Open workshop

The spring school is organized as open workshop in two parallel sessions: **Option A**dvanced and **Option B**eginners. It promotes the participants and is open for the interested general public. The spring school is organized as a non-profit event. This year's spring school **venue is the historic building of the *Heidelberger Akademie für Wissenschaften* in the city of Heidelberg, right underneath the famous castle.**

Registration fee includes:

Lecture notes (theory lecture part: pdf, software lab part: printed), lectures by invited speakers, software tutorial mentored by *OpenLB* developers, daily lunches, 2x dinner (including Spring School dinner), social excursion, daily two coffee breaks, certificate of participation. Several scholarships are available for students (MA or PhD candidates).

Pricing

	Early registration by 4. February 2024	Regular registration
Academia	€ 420	€ 570
Industry	€ 1,770	€ 1,920

Important dates

Spring School 4. - 8. March 2024

Early registration 4. February 2024

Poster session award

The award is aiming at supporting excellent students working in the field of LBM.

More information

Web: www.openlb.net/spring-school-2024

Email: springschool@openlb.net

HEIDELBERGER AKADEMIE DER WISSENSCHAFTEN
Akademie der Wissenschaften des Landes Baden-Württemberg

LBRG

KIT Karlsruhe Institute of Technology

OpenLB

UK COMES Consortium on Mesoscale Engineering Sciences

KIT Campus TRANSFER

Spring School 2024 venue, Heidelberg, ©Schwerdt

7th Spring School

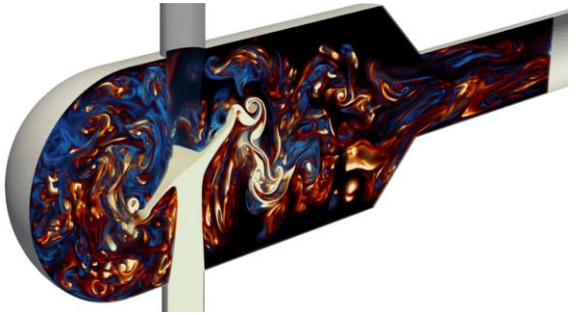
Lattice Boltzmann Methods

with *OpenLB* Software Lab

4. - 8. March 2024

Heidelberg, Germany

Open Workshop



www.openlb.net/spring-school-2024

Executive committee

Kerstin Dick (KIT)

Shota Ito (KIT)

Mathias J. Krause (KIT)

Stephan Simonis (KIT)

Host organization

KIT Campus Transfer GmbH

Venue

Heidelberger Akademie der Wissenschaften

The field of Lattice Boltzmann Methods

Lattice Boltzmann Methods (LBM) are an established numerical technique for Computational Fluid Dynamics (CFD) and beyond. The simulation of complex multi-physics benefits strongly from the mesoscopic modelling of LBM and positions it next to traditional numerical methods. The rapid development in LBM – also driven by the emergence of massively parallel computing infrastructure – enables engineers to solve relevant problems for academia as well as for industry.

Target audience

The expected attendees are developers and researchers, from industry and academia interested to learn theoretical and practical aspects of LBM. The spring school addresses e.g., engineers, computer scientists, mathematicians, and physicists as well as Master and PhD students. The course level is either beginners (**Option B**) or advanced (**Option A**). Based on their interest in CFD, this course provides a collaborative platform for LBM, both for developers and researchers.

Objective of the spring school

The spring school introduces researchers and users from industry to the theory of LBM and trains them on practical problems. **Option B**: The first half of the week is dedicated to theoretical fundamentals up to ongoing research on selected topics in kinetic theory, scientific computing, LBM, and Partial Differential Equations (PDE). Followed by mentored training on case studies using *OpenLB* in the second half of the week. Emphasis is placed on the modelling and simulation of particulate, multi-component, and turbulent fluid flows. **Option A:** Advanced *OpenLB* users and developers are enabled to solve their own application problems and implement their own solution approaches.

This educational concept is probably unique in the LBM community and offers a comprehensive and personal guided approach to LBM. Participants also benefit from the knowledge exchange during the poster session, coffee breaks and an excursion.

Topic overview and preliminary agenda (Option B)

	MONDAY, 04.03.2024
Morning	Registration, introduction, LBM applications, short introduction by all participants
Afternoon	Scientific computing, mesoscopic modeling: kinetic theory, PDE, from micro to macro scale, LBM introduction, Chapman–Enskog expansion, boundary conditions, dimensionalisation
Evening	Poster session and dinner
	TUESDAY, 05.03.2024
Morning	LBM for turbulent flows, thermal flows, reactive flows, optimal control
Afternoon	LBM for multi-phase and multi-component flows, particulate flows, efficient parallel implementation
Evening	Free, optional: help desk
	WEDNESDAY, 06.03.2024
Morning	Introduction *OpenLB,* preliminaries (*Linux*, compile, run in parallel, *ParaView*), converter, Exercise 1
Afternoon	Social event / excursion
Evening	Spring School dinner and poster award
	THURSDAY, 07.03.2024
Morning	Setup geometry, meshing, Exercise 2, place LB models, initial and boundary conditions, convergence
Afternoon	Exercise 3, get results: console, *VTK*, images, *Gnuplot* functor concept, Exercise 4
	FRIDAY, 08.03.2024
Morning	Advanced models, Exercise 5 and 6
Afternoon	Option 1: OpenLB for applicants: getting started to solve your own problem Option 2: *OpenLB* for developers: getting started to implement your own LB model

Preliminary agenda (Option A)

MONDAY TO FRIDAY, 04. - 08.03.2024

Supervised (**MON to WED**) & independent (**THU, FRI**) software lab: *OpenLB* for experienced applicants and developers; participation with all other attendees in short introduction, social event, poster session, dinner, and all coffee as well as lunch breaks.

Software lab and requirements

The participants are trained on practical applications, deploying the open-source software *OpenLB*. **Option B** (**WED to FRI**): Special focus is placed on case studies, which are important to understand and verify the theory presented in the lectures (**MON, TUE**). By the help of experienced tutors, beginners are enabled to set up simulations for relevant problems. **Option A**: Experienced applicants and developers are supervised by tutors (**MON to WED**) to solve their own application problems and/or implement their own LBM. They work independently (**THU, FRI**), though discussions with the tutors are always welcome. To guarantee personal tutoring and intensive exchange between experienced mentors and novices, the lab is limited to 50 participants. The attendees are responsible to bring their own laptop equipped with:

- *Recent C++ compiler with full C++17 support (minimum versions: GNU GCC 9, Clang 7 or Intel C++ 19.0)*
- *OpenMPI 2.1 and higher*
- *ParaView*

Windows users should prepare their laptop in advance to enable the Windows Subsystem for Linux (WSL) following the *Technical Report* 5 (www.openlb.net/tech-reports).

Speakers (preliminary)

D. Dapelo (University of Liverpool), F. Dubois (Université Paris-Sud), T. Krüger (University of Edinburgh), H. Kusumaatmaja (Durham University), T. Reis (University of Greenwich), T.N. Bingert, F. Bukreev, M. Frank, S. Ito, M.J. Krause, A. Kummerländer, J.E. Marquardt, S. Simonis, D. Teutscher (Karlsruhe Institute of Technology)