

Field: NUCLEAR SAFETY

Topic: DETERMINISTIC SAFETY ASSESSMENT (DSA)

Date:	17-21 June 2024	Objective The course provides the trainees with theoretical background to understand the framework of Deterministic Safety Assessment (DSA) and hands-on training to develop practical skills in DSA, including in the analysis of design basis or beyond design basis accidents through the familiarization with system thermal-hydraulics, reactor physics, fuel performance or severe accident codes.
Duration:	One week	
Location:	Lucca, Italy	
Working language of the course:	English	

Outline of course content

This course is primarily designed for staff from nuclear regulatory organizations, aiming to transfer know-how, and the experience and expertise of recognized experts in the field to those who are beginning their careers or seeking to benchmark their knowledge and skills against their peers' practices.

The course provides an overview of the computer codes used in Deterministic Safety Assessment (DSA), directed toward beginner code users without prior experience in system thermal-hydraulics, reactor physics, fuel performance or severe accident codes. Participants will gain familiarity with the syntax and the input structure of these codes, as well as with the use of plotting tools. In addition to theoretical lectures, hands-on training on simple modeling techniques is provided.

The course is structured around the following topics and components:

- Introduction to Deterministic Safety Assessment
- Overview of the System Thermal-Hydraulic Codes, discussion on their capabilities, limitations and sources of errors
- Overview of the RELAP5 Code Architecture and Structure, introduction to RELAP5 Components
- Outline of Reactor Physics Analysis in the DSA
- Overview of Lattice Physics Analysis in the DSA, introduction of computer codes (including platforms, verification and validation), and lattice physics calculations (Lattice Cross-section Generation, Depletion)
- Overview of Reactor Core Analysis in the DSA, introduction of computer codes (including platforms, verification and validation), and reactor core calculations (Steady-State, Transient, Depletion, Criticality, Radiological analysis)
- Discussion on the Thermo-Mechanical Behaviour of Fuel Rods in Nuclear Reactors
- Overview of Fuel Rod Integrity and Fuel Performance Modelling and Tools
- Outline of Severe Accident Analysis, review of main historical Severe Accidents and In-/Ex-Vessel Phenomena, introduction of System & Containment codes for Severe Accidents

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 14 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 utilizing computer codes, conducting analysis and performing calculations 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.

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 in the preparation and review of Deterministic Safety Analysis (DSA).

Target number of participants: 10 – 20

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.

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/>.

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.

Application

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

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.
