

## Field: NUCLEAR SAFETY

### Topic: SAFETY ASSESSMENT APPLICATIONS (SAA)

**Date:** 24-28 June 2024

**Duration:** One week

**Location:** Lucca, Italy

**Working language  
of the course:** English

#### Objective

The course provides the trainees with theoretical knowledge and hands-on experience about methodologies, approaches, codes, and applications related to system thermal-hydraulics, reactor physics, fuel performance, and severe accidents and multi-physics analysis.

#### Outline of course content

The course offers an overview of methodologies and applications for conducting Deterministic Safety Analysis (DSA) within a licensing framework. It covers various topics, including methodologies, approaches, codes, and applications related to system thermal-hydraulics, reactor physics, fuel performance, and severe accidents.

The course is structured around the following topics and components:

- Introduction to the CEMVA (Cause-Effect Mapping for Vulnerability Analysis) methodology used for Safety Assessment in NPP Licensing, addressing the CEMVA validation process (validation of code and nodalization techniques) and the CEMVA qualification process (qualification process of a NPP evaluation model)
- Introduction to the OECD/NEA Computer Code Validation Matrix for integral and separate effects test facilities (ITF and SETF)
- Discussion of cross-section generation and core simulation for variant reactor types (light-water reactors (LWRs), advanced reactors)
- Outline of reactor core simulations, discussion of estimating reactor core inventory and radiation shielding
- Introduction to thermo-mechanics modeling of fuel performance codes
- Introduction to multi-physics analysis in Safety Assessment (SA) and multi-physics calculation (through the example of large-size Pressurized Water Reactors (PWRs))
- Explanation of the Best Estimated Plus Uncertainty Analysis (through the example of PWRs)
- Overview of Physical models in SA code
- Explanation of source term evaluation and radiological consequence analysis

In addition to theoretical lectures, hands-on training sessions are provided for each topic, focusing on simple applications to facilitate practical skills development.

#### Technical schedule and delivery methods

The course consists of one module taking a working week (i.e. 5 workdays).

- **Lectures:** the course is organized in 16 theoretical, classroom lectures.
- **Tabletop group exercises and Hands-on training:** throughout the week trainees are engaged in various tabletop group exercises and Hands-on training, offering multiple opportunities to improve their practical skills in risk quantification and development of event trees and fault trees as well as to measure their progress and accomplishments throughout these sessions.
- **Technical visit:** a Laboratory close to Lucca is visited on the third day afternoon.

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### **Target audience**

This course is intended to experts and professionals of Nuclear Regulatory Authorities (NRAs) and Technical Support Organisations (TSOs), with knowledge on nuclear power and preferably with responsibilities in the field of nuclear safety, particularly related to Safety Assessment.

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**Target number of participants:** 10 – 20

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### **Prerequisites and requirements for participants**

Participants should have an adequate level of knowledge in English (at least an 'Independent user' level defined by the [CEFR](#)). A university degree obtained in engineering or physics faculties with nuclear specialization and at least 1 year of professional experience in functions relevant to the content of the course is also a prerequisite.

Relevancy of the course topic in the work and institutionally justified interest in participating will be considered as well as the need and opportunity for filling competence gaps. Efforts are made to ensure gender equality.

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### **Terms of participation**

The project is implemented under the European Union (EU) external assistance programme called the European Instrument for International Nuclear Safety Cooperation (INSC) and aims to support the National Nuclear Regulatory Authorities (NRAs) and their Technical Support Organisations (TSOs) in non-EU countries in strengthening their capabilities with regard to their regulatory tasks and responsibilities in the field of nuclear safety and radiation protection.

Employees of the NRAs or their TSOs in the Beneficiary Countries are eligible for financially supported participation in the T&T courses. Beneficiary Countries of the project are published on the website <https://training.ek-cer.hu/>.

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### **Costs**

Travel costs and subsistence allowances (including the international and national travel tickets, per diems, shuttle services, insurance and visa application costs) for participants will be covered by the project.

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### **Application**

Application via the website <https://training.ek-cer.hu/>, according to the process and deadlines indicated there.

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### **Examination**

Technical and linguistic tests will be written as part of the application and selection process to assess the underlying knowledge and preparedness of applicants. Knowledge and development of selected participants will be assessed through technical tests throughout the course.

Participants attending the full course will be issued with attendance certificates. Successful participants will receive certificates confirming their knowledge achieved and skills acquired.

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