

Course on

Neutron transport at the fuel cell and assembly levels

The course focuses on the study of the transport of neutrons at the fuel cell and assembly levels, to provide useful information for the next steps of reactor physics analysis, such as the full core simulation in steady-state and transient conditions.

The course aims at providing the students with a sound understanding of the physical phenomena described by the neutron transport models, as well as giving the participants the instruments to perform numerical simulations of neutron transport with state-of-the-art models and codes.

The **pedagogical format** of the course is based on a **hybrid flipped classroom**. In this format, you need to complete some **online self-paced preparatory work** (representing about 40 hours of work) before attending **interactive classes** organized during 5 consecutive days (representing about 40 hours of work). Those classes are given in a hybrid set-up, with participants following the classes either onsite or remotely on the web. Research in engineering education demonstrated that flipping leads to higher student engagement, better achievement of the learning outcomes and increases the interactions between the students and the teachers.

After successfully completed the course, you will be able to:

- Understand the physical phenomena described by the Boltzmann linear transport equation.
- Know the various numerical approaches typically adopted for the simulation of neutron transport.
- Implement some of those approaches in simulation environments.
- Describe the fundamental differences between the deterministic and the Monte Carlo methods for the solution of the transport equation.
- Use with confidence deterministic and Monte Carlo tools for the simulation of neutron transport.
- Appreciate the effects of the numerical approximations on the physical representation of the transport phenomenon.

The **target audience** for the course is:

- MSc students, PhD students and Post-Doc students having some background knowledge in nuclear engineering.
- Nuclear engineers.
- Reactor physicists.
- Nuclear safety analysts.
- Research scientists in the above fields.

In order to **pass the course** and be issued a **course completion certificate**, you need to obtain at least 50 points (out of 100 max. points). All activities (both during the preparatory work and the interactive classes) are graded. The certificate will briefly describe the course contents, the number of hours the different course elements represent and the number of equivalent ECTS credits (European Credit Transfer and Accumulation System). **The course is worth 3 ECTS.**

As a course participant, you get access to:

- An online **Learning Management System** with 24/7 access to all teaching resources for 4 months.
- During the **online self-paced preparatory phase**:
 - A set of **handbooks** written for the course.
 - **Video lectures** associated to the handbooks.
 - **Quizzes** to test your understanding.
- During the **interactive phase**:
 - **Engaging activities** aimed at applying the principles learned during the preparatory phase.
 - **Expert support** from the teachers.
 - Possibility to **network** with the other participants.

You can read some **testimonies** of our past attendees on our website at this [link](#).

The course is given by:

- Prof. Sandra Dulla, Politecnico di Torino, Turin, Italy.
- Prof. Christophe Demaziere, Chalmers University of Technology, Gothenburg, Sweden.
- Assoc. Prof. Máté Szieberth, Budapest University of Technology and Economics, Budapest, Hungary.

The course is fee-based. Fees vary according to geographical location (developed or emerging country) and participant status (student or professional). Payment of the course will be requested after having applied and having received confirmation that you have been accepted for the course. People accepted for the course will then get a link to pay online. The course fees are as follows:

- Course fee for professionals – Developed countries: 1875 EUR (VAT included).
- Course fee for professionals – Emerging countries: 300 EUR (VAT included).
- Course fee students – Developed countries: 100 EUR (VAT included).
- Course fee students – Emerging countries: 50 EUR (VAT included).

You can find more information on fees and the list of developed and emerging countries on our website at this [link](#).

The course platform opens on September 26th, 2025, for the online self-paced preparatory work, and the interactive sessions are organized between October 27th and October 31st, 2025, at Chalmers University of Technology, Gothenburg, Sweden, and on the web.

Apply for the course between June 23rd, 2025, and July 13th, 2025:
great-pioneer.eu/registration

Participants choosing the onsite version of the course must also cover their own expenses (travel, food, and accommodation).

Questions can be sent to contact@great-pioneer.eu