Course Description and Aims

OpenFOAM® is a widely spread open-source C++ library and a powerful software platform for solving a variety of problems in Computational Continuum Physics including Computational Fluid Dynamics (CFD) and Multiphysics applications.

This 3.5-day short course on multiphase flow simulations with OpenFOAM will cover the theoretical basis of multiphase flow approaches:

- Model Fundamentals
- Numerical Methods
- OpenFOAM Solver Families
- OpenFOAM's Multiphase Capabilities

Furthermore, the course aims at providing a distinctive overview over cutting-edge method developments going on in the international OpenFOAM community. Thus, the course goes beyond what standard OpenFOAM provides and gives attendees the unique opportunity to acquire the knowledge and method competence required to tackle challenging multiphase flow problems.

This year's special topics cover

- Sharp interface methods
- Diffuse interface methods
- Eulerian-Eulerian multi-fluid methods
- The discrete element method

The program is intended to stimulate intensive discussions between the participants and the lecturers as well as between the participants themselves. The aim is to address on-going developments as well as to discuss application problems.

Who should attend?

This course is directed towards researchers in academia, R&D researchers in industry as well as practicing engineers involved in the simulation of multiphase flows with OpenFOAM. Participants receive all the materials in electronic version.

The course is designed to impart crucial background knowledge and method competence by covering fundamentals and providing a unique overview over ongoing developments of renowned members of the international OpenFOAM community.

Venue

Technische Universität Darmstadt
Center of Smart Interfaces
(L2|06, Lichtwiese Campus)
Alarich-Weiss-Straße 10
64287 Darmstadt, Germany

Participants are requested to make their own accommodation arrangements. For a recommendation of hotels or further information, please contact Ms. Monika Medina (monika.medina-espana@tu-darmstadt).

Fees and Registration

To register for this short course, please visit:
www.sfb1194.tu-darmstadt.de

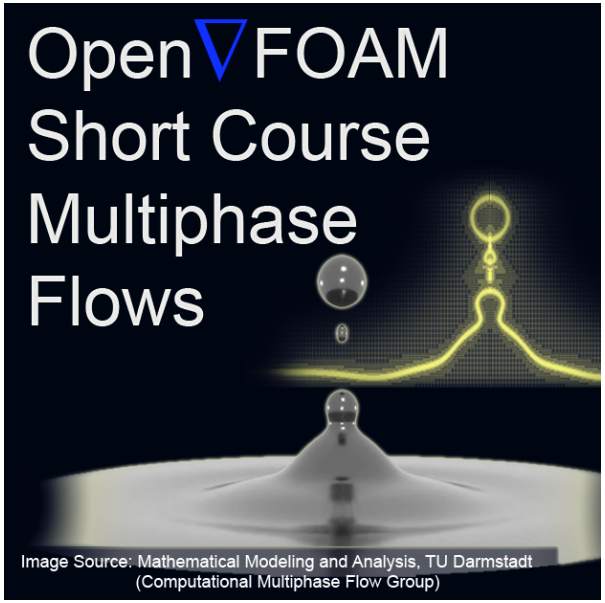
The course fee is 600 EUR for participants from industry and 300 EUR for participants from academia. The fee is exempt from VAT according to §4 Nr. 22a UStG. A charge of 50 EUR applies to cancellations up to the start of the course. The fee includes the electronic documentation of the lectures, coffee breaks, lunches and a course dinner on the second day.

OpenFOAM Short Course on Multiphase Flows

20–23 March 2023
Technical University of Darmstadt
Darmstadt, Germany

TECHNISCHE UNIVERSITÄT DARMSTADT

CRC 1194 Interaction between Transport and Wetting Processes



Supported by
Thermo-Fluids & Interfacial Phenomena
(www.tu-darmstadt.de/tfi)
Collaborative Research Center 1194
(www.sfb1194.tu-darmstadt.de)
OpenFOAM Technical Committee on Multiphase Flows
(wiki.openfoam.com/Multiphase_Technical_Committee)

Lecturers

Dr.-Ing. Thomas Antritter
BASF SE, Germany

Prof. Dr. Dieter Bothe
Institute of Mathematical Modeling and Analysis,
Department of Mathematics, TU Darmstadt, Germany

Dr. Mathis Fricke
Institute of Mathematical Modeling and Analysis,
Department of Mathematics, TU Darmstadt, Germany

Dr.-Ing. Federica Ferraro
Institute of Simulation of reactive Thermo-Fluid Systems,
Department of Mechanical Engineering,
TU Darmstadt, Germany

Prof. Dr. Hrvoje Jasak
Department of Physics: Cavendish Laboratory,
University of Cambridge, United Kingdom

Prof. Dr. Kimiaki Washino
Mechanical Engineering Department, Osaka University, Japan

Prof. Dr. Tommaso Lucchini
Department of Energy, Politecnico di Milano, Italy

Dr. Julien Maes
Institute of GeoEnergy Engineering,
Heriot-Watt University, UK

Dr.-Ing. Tomislav Marić
Institute of Mathematical Modeling and Analysis,
Department of Mathematics, TU Darmstadt, Germany

Dr.-Ing. Holger Marschall
Institute of Mathematical Modeling and Analysis,
Computational Multiphase Flow,
Department of Mathematics, TU Darmstadt, Germany

Prof. Dr. Alberto Passalacqua
Department of Mechanical Engineering,
Iowa State University, USA

Prof. Dr. Johan Rønby
Department of Science and Environment,
Roskilde University, Denmark

Dr. Henning Scheufler
Hydrogen Systems, Airbus, Germany

Prof. Dr.-Ing. Martin Sommerfeld
Faculty of Process and Systems Engineering,
Otto-von-Guericke-Universität Magdeburg, Germany

Prof. Dr. Željko Tuković
Faculty of Mechanical Engineering and Naval Architecture,
University of Zagreb, Croatia

Dr.-Ing. Andre Weiner
Institute of Fluid Mechanics, TU Braunschweig, Germany

Monday, 20 March

Fundamentals I/II

13:30 Registration
14:00 Welcome, Introductions, Overview of the Course *(Marić, Marschall)*
14:15 Direct Numerical Simulation Methods – Modeling Fundamentals *(Bothe)*
15:15 Group Photo + Coffee
16:00 Direct Numerical Simulation Methods – Numerical Approaches *(Bothe)*
17:00 OpenFOAM's Multiphase Capabilities *(Jasak)*
18:00 Close of First Day

Tuesday, 21 March

Fundamentals II/II

9:00 Discrete Element Methods – Modeling Fundamentals *(Washino)*
10:00 Coffee
10:30 Eulerian-Lagrangian Flow Methods – Modeling Fundamentals (*Sommerfeld)*
11:30 Eulerian-Eulerian Flow Methods – Modeling Fundamentals *(Passalacqua)*
12:30 Lunch

Dispersed Flows

13:30 Modeling Polydispersity in Gas-Liquid Systems with Population Balances (*Passalacqua*)
14:30 Modeling the Evolution of Nanoparticles and Microparticles in Turbulent Reactive Flows (*Ferraro*)
15:30 Coffee
16:00 Modeling Turbulent Chemically Reacting Sprays *(Lucchini)*
17:00 Close of Second Day
19:00 Short Course Dinner

Wednesday, 22 March

Interfacial Flow

9:00 Arbitrary-Lagrangian-Eulerian Method *(Tuković)*
10:00 Coffee
10:30 The isoAdvector Volume-Of-Fluid Method *(Rønby)*
11:30 Unstructured Geometrical Un-split Volume-Of-Fluid Methods *(Marić)*
12:30 Lunch
13:30 Modeling Phase-Transition in Volume-Of-Fluid Methods *(Scheufler)*
14:30 Data-driven Modeling and Validation of Reactive Mass Transfer at Rising Bubbles *(Weiner)*
15:30 Coffee
16:00 Compressible Multiphase Flows *(Jasak)*
17:00 Close of Third Day

Thursday, 23 March

Wetting & Contact Line Treatment

9:00 Wetting in Discrete Element Methods for Gas-Liquid-Solid Three-Phase Flows *(Washino)*
10:00 Coffee
10:30 Dynamic Wetting Simulations using the Phase-Field Method *(Marschall)*
11:30 Dynamic Wetting and Surfactant Transport using the VOF Method" (*Antritter*)
12:30 Lunch
13:30 Modeling and ALE-based Simulation of Dynamic Wetting *(Fricke)*
14:30 Multiphase Transport in Real Pore Geometries *(Maes)*
15:30 Close of Short Course