



DIPARTIMENTO DI INGEGNERIA INDUSTRIALE

## ENGINEERING ELEMENTS IN THE DESIGN OF A REACTOR CORE

**Abstract:** A nuclear plant is first of all a complex engineering product: in no other project as many different physics and phenomena are involved.

The reactor core is the heart of a nuclear plant: it is here that a stable population of neutrons is maintained, so to produce heat by a controlled fission chain reaction. Fission generates radioactive products that are to be confined by barriers, while the neutron field induces radiation damage on the structures.

Heat is then removed from the core by a fluid to be maintained in the desired status, and under favorable hydraulic conditions. Heat removal must also occur in a desired temperature range, as temperatures may as well affect the resistance of the structures.

Addressing all the aspects of neutronics, fuel chemistry and mechanics, thermal-hydraulics and thermo-mechanics at the same time is the major challenge in reactor core engineering. Blindly relying on the standard approach of design-verification-review generally turns particularly resource-extensive.

Significant advancements could be made by adopting reversed approaches to core design, based on starting from the analysis of the goals and constraints typically verified at the end, for their translation into explicit design inputs. If properly used, these approaches could enhance the performance of the design process, and of the resulting core configuration.



**Speaker bio:** Eng. Dr. Giacomo Grasso is head of the "Design and technical support for nuclear safety, security and sustainability" laboratory at the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA).

He is responsible for the coordination of ENEA activities dealing with core design and analysis, fuel cycle analysis and optimization.

He serves as the Italian delegate in several international initiatives and he has lead activities in numerous projects funded by private nuclear engineering companies (e.g. Westinghouse Electric Company Ltd., newcleo s.r.l. and Hydromine Inc.) or by EURATOM collaborative grants.

Eng. Dr. Grasso holds a master degree and a PhD in nuclear engineering, both from the University of Bologna.

### Program:

Date: 24th October 9.30-13.30

Where: seminar room, Laboratorio di Montecuccolino, via dei Colli 10, Bologna ([Teams link](#))

Date: 3rd November 9.30-13.30

Where: seminar room, Laboratorio di Montecuccolino, via dei Colli 10, Bologna ([Teams link](#))