

**One Week TEQIP-II Sponsored National Workshop on
Advanced Computational Fluid Dynamics (ACFD-2014)**

Date: June 28 – July 02, 2014

Department of Applied Mechanics

**Motilal Nehru National Institute of Technology Allahabad
Allahabad- 211004, Uttar Pradesh, India.**

Introduction:

To improve quality of technical education through manpower development for effective teaching including the provision of pedagogical training, a National Workshop on 'Advanced Computational Fluid Dynamics (CFD)' is planned, which offers advanced theories of CFD with latest techniques of grid generations and CFD modeling.

Scope of the Programme:

CFD is considered as a cutting-edge tool for the computational simulation ranging from the movement of microorganisms to the weather prediction. The leading manufactures, like automotive, aerospace, naval sectors frequently use this technique for the building of prototype and product development. The workshop deals with advanced CFD techniques which are emerged in the last one decade, which will be explained and discussed by the eminent experts mainly from IITs and NITs before the participants.

Highlights of the Programme:

- Thoughtful course contents designed for those practicing CFD.
- CFD in Multiphase Flows: VOF and MOF methods, PLIC calculation, CICSAM meshing scheme
- Finite volume method for complex geometries, Level set methods for multiphase flows and moving boundary problems. Particle based simulation techniques-MD, DSMC, LBM.
- Turbulence and its Modeling in CFD.
- Overview of OpenFoam, High Performance Computing (HPC), Parallel Programming.

Takeaways:

- The workshop helps to understand the latest advancement in CFD and to know how to excel in this area.
- It offers introduction to OpenFoam- a free source CFD software and concept of HPC and Parallel programming enabling the participant to carry out CFD coding.
- The programme builds confidence in one's mind to carry out CFD simulation independently.

CFD at MNNIT Allahabad:

Department of Applied Mechanics has a state-of-the art CFD laboratory, which houses one 64 core IBM blade server, 14 high power workstations starting from HP Z800 followed by 36 desktop computers of latest configuration. The department also has ANSYS Fluent, ANSYS CFX and OpenFoam CFD softwares. The Fluids Engineering Research Group of the department is actively engaged in the teaching and research of CFD at M.Tech. and Ph.D. levels. Current research interest of the group includes aerospace, bio-fluid dynamics, vehicle aerodynamics, flow control, thermo-fluid dynamics, and turbomachines with active participation of students and professionals across academia and industries. The group also handles sponsored projects from Govt. agencies and industry.

About MNNIT Allahabad:

Motilal Nehru National Institute of Technology Allahabad (MNNIT) is an institute with total commitment to quality and excellence in academic pursuits. It was established as one of the seventeen Regional Engineering Colleges (RECs) of India in the year 1961 as a joint enterprise of Government of

India and Government of Uttar Pradesh, and was an associated college of University of Allahabad. With over 50 years of experience and achievements in the field of technical education, having traversed a long way, on June 26, 2002 MNREC was transformed into National Institute of Technology and a Deemed University fully funded by Government of India. With the enactment of National Institutes of Technology Act-2007, the institute has been granted the status of Institution of National Importance w.e.f. 15.08.2007.

The Institute now offers nine B.Tech., twenty M.Tech. Degree Programmes (including part-time), MCA, MBA, M.Sc. (Mathematics and Scientific Computing) and Master of Social work (M.S.W.) programmes and also registers candidates for the Ph.D. degree. The Institute has been recognized by the Government of India as one of the centres for the Quality Improvement Programme (QIP) for M.Tech. and Ph.D. The entire campus is networked with 94 Mbps lease line. The institute offers congenial atmosphere for learning.

About Department of Applied Mechanics:

The Department of Applied Mechanics was established in 1964 and celebrates Golden Jubilee (1964-2014) this year. It was initially named as "Department of Applied Mechanics, Hydraulic and Hydraulic Machines", which was renamed as "Department of Applied Mechanics" in 2003. The Department offers courses at undergraduate level on Solid Mechanics, Fluid Mechanics, Hydraulic Machines, Structural Analysis, Material Science, Engineering Mechanics, Mechanics of Deformable Solids, Structures, Kinematics of Mechanics, Dynamics of Machines, Theory of plates & shells, Mechanical Vibration and Nano Technology.

The department offers four Post Graduate (M.Tech.) programmes in (i) Applied Mechanics, (ii) Material Science & Engineering, (iii) Fluids Engineering, and in (iv) Biomedical Engineering. The department also offers Ph.D. programme in these areas. The thrust areas of the department can be broadly divided into two groups: Mechanics & Materials and Fluid Mechanics involving theoretical, computational and experimental studies.

About City of Allahabad and its Connectivity:

Allahabad is well known throughout the country for its purity and cleanliness that the city has maintained for many years. It is a holy and religious place and the meeting point of three most pious rivers namely Ganga, Yamuna and the mythological Saraswati. The city has always been associated with well known political, cultural and academic personalities of the country which has aggrandized the glory of the city.

Allahabad city is situated in the northern part of India in the Awadh region of the state of Uttar Pradesh. It is well connected with flights, rail and road transport to other parts of India. Allahabad is the head quarters of north-central railway and is part of Howrah-Delhi grand chord rail network. It is well connected to all other important cities in India. Allahabad has its own domestic airport at Bamrauli which is 15 km away from the heart of the city. Direct air-link is available for New Delhi and Mumbai. Air-connectivity to other parts of India is available from Lucknow (200 km) and Varanasi (135 km). Good road services are available in Allahabad. UPSRTC buses offer service to most of the cities in Uttar Pradesh. From Allahabad bus services are available to as far as Delhi (650 km) and Kolkata (800 km).

Eligibility Criteria to attend the Workshop:

Faculty members of any government/private engineering/technical institutions with relevant background and CFD as an area of interest are eligible for this course. However, post-graduate students/research scholars/fellows/senior B.Tech. students with an ambition to pursue teaching/research as a career are also encouraged to attend. The seats are limited, and the selection will be made on 'First come first serve' basis.

Registration Fees:

Rs. 3000/- for outstation participants. Rs. 2000/- for participants from MNNIT. Registration fee includes registration kit, course materials, breakfast, working lunch and tea for all five days of the course. The registration fee does not include the accommodation and dinner charges. No T.A., D.A. will be paid to the participants.

Registration fee can be directly deposited through NEFT to the designated account or can be sent in the form of demand draft (D.D.) drawn on any nationalized bank in favour of "ACFD-2014" payable at Allahabad.

Bank Details:

Account Name: ACFD-2014.

Account No.: 718400301000112.

Bank: Vijaya Bank, MNNIT Branch, Allahabad- 211004, U.P.

IFSC Code: VIJB0007184.

Boarding and Lodging:

The institute offers limited accommodation and dining facilities *on payment basis* at the Executive Development Centre (EDC), which is located in the MNNIT staff colony. It houses limited A.C. and non-A.C. rooms and dining hall. Accommodation may be provided on 'first-come-first-serve' basis depending on the availability. A few guest rooms are also available in various hostels of the institute. Click here for details:

<http://www.mnnit.ac.in/index.php/facilities/edc.html>

Venue:

Department of Applied Mechanics, MNNIT Allahabad.

Organizing Committee:

Patron: Prof. P. Chakrabarti, Director, MNNIT Allahabad.

Convener: Prof. Anuj Jain.

Coordinator: Dr. Akshoy Ranjan Paul.

Members: Dr. R.P. Tewari.

Dr. S.J. Pawar.

Dr. Ramesh Pandey.

Dr. Abhishek Kumar.

Er. Ajaya Bharti.

Dr. Anindya Bhar.

Dr. A.K. Upadhyay.

Dr. V. Murari.

Contact Details:

Dr. Anuj Jain

Professor & Convener, ACFD-2014
Department of Applied Mechanics
MNNIT Allahabad.
Pin: 211004, Uttar Pradesh.
Tel: 0532-2271200. Mob: 0-9415014446.
e-mail: anuj.jain.mnnit@gmail.com

Dr. Akshoy Ranjan Paul

Assistant Professor & Coordinator, ACFD-2014
Department of Applied Mechanics
MNNIT Allahabad.
Pin: 211004, Uttar Pradesh.
Mob.: 0-9415364799 (**Dr. Abhishek Kumar**)
e-mail: arpaul2k@gmail.com

Note:

A Short-Term Training Programme (STTP) on "Basics of Computational Fluid Dynamics" (BCFD-2014) is also scheduled from June 23 to 27, 2014 at MNNIT Allahabad. Those who wish to hone/recall the basics of CFD with the hands on experience are encouraged to attend STTP on BCFD-2014 also. For details, please visit the announcement page of the institute website www.mnnit.ac.in.

Resource Persons:

- **Prof. Jyotirmay Banerjee**, Department of Mechanical Engineering, SVNIT Surat.
<http://www.svnit.ac.in/facup/DRJYOTIRMAYBANERJEE/HOME.html>
- **Prof. Atul Sharma**, Department of Mechanical Engineering, IIT Bombay.

<http://www.me.iitb.ac.in/wiki/doku.php?id=atulsharma>

- **Prof. Amit Agrawal**, Department of Mechanical Engineering, IIT Bombay.
<http://www.me.iitb.ac.in/wiki/doku.php?id=amit.agrawal>
- **Prof. Amitabh Bhattacharya**, Department of Mechanical Engineering, IIT Bombay.
<http://www.me.iitb.ac.in/wiki/doku.php?id=bhattach>
- **Prof. Shiva Gopalakrishnan**, Department of Mechanical Engineering, IIT Bombay.
<http://www.me.iitb.ac.in/wiki/doku.php?id=sgopalak>

Programme Details:

Date	Breakfast (9-9.30)	Session-I (9.30-11)	Tea (11-11.30)	Session-II (11.30-1.00)	Lunch (1-2)	Session-III (2-3.30)	Tea (3.30-4)	Session-IV (4-5.30)	Discussion
28/06/2014 (Saturday)		Prof. J. Banerjee, SVNIT Surat: Volume of Fluid Method for Multiphase flow: Volume fraction equation, Advection of volume fraction, Geometrical Interface Reconstruction methods: Piecewise Line Interface Calculation (PLIC)_ Part-I.		Prof. J. Banerjee, SVNIT Surat: Volume of Fluid Method for Multiphase flow: Volume fraction equation, Advection of volume fraction, Geometrical Interface Reconstruction methods: Piecewise Line Interface Calculation (PLIC)_ Part-II.		Prof. J. Banerjee, SVNIT Surat: Moment of Fluid (MOF), High Resolution Differencing schemes - Compressive Interface Capturing Scheme for Arbitrary Meshes (CICSAM) and Coupling with N-S solver_ Part-I.		Prof. J. Banerjee, SVNIT Surat: Moment of Fluid (MOF), High Resolution Differencing schemes - Compressive Interface Capturing Scheme for Arbitrary Meshes (CICSAM) and Coupling with N-S solver_ Part-II.	Review of the day's learning
29/06/2014 (Sunday)		Prof. Atul Sharma, IITB: Finite Volume Method for Complex Geometry_ Part-I.		Prof. Atul Sharma, IITB: Finite Volume Method for Complex Geometry_ Part-II.		Prof. Atul Sharma, IITB: Level Set Method for Multi-Phase Flow_ Part-I.		Prof. Atul Sharma, IITB: Level Set Method for Multi-Phase Flow_ Part-II.	Review of the day's learning
Date	Breakfast (9-9.30)	Session-I (9.30-11)	Tea (11-11.30)	Session-II (11.30-1.30)	Lunch (1.30-2.30)	Session-III (2.30-4.30)	Tea (4.30-5)	Session-IV (5-6.30)	Discussion
30/06/2014 (Monday)		Prof. Atul Sharma, IITB: Level Set based Immersed Boundary Method for Moving Boundary Problems.		Prof. Amit Agrawal, IITB: Need and introduction to particle based simulation techniques: Molecular Dynamics (MD), Direct Simulation Monte Carlo (DSMC), Lattice Boltzmann Method (LBM).		Prof. Amit Agrawal, IITB: Application to LBM to bluff-body wake, microflow, and other fluid flow problems.		Prof. Amitabh Bhattacharya (IITB): Introduction to Turbulence: Examples of turbulent flow, turbulent statistics, concept of isotropy, anisotropy.	Review of the day's learning
Date	Breakfast (9-9.30)	Session-I (9.30-11)	Tea (11-11.30)	Session-II (11.30-1.00)	Lunch (1-2)	Session-III (2-3.30)	Tea (3.30-4)	Session-IV (4-5.30)	Discussion
01/07/2014 (Tuesday)		Prof. Amitabh Bhattacharya (IITB): Physics of turbulence: Length scales of turbulence, Fourier spectrum, cascade of energy (Kolmogorov theory), time scales of turbulence.		Prof. Amitabh Bhattacharya (IITB): Reynolds Decomposition, mixing length models, Decomposition of velocity into mean and fluctuating parts, derivation of equation for mean velocity, Prandtl's mixing length model, eddy viscosity, application to turbulent channel flow (log law velocity profile).		Prof. Amitabh Bhattacharya (IITB): RANS modeling -- 1 and 2 equation models Cebeci-Smith model, k-epsilon model, k-omega model, SST model (strengths and shortcomings). Where do constants in k-epsilon model come from ? Boundary conditions.		Prof. Amitabh Bhattacharya (IITB): DNS and LES Computational cost of DNS, finite difference vs spectral methods, LES filtered field, subgrid models (Smagorinsky, Dynamic Smagorinsky).	Review of the day's learning
02/07/2014 (Wednesday)		Prof. S. Gopalakrishnan, IITB: Introduction and basics of OpenFOAM : solver structure, setting up and running different examples, data visualization and analysis.		Prof. S. Gopalakrishnan, IITB: Intermediate and Advance concepts in OpenFOAM: Programming in OpenFOAM, implementing a new solver and new boundary conditions.		Prof. S. Gopalakrishnan, IITB: Introduction to HPC and HPC Concepts. .		Prof. S. Gopalakrishnan, IITB: Parallel Programming: OpenMP, MPI and GPU programming.	Valedictory.

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REGISTRATION FORM

Name: _____

Date of Birth (in dd/mm/yy format): _____. Gender: _____

Designation: _____

Department: _____

Institute: _____

Highest Degree with Specialization/Branch: _____

Exposure and Experience in CFD (if any): _____

Address for Correspondence: _____

Phone: _____ Mobile: _____ E-mail: _____

Accommodation Required: YES/NO

Type of Accommodation Required: _____

Date & Time of Arrival: _____. Date & Time of Departure: _____

Registration Fee Details:

Amount: _____

D.D. No./UTR No. (in case of NEFT): _____

Date of D.D. or direct transfer: _____

Issuing Bank Details: _____

Signature of Applicant with Date: _____

*The completed registration form should reach to the programme coordinator **on or before June 09, 2014** along with necessary registration fee. No application will be considered without the registration fee.