

APPLICATION

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

All FJOH-2017 school applicants should fill out the on-line form at:

www.fjohss.eu

Should there be any problem with the on-line registration, please contact:

Mrs. Ingeborg Schwartz

Ingeborg.schwartz@kit.edu

Deadline for application: **May 17, 2017**

Full Registration fees: **€ 2000**

Reduced Fees: € 1000 for fellowship recipients
Information for payment of the fees will be provided upon review of applications.

The fees cover: lectures, class notes, excursions, meals and lodging at the AKADEMIE HOTEL KARLSRUHE.

The fees do not cover travel expenses.

A small number of fellowships will be available for qualified candidates. The fellowship covers the amount of EUR 1000, the same amount of Euro 1000 having to be financed by the applicant or his/her employer. These fellowships are primarily **intended for candidates from developing countries**. Requests should be motivated.

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

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

The FJOH School considers that the 2017 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.

Key dates

May 17, 2017: Deadline for application

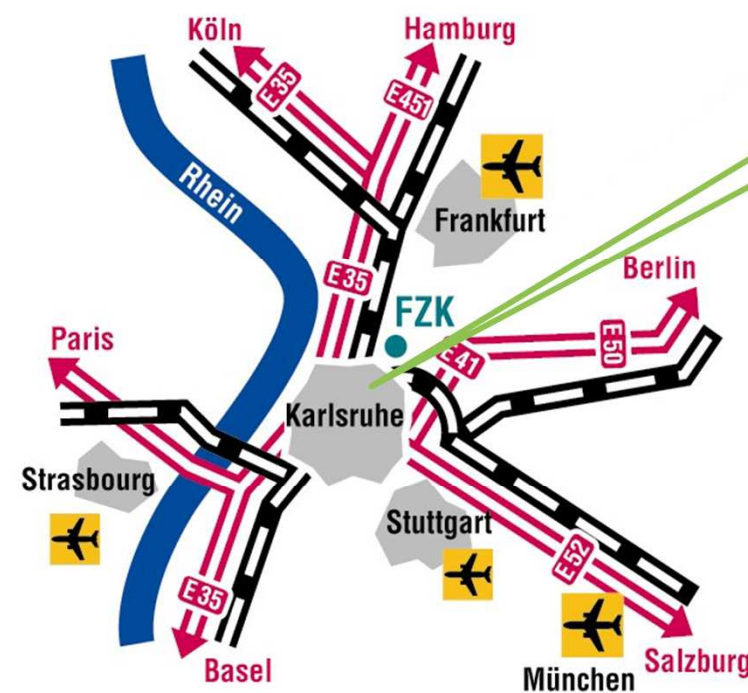
June 9, 2017: Notification to applicants

August 22, 2017, 7 pm: Welcome to participants with a get-together-dinner at the Akademie Hotel Karlsruhe

August 23, 2017, 9 am: Start of the school's lectures

September 1, 2017, 1 pm: End of school

Partial participations are not accepted



INFORMATION

Venue

The School will be held at the Akademie Hotel Karlsruhe, located about 4 km from downtown Karlsruhe, Baden-Württemberg, Germany.

The Akademie Hotel is conveniently accessible by tram from the Karlsruhe central train station.

Registration fees

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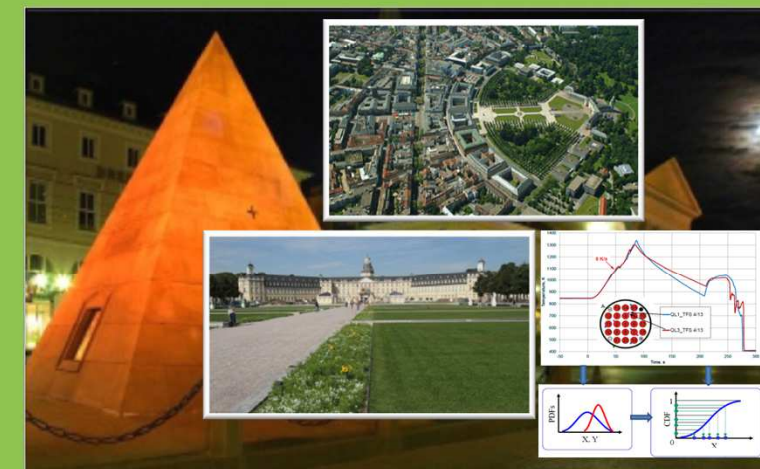
Frédéric JOLIOT & Otto HAHN

SUMMER SCHOOL ON NUCLEAR REACTORS "Physics, fuels and systems" 2017



Uncertainties in Nuclear Reactor Systems Analysis: Improving Understanding, Confidence and Quantification

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



Credit Photos: City of Karlsruhe

Karlsruhe, Germany
August 23 > September 1, 2017

FOR QUESTION, PLEASE CONTACT:

Mrs. I. Schwartz
Ingeborg.Schwartz@kit.edu

FOR MORE INFORMATION,
PLEASE VISIT OUR WEB SITE:

<http://www.fjohss.eu>



PROGRAMME OUTLINE

LECTURERS

COORDINATION

DESCRIPTION

1 - Introduction

- 1.1. On the practical importance of uncertainties for nuclear applications
- 1.2. Overview of current approaches, practices, and trends in the nuclear industry

2 H

R. Taylor (Manchester Univ. & NNL)
R. Taylor (Manchester Univ. & NNL)

2 - Methods of uncertainty assessment and propagation

- 2.1. Statistical uncertainty, error propagation, correlation analysis, statistical testing, linear regression, estimation techniques (3h)
- 2.2. Uncertainty quantification using global sensitivity analysis methods (3h)
- 2.3. Epistemic uncertainty propagation in risk/reliability analysis (2h)
- 2.4. VVUQ of modelling & simulation tools: Basic principles and methodology (2h)
- 2.5. Planning and designing representative and optimized (envelope) validation experiments (2h)

12 H

H. Abdel-Khalik (Purdue Univ.)
B. Iooss (EdF)
S. Destercke (Compiègne TU/CNRS)
W. Oberkampf (Consulting Engineer)
W. Oberkampf (Consulting Engineer)

3 - Error analysis in reactor core and fuel design and operation

- 3.1. Nuclear data covariance assessment and data assimilation (2h)
- 3.2. Uncertainty evaluation, sensitivity analysis, error propagation and V&V experiments for core physics (2h)
- 3.3. New methods for assessing uncertainties in CFD simulations, inferring limitations (2h)
- 3.4. Uncertainties in fuel modelling (2h)
- 3.5. Deriving information from large sets of measurements (2h)

10 H

H. Leeb (TU Wien)
T. Kozłowski (Univ. Illinois)
R. Macian-Juan (TU Munich)
A. Bouloré (CEA)
R. Van Geemert (AREVA)

4 - Uncertainty quantification methods in safety analyses

- 4.1. Deterministic and statistical methods of uncertainty and sensitivity evaluation (2h)
- 4.2. Safety margin assessment and decision process (2h)
- 4.3. Evaluating uncertainties and correlations in fuel thermo-mechanics and system thermo-hydraulics calculations (2h)
- 4.4. CIAU methodology for uncertainty evaluation in thermal-hydraulics (2h)
- 4.5. Uncertainty quantification for severe accident scenarios (2h)

10 H

H. Gläser (GRS)
E. Ivanov (IRSN)
F. Gaudier (CEA)
A. Petruzzi (NINE Consulting)
X. Zheng (JAEA)

5 - Group reflection on selected scientific topics

Seminar

6 H

2 H

Real-time on-line decision support systems for off-site emergency management

W. Raskob (KIT)

Technical visits of KIT R&D facilities

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The 23rd session of the Frédéric Joliot/Otto Hahn (FJOH) Summer School on “Nuclear Reactors Physics, Fuels, and Systems” will be held in Karlsruhe, Germany, from **August 23 to September 1, 2017**. This session is entitled “Uncertainties in nuclear reactor systems analysis: Improving understanding, confidence and quantification”. It 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.

The FJOH-2017 objective is to help the school participants broaden their knowledge of uncertainty assessment for the design, operation and safety of complex technological systems such as nuclear reactors. The overall course will describe methods for estimating and propagating statistical and systematic errors, VVUQ methodologies and best practices, the main challenges and limitations, expected improvements and current R&D trends.

The FJOH-2017 programme covers the following three topics: (1) Methods of uncertainty assessment and their propagation; (2) Error analysis in reactor core/fuel design and operation; (3) Uncertainty quantification methods in safety analyses. In the 1st topic, common and advanced concepts of statistical error analysis will be described, as well as the general methodological basis for VVUQ. In the 2nd topic, these concepts and methods will be specialized to nuclear data, reactor core physics, thermal-hydraulic and fuel modelling as well as plant data analyses. In the 3rd topic, practical methods of uncertainty and margin estimations will be described in the integrated approach to allow for a plant safety demonstration. Examples will be provided throughout the course to illustrate actual practices.

FJOH-2017 includes plenary lectures, group discussions, seminars, and technical visits. The speakers invited are internationally recognized experts from leading universities, research and development laboratories and industry.

The FJOH-2017 participants will have the opportunity to share their views on specific cross-cutting subjects and open-ended questions, as part of group reflection and critical thinking activities. Time for these group activities is reserved in the School schedule.

This 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 School's aim is to address the challenges of reactor design and optimal fuel cycles, and to broaden the understanding of theory and experiments.

The programme of each School session is defined by the International FJOH Scientific Board (see below).

The Karlsruhe Institute of Technology and the Nuclear Energy Division of CEA jointly organize and sponsor the FJOH Summer School.

2017