INTRODUCTION TO MODERN COMPUTATIONAL FLUID DYNAMICS

March 9th, 2026 (from 9 AM to 4 PM)
at ASTFE TFEC2026 Conference in person at Arizona State University and online virtual in Whova/Zoom
www.astfe.org/courses/mcfd2026/

Dr. Akshai Runchal

Computational Fluid Dynamics (CFD) has emerged as an essential component of the design and analysis process for a wide range of engineering disciplines. CFD tools enable an engineer to analyse and understand the impact of the underlying physics, mathematics, and numerical concepts on an engineering system. This introductory course is intended to provide a researcher or a practicing engineer with the basic essentials to deal with problems of engineering design that involve fluid flow, heat and mass transfer, turbulence, combustion or other flow processes. It also provides an overview of the uses, abuses, promises and limitations of CFD so as to enable a design engineer to make effective use of CFD as an engineering tool.

This introductory course covers a range of topics from fundamental aspects of CFD to the state-of-the-art technologies, such as application of the latest Machine learning techniques to CFD.

KEY BENEFITS TO PARTICIPANTS

1. Help participants develop an intuitive understanding of key concepts of CFD
2. Provide an insight into the relevance of CFD to real-world industrial problems
3. Discuss the uncertainties, promises and pitfalls of CFD
4. Help participants correctly interpret results of their flow simulations
5. Discuss how Machine Learning can be integrated with CFD to improve performance and accuracy

WHO SHOULD ATTEND

- Graduate students and research scholars involved with development and application of CFD
- Design engineers working with CFD

REGISTRATION

- **Fee: $100**
- **Registration will be limited to 50 participants**
- **A certificate will be given upon completion of the course**

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WORKSHOP INSTRUCTOR

Dr. Akshai Runchal

Dr. Akshai K. Runchal has over 60 years of experience in CFD and simulation of flow, heat and mass transport processes in engineering and environmental sciences, He obtained his Ph.D. in 1969 from Imperial College (London) under the guidance of Prof. D, B. Spalding. He was a key member of the 3-person team led by Spalding that invented the Finite Volume Method (FVM) of Fluid Dynamics (CFD) in mid 1960's. He started his professional career as a faculty at IIT Kanpur in 1969 and has also taught as regular or adjunct faculty at Imperial College (London), University of California (Los Angeles), Cal Tech (Pasadena), and Cal State (Northridge). In 1979, Dr. Runchal established the ACRi group of companies (www.acricfd.com) that has offices in the USA, France and India.

For the past 60 years, Dr Runchal, has consulted extensively on projects related to flow, heat and mass transfer, combustion, environmental impact, management of air, surface and ground water resources, safe disposal of hazardous and nuclear waste, and, policy and decision analysis. Dr. Runchal is a co-author of the first book ever published on CFD. He is the author or co-author of 12 books and over 200 technical publications. He is the principal author of the ANSWER®, PORFLOW®, TIDAL®, and RADM™ CFD Software Tools that are widely employed by commercial, academic, and R&D organizations. (https://www.acricfd.com/)

Dr. Runchal has received professional honours and awards and has delivered keynote and invited talks at more than 100 international conferences and seminars. In 2011, Dr. Runchal founded a non-profit CFD Virtual Reality Institute (www.CFDVRi.org) to further the cause of CFD education, training, and R&D. He divides his time between Los Angeles and McLeod Ganj and is actively engaged in promoting education, training, and R&D in CFD and related disciplines.

WORKSHOP OUTLINE

Lecture 1: Brief History & Governing Equations

Lecture 2: The Finite Volume Method & Application to 1D Equations

Lecture 3: Basics of Numerical Analysis & Matrix Solvers

Lecture 4: Navier Stokes Equations, Pressure Projection & SIMPLE Method

Lecture 5: Density Based Methods

Lecture 6: Turbulence Modeling

Lecture 7: Environmental Flows

Lecture 8: CFD of the Future: Adaptive Grids, Meshless

Lecture 9: CFD of the Future: AI & Machine Learning

Lecture 10: Models & Reality

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