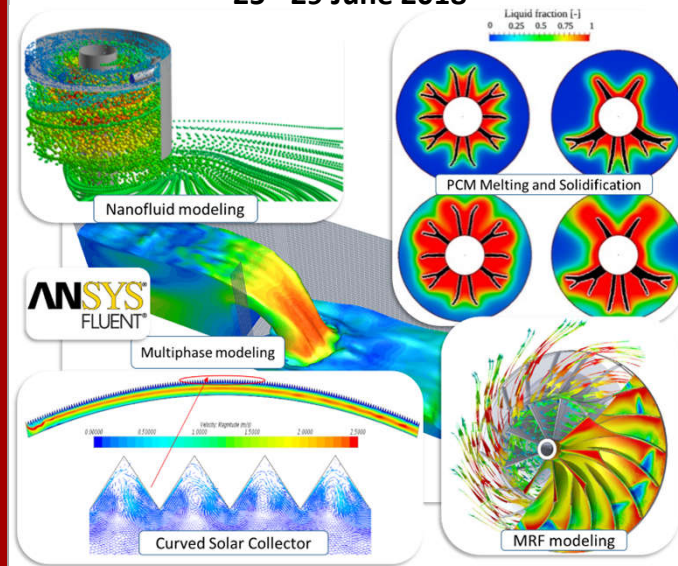


# Short term course / Training program on Multi-Physics Modeling using CFD

25 - 29 June 2018



## Coordinator

Dr. Om Prakash Singh

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## Organized by

Department of Mechanical Engineering  
Indian Institute of Technology (IIT) (BHU)  
Varanasi-221005



## COURSE OBJECTIVE

Almost every engineering problem comprises of interactions between matter: water, air, oil, solid particles etc. For this reason, the Computational Fluid Dynamics (CFD) analyst should carefully specify the problem, taking these factors into consideration. In order to understand the complex nature of multi-physics flow behaviour, it is necessary to know basics of the physical phenomenon and modeling techniques. This training program aims at imparting the much needed skills to the participants for handling complex real life problems using CFD. Extensive modeling techniques such proper mesh generation, how to apply relevant boundary conditions, who to decide on 2D or 3D models etc. will be covered in the program. This unique workshop is a must for engineers, scientist and faculty to acquire much needed skills that are needed in 21st Century for 'simulation driven research and innovation'.

## COURSE CONTENT

**CFD theory:** Governing differential equations, discretisation techniques, concept of boundary layer, scaling laws, turbulent models, Y+ estimation etc.

**Complex geometry handling:** feature curves, surface organization, free edges, boundary surfaces, other pre-processing techniques.

**Surface and Volume Meshing:** When to use 2D/3D simulations, effect of mesh density, effect of biasing in critical region, mesh refinement using line/surface data, boundary conditions, how not to mesh, shrink wrap meshing, boundary layer mesh generation, effect of mesh size on results, control volumes for mesh refinement etc.,

**Mesh Quality and Checks:** Quality checks for CFD mesh, grid independence study.

**CFD Boundary Conditions for internal/external flows:** How to model steady and transient phenomena: how to decide time steps, heat flux, convection, adiabatic, radiation, moving reference frame etc., wind tunnel design techniques, slip/no slip BC controls etc., lift/drag prediction, Axis-symmetric modeling techniques

**Multi-physics modeling techniques:** Introduction, governing equations and applications, how to apply proper various boundary conditions.

**Multi-phase modeling techniques:** Multi-phase applications, Governing differential equations, modeling techniques for multi-phases: Stratified / free-surface flow, Particle-laden flow, Fluidized bed reactors, Discrete gaseous bubbles in a continuous fluid, Turbulence modeling with multiphase flows, Discrete Phase Model (DPM), Nano fluid modeling, Eulerian multiphase flow model, Models suited for stratified flows - Volume of Fluid Model (VOF), Heating/cooling of the discrete phase, Droplet breakup and coalescence using spray models, Horizontal Film Boiling - Erosion, Cavitation modeling, Sedimentation modeling etc.

**Heat Transfer modeling techniques:** Energy equation, boundary conditions, Conjugate heat transfer modeling, natural convection modeling, Modeling for energy storage: Phase - Change Modeling techniques: Engineering application of phase changes materials (PCM), CFD simulations for collectors, thermal receivers, and thermal storage technologies, Integrating Phase Change Materials (PCM) on solar collectors and modeling techniques etc.

**Post-Processing techniques:** Contours, animations, streamlines, scenes, particle tracking etc.

## WHO CAN ATTEND

- Students/faculty/engineers from Civil, Mechanical, Structural, Automotive, Electrical, Construction, Aerospace, Biomedical etc can attend.
- This course is not just a course, it is a skill building program. Anyone interested to enhance their skill in the CAE domain, are welcome to participate.

## CERTIFICATE

A certificate of completion of the course would be issued to all the participants.

## LOCATION

Varanasi Railway Station is well connected to almost all parts of the India. Also it is well connected via Air to Delhi, Mumbai, Kolkata, Hyderabad, and Bengaluru. There are frequent flight services from New Delhi. The Institute is located in the south of the Varanasi city and about 7 km away from Varanasi Railway Station and 30 km from the Babatpur (Varanasi) airport. Taxis, Auto-rickshaws, are available as transport.

## IMPORTANT DATES

Registration starts: 1<sup>st</sup> April 2018.

Last date of registration: 20<sup>th</sup> June 2018

*Enquires should be addressed to:*

Dr. Om Prakash Singh, Associate Professor,  
Department of Mechanical Engineering, IIT (BHU),  
Varanasi – 221 005

E-mail : [stccdfem@gmail.com](mailto:stccdfem@gmail.com),  
[opsingh.mec@iitbhu.ac.in](mailto:opsingh.mec@iitbhu.ac.in) ,

## ACCOMMODATION

Shared accommodation in the IIT guest house will be provided on payment basis. Participants interested to stay outside the campus in hotels can make their own arrangement.

## REGISTRATION FEE

- IIT BHU student: Rs. 3000/-
- Non-IIT BHU student : Rs. 7,000/-
- Faculty member : Rs, 15,000/-
- Industry professional: Rs. 20,000/-

## REGISTRATION PROCESS

- Send an email to [stccdfem@gmail.com](mailto:stccdfem@gmail.com) and CC to [opsingh.mec@iitbhu.ac.in](mailto:opsingh.mec@iitbhu.ac.in) with the subject line STC19. Mention the list of participants interested to attend the course.
- Depending upon the seat availability, a provisional confirmations though email will be sent within 2 hour.
- After receiving email confirmation, kindly pay ONLINE within a week **OR** speed post the registration fee (Cheque/DD in favour of **STC CFD FEM** payable at Varanasi, U.P) to the address given below
- Mention your name, designation (student, faculty or industry professional) address, mobile number and email id on the back of the DD/Check. The same information should also be sent as email. In case of many participants with a single DD/Cheque, use a separate sheet of paper to mention participants details.
- **There is no separate registration form.**
- If registration fee is paid via online transfer, the participant should inform the transaction details/proof of money transfer via email.
- Kindly mention participant's name in the remark section during the bank transaction.

## Address

Write "CFD: Multi-Physics modeling Techniques" on the top of the envelope and send Cheque/DD to the following address:

Dr. Om Prakash Singh, Department of Mechanical Engineering, IIT (BHU), Varanasi, U.P, India-221005

## ONLINE REGISTRATION FEE PAYMENT

Account holder name: **To be updated**

Bank name: **State Bank of India**

Branch: **IT-BHU**, Branch code: **11445**

Account No.: **To be updated**

Account type: **Current**

IFS Code: **SBIN0011445**

## EVALUATION AND GRADING

There is will be continuous evaluation of each participants during the course on the understanding of the concepts and skills.

- A overnight assignment will be given to the participants whose evaluation will be done next day morning.

## COMMITTEES

### Patron:

Honorable Professor Rajeev Sangal, Director, IIT (BHU)

### Organizing/Advisory committee, IIT (BHU)

Dr. Om Prakash Singh

Prof. Prashant Shukla

Prof. Pradyumna Ghosh

Dr. Swati Sunder Mondal

Dr. Jahar Sarkar

Dr. Amitesh Kumar

Dr. Arnab Sarkar