finite Volume Discretization; pressure-velocity coupling; Explicit and Implicit methods; Semi-explicit and Semi-Implicit Method, Solution Methodology on Staggered and Colocated Grid, Solution algorithm; Example problems on Isothermal flow and Forced/Mixed/Natural Convection Heat Transfer.
4. Grid Generation: Structured Grid. Algebraic and Elliptic method.

Duration and Venue

The duration of the workshop is **2 weeks (10 working days.)** It will begin on Tuesday 12th June at **09:00 hrs** and end at **18:00 hrs** on Friday 22nd June 2012 with a day break on Sunday 17th June only. Additional contributions from participants are required to be made within the following two weeks.

The details and enrollment link available on the website <http://www.it.iitb.ac.in/nmeict/eoutreachhome.do>
The venues for the workshop will be **48 remote centers**. This brochure contains a list of all remote centers.

Who may benefit

The workshop will benefit faculty colleagues who are teaching or planning to teach Computational Fluid Dynamics and Heat Transfer at the UG or PG level. Furthermore, they should be either from Mechanical, Chemical, Civil, Aerospace, or Metallurgical engineering departments, in their colleges. **Background in UG Fluid Mechanics, Heat Transfer and Elementary Numerical Methods, is essential.** Knowledge of differential and vector calculus is desired.

Note

Please note that this workshop is conducted by the eOutreach project of IIT Bombay, under the **National Mission on Education through ICT**. Live recording of the course and other created contents will be released under Open Source through a portal. The recorded CD/DVD of the course lectures will be available for distribution at cost, to any individual/ institution. All participants are required to sign a authorization for such release of contents contributed by them during and after the workshop. Recognition and citation will naturally be made for all contributors.

Course Fee

Since the workshop is funded by the National Mission on Education through ICT (MHRD, Government of India), there is no course fee for participation.

Accommodation & other support

Remote centers are being funded to provide tea/lunch on each day of the workshop, and for accommodation, wherever available*, for limited number of outstation participants. **Travel expenses up to Rs.1000/- will be reimbursed against proof of actual expenditure.** * Accommodation is not guaranteed.

How to Apply

Those wishing to attend this workshop, should enroll online at this website:

<http://www.it.iitb.ac.in/nmeict/eoutreachhome.do>

Enrollment will be strictly online, and no other mode of applications, will be entertained.

The online form contains a list of remote centers. From this list, please select a center close to your institute, where you would wish to attend the workshop. Last date for enrollment and for submission of permission letter is, **25th May 2012**. A list of selected participants will be put up on this website on **30th May, 2012**. The selected participants will also be informed by email.

LAST DATE FOR ONLINE ENROLLMENT AND SUBMISSION OF PERMISSION LETTER: 25th May 2012.

For queries, contact

Dr Mukta Atrey,
Project Manager
Project Ekalavya under NMEICT
Dept of Computer Science & Engineering
Kanwal Rekhi Bldg. 4th Floor
Indian Institute of Technology Bombay,
Powai, Mumbai 400 076.
Tel.: +91-22-2576 4982/4983
Fax: +91-22-2572 0022
Email: eoutreach@it.iitb.ac.in

Remote Centers

Andhra Pradesh

JNTUH College of Engineering, **Hyderabad**
Muffakham Jah College of Engineering and Technology, **Hyderabad**
Prasad V. Potluri Siddhartha Institute Of Technology, **Vijayawada**
National Institute of Technology, **Warangal**

Gujarat

Institute of Technology, Nirma University, **Ahmedabad**
School of Engineering, RK University, Rajkot.
Sardar Vallabhbhai National Institute of Technology, **Surat**

Remote Centers (Continued...)

Karnataka

Amrita School of Engineering, **Bengaluru**
Nitte Meenakshi Institute of Technology, **Bangalore**
Manipal Institute of Technology, **Mysore**

Kerala

National Institute of Technology, **Calicut**
Amal Jyothi College Of Engineering, **Kottayam**
Amrita School of Engineering, **Kollam**
St Joseph's College of Engineering, **Palai**

Madhya Pradesh

National Institute of Technology, **Bhopal**
Jabalpur Engineering College, **Jabalpur**
SGSITS, **Indore**
Truba College of Engineering & Technology, **Indore**

Maharashtra

Vishwabharati Academy's College of Engg, **Ahmednagar**
Vidya Prasthan's College of Engineering, **Baramati**
D.K.T.E'S Textile & Engineering Institute, **Ichalkaranji**
K.C.E. Society College of Engineering & IT, **Jalgaon**
Shivaji University, **Kolhapur**
Sou. Sushila Danchand Ghodawat Institution, **Kolhapur**
Kolhapur Institute of Technology, **Kolhapur**
K.J.Somaiya College of Engineering, **Mumbai**
Veer mata Jijabai Technological Institute (VJTI), **Mumbai**
G. H. Rasoni College of Engineering, **Nagpur**
Visvesvaraya National Institute of Technology, **Nagpur**
K. K. Wagh Institute of Engineering Education & Research, **Nashik**
MES's Pillai's Institute of Information Technology, **New Panvel**
College of Engg, **Pune**
MKSSS's Cummins College of Engineering, **Pune**
PVG COET, **Pune**
Vishwakarma Institute of Technology, Bibwewadi, **Pune**
Shri Sant Gajanan Maharaj College of Engineering, **Shegaon**
R. C. Patel Institute of Technology, **Shirpur**

Rajasthan

Jaipur Engineering College, Kukas, **Jaipur**

Tamilnadu

Amrita Vishwa Vidyapeetham, **Coimbatore**
PSG College of Technology, **Coimbatore**
Institute of Road and Transport Technology, **Erode**
National Institute of Technology, **Tiruchirappalli**
Government College of Engineering, **Salem**
Sona College of Technology, **Salem**
Periyar Maniammai University, **Thanjavur**
Sastra University, **Thanjavur**
Thanthai Periyar Government Institute of Technology, **Vellore**
Vellore Institute of Technology, **Vellore**

2-WEEK ISTE WORKSHOP

on

Computational Fluid Dynamics

Under the

National Mission on Education through ICT

(MHRD, Govt. of India)

12th to 22nd June, 2012

Conducted by IIT Bombay



Course Coordinators:

Prof. Bhalchandra Puranik

Prof. Atul Sharma

Project Coordinator

Prof. Deepak B. Phatak

Indian Institute of Technology, Bombay

Mumbai - 400076