

### The emphasis of the course is on

- A condensed, critical and updated view of basic knowledge and future developments, in relation to systems and phenomena encountered in industrial applications
- Trends in modelling, design, analysis, CFD / CMFD methods and experimentation
- Sources of information, data and correlations
- Availability as well as limitations of modern modelling and computational techniques and codes
- Interdisciplinary transfer of knowledge from one area of applications to another

### This limited-enrolment course features

- 21 well-coordinated lectures by experts and excellent lecturers
- Movies, videos, animations, and computer simulations illustrating the physical phenomena and the numerical techniques
- Discussion time and discussions with the lecturers during and between lectures

### Lecturers

- Emilio Baglietto
- Sanjoy Banerjee
- Dominique Bestion
- Matteo Bucci
- Jacopo Buongiorno
- Michael L. Corradini
- Djamel Lakehal
- Annalisa Manera
- Gretar Tryggvason
- Stéphane Zaleski

Information



Registration



# 39th Short Courses on Modelling and Computation of Multiphase Flows

Part I: Bases

Part IIA: New Reactor Systems and Methods

Part IIB: Computational Multi-Fluid Dynamics

Part III: CMFD with Commercial Codes

12 - 16 February 2024  
hosted by ETH Zurich  
Zurich, Switzerland



## The Multiphase Flow Short Courses

Multiphase flows and heat transfer with phase change are of interest to researchers, scientists and engineers working in a multitude of industries. Courses similar to this one have been offered in the past at Stanford University, the University of California-Santa Barbara, in Washington D.C., and elsewhere. The course has taken place at ETH-Zurich since 1984 with over 2100 participants so far. Over the years, the course has continuously evolved, reflecting on-going progress, interests, and developments; parallel sessions were introduced in 1989.

The Zurich course not only offers the opportunity to meet and interact with outstanding lecturers, but also with colleagues working worldwide on similar topics but in different industries.

The course is organized in a modular form as intensive introductory courses for persons having basic knowledge of fluid mechanics, heat transfer, and numerical techniques (introductory tutorial texts are provided to the participants before the course), but also serve as advanced course for specialists wishing to obtain the latest information.

### Preparatory material and handouts

The extensive lecture notes, preparatory tutorial text for Part I and the tutorial material for parts IIA and IIB will be provided to the participants.

Hard copies of the handouts to be used in class will be distributed or provided in electronic form.

### Cocktail reception

A cocktail reception at ETH is scheduled for the first day of the course after the lectures and is included in the course fee.

## Part I, Basics

covers the common background material and emphasises the latest empirical and mechanistic modelling, computational and instrumentation aspects of multiphase flows. A tutorial text is e-mailed to the participants before the course to introduce the very basic concepts and fill any basic gaps in their background, so that they can participate in the most effective way.

## Part IIA, New Reactor Systems and Methods

covers multiphase flow topics of particular interest to the nuclear industry. Some of the most recently proposed advanced reactor designs and the main multiphase phenomena of importance to the nuclear industry are treated. The state-of-the-art and beyond in modelling and simulation methods (including CFD and CMFD applications) for core design and accident analysis is introduced. An article introducing Light Water Reactors will be e-mailed to the participants in Part IIA as tutorial material before the course.

## Part IIB, Computational Multi-Fluid Dynamics (CMFD)

reflects the growing interest in the application of CMFD techniques to multi-phase flows and covers the most common computational techniques. The introductory chapters from a book authored by Tryggvason, Scardovelli and Zaleski will be emailed to the participants in Part IIB to prepare them for the lectures.

## Part III, CMFD with 3D System Codes and Commercial CFD Codes

is attached to both Parts IIA and IIB. The participants will hear about the latest developments in 3D TH system codes, and commercial code developers discuss their products for both nuclear and other applications.

**Remark:** Part IIA and part IIB are parallel sessions.

## Course venue

ETH Zurich, Zentrum Campus

## Contact data

ETH Zurich, Laboratory of Nuclear Systems and Multiphase Flows

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## Course website

ns-ecmfl.ethz.ch/education/short-course-mpf

## Registration

<https://ethzurich.eventsair.com/scomf2024/reg>

## Fees

Full course (I, IIA or IIB + III): CHF 1'950 (5 days)

Part I: CHF 1'400 (3 days)

Parts IIA or IIB + III: CHF 1'100 (2 days)

## Cancellation policy

A fee of CHF 200 will be retained in case of cancellation later than 31 January 2024.

The course organizers reserve the right to cancel the course on short-term notice.

In case of postponement or cancellation by the organizers, the full course fee will be refunded.

Fees include the cost of course materials but do not include meals and hotel accommodation.