

APPLICATION



The target participants are junior as well as experienced scientists and engineers in the broad field of nuclear sciences, engineering and technologies.

The application form should be filled out online at:

<http://www.fjohss.eu>

Should there be any problem with the online registration, please contact:

fjoh@cea.fr

Deadline for application: May 28th, 2021

Full Registration fees: € 400

Information for payment of the fees will be provided after review of the applications.

All applicants are required to provide a short curriculum vitae, which will be used for selection purposes.

The FJOH School considers that the 2021 programme corresponds approximately to 3-4 ECTS credits of post graduate-level course work in Nuclear Engineering.

Selection by the FJOH School organizers is final.

Partial participations are not accepted.

August 25th > September 3rd, 2021

For more information, please visit our web site:

www.fjohss.eu

INFORMATION

Key dates

May 28th, 2021: Deadline for application

June 7th, 2021: Notification to applicants

August 25th, 2021: Start of the school lectures

September 3rd, 2021 : End of school

Virtual format

FJOH-2021 will be a fully-virtual school striving for essentially the same learning outcomes as in a traditional format. There will be a balanced mix of live, offline, and asynchronous activities, scheduled in such a way as to allow participation from different time zones:

- Offline sessions to follow pre-recorded lectures
- Two-hour synchronous daily live plenary sessions,
- Tutored asynchronous daily group sessions,
- Virtual visits of selected facilities.

Each daily two-hour live session will be dedicated to a given topic and will consist of (i) A summary highlighting key points in the lectures, (ii) A short quiz-type serious game, (iii) A question/answer period for addressing special issues raised by the participants or open-ended questions.

These daily live sessions will be scheduled around midday (Paris time) so that participants from all time zones can join simultaneously. The sessions will be managed remotely by the organizers and the lecturers.

Tutored sessions will be organized daily, in which groups of participants will be tasked with preparing specific questions on the various school topics. The questions will be submitted to the lecturers and will be debated during the next-day live session. The groups will also be asked to address open-ended questions.

Questions? Please contact: the FJOH Secretariat at

fjoh@cea.fr

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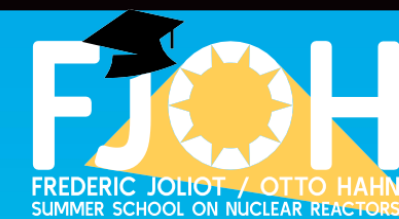
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VIRTUAL SCHOOL

2021

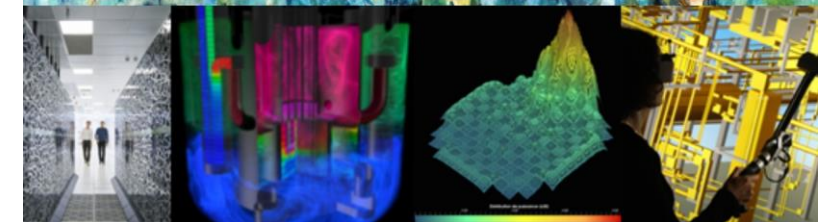


FREDERIC JOLIO / OTTO HAHN
SUMMER SCHOOL ON NUCLEAR REACTORS

"Physics, Fuels and Systems"

High-fidelity Modelling and Simulation of Nuclear Reactors: Turning a Promise into Reality

Jointly organized by the Commissariat à l'Energie Atomique et aux Energies Alternatives (France) and the Karlsruhe Institute of Technology (Germany)



August 25th > September 3rd, 2021

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Karlsruhe Institute of Technology

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PROGRAMME OUTLINE



LECTURERS

OBJECTIVES



DESCRIPTION



High-fidelity Modelling and Simulation of Nuclear Reactors: Turning a Promise into Reality

Technical webinars



16 h

1. Introduction

- 1.1 Lessons Learned from Recent High-fidelity M&S Projects: Have they Delivered on their Promise? **S. Palmtag** (NCSU/CASL)

2. State-of-the-art M&S in Connection with Current LWR Operation

- 2.1 Core Physics and Design Methods **L. Deokjung** (UNIST)
2.2 LWR Fuel Performance: Phenomenology, Modelling, Applications and Challenges **G. Rossiter** (NNL)
2.3 System Operation and Safety Assessment **M. Seidl** (PreussenElektra)

3. M&S to Address Anticipated Needs and the Unexpected

- 3.1 Resolution of Operational LWR Problems Using Neutron Noise-based Techniques **C. Demazière** (Chalmers)
3.2 Analysis Methods for Post-Fukushima WENRA Cat-A Design Extension Conditions **C. Schneidesch** (Engie-Tractebel)

4. Facing Nuclear Challenges Using Advanced M&S

- 4.1 Monte-Carlo Neutron-transport Methods for Reactor Dynamics **D. Mancusi** (CEA)
4.2 Advanced Fuel Models and Experiments: A Multi-scale Approach for a High-fidelity Simulation **B. Michel & J. Bouchet** (CEA).
4.3 Advanced Thermal Hydraulics: Multiscale-Multiphase CFD Modelling, Verification and Validation **D. Lucas** (HZDR)

5. Cross-cutting Issues: Margin Assessment, V&V, Safety Demonstration, Digital Twins, Integration, Reduced-order Modelling

- 5.1 From Basic Uncertainty Estimations to V&V and Advanced Tools for a Science-based Safety Demonstration **M. Avramova** (NCSU)
5.2 Digital Twins in the Nuclear Industry : Where Are We Now and How They Will Change our Industry and Practices ? **Tbc**
5.3 Screening and Meta-model for High-dimensional Problems: Application to the Identification of Penalizing Configurations in Safety Studies **A. Marrel** (CEA)
5.4 Reduced-order Modelling of High-fidelity Simulations **D. Lathouwers** (TU Delft)

Live plenary sessions



16 h

Key points in the lectures, quiz-type serious game, Q/A period, Tutored Group session

Virtual visits of facilities

FJOH-2021 will revisit some of the nuclear reactor modelling topics covered in the 2011 session, to cast light on major advances, lessons learned, current trends and promising on-going developments. By the end of the course, the participants should be able to describe state-of-the-art M&S methods applicable to LWR design, operation and safety, discuss their relative merits and limitations, and relate them to changes in industrial practices as part of a broad digital transformation.

Advanced multiscale multi-physics M&S methods already make it possible for nuclear engineers to simulate large-size components from finely detailed descriptions, while accounting for coupled interactions between subsystems and with other components. Although such methods cannot yet predict the full response of a system as complex as a reactor, they foreshadow the next generation of reactor M&S tools, with a wide spectrum of new possibilities, ranging from costly high-fidelity models to faster-running reduced-order models tailored to users' needs. Ultimately, they will take the form of embedded "digital twins" bridging the gap between the digital and real worlds. As industry progressively moves from legacy M&S to adopt these highly sophisticated methods and algorithms, gains are anticipated in plant performance, predictive maintenance, innovative design, reactor safety, workforce efficiency, etc.

This evolution shows great promise and is a powerful driver for engagement, while also being a challenge for traditional engineering practices. At the same time, unrealistic expectations and claims may arise unless one critically thinks of intrinsic model limitations, data management and integration, V&V and simulation fidelity evaluation, prediction credibility, accrued complexity vs usefulness, etc.

The 26th session of the Frédéric Joliot/Otto Hahn (FJOH) Summer School on "Nuclear Reactors Physics, Fuels, and Systems", will be dedicated to "High-fidelity Modelling and Simulation of Nuclear Reactors: Turning a Promise into Reality." It will be held from August 25 to September 3, 2021.

Although there is hope for an improvement of the situation in the coming months regarding the COVID crisis, it is not sure that the conditions will be met in August for a residential course in Aix-en-Provence as planned initially. Therefore, FJOH-2021 will be held 100% remotely, with a balanced combination of off-line and live sessions.

FJOH summer school is an advanced post-graduate-level course aimed at junior as well as experienced scientists and engineers engaged in the broad field of nuclear sciences, engineering and technologies.

Lecturers are invited from internationally leading universities and industry. The School format encourages informal discussions and the exchange of knowledge between lecturers and participants.

The Frédéric Joliot / Otto Hahn Summer School course represents the continuation of the Frédéric Joliot Summer Schools on "Modern Reactor Physics and the Modelling of Complex Systems", which was created by CEA in 1995 to promote knowledge in the field of reactor physics, in a broad sense, and the international exchange of teachers, scientists, engineers and researchers. Beginning in 2004, the scope of the School was extended to include scientific issues related to nuclear fuels. The venues of the FJOH School sessions alternate between Karlsruhe and Aix-en-Provence.

The program of each School session is defined by the International FJOH Scientific Board (see Coordination page).

FJOH is jointly organized by the CEA Energy Division (France) and the Karlsruhe Institute of Technology (KIT, Germany).