UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

# COURSE SYLLABUS

# Nuclear energy in the energy transition

**2425-BbetweenSDG-08-03**

## Module description

The objective of the module is to provide the knowledge to enable critical and independent thinking about the possible use of nuclear energy in the energy transition. In this regard, it is intended to provide a basic understanding of the operation, issues and status of nuclear energy research. From this content, a general introduction regarding the concept of nuclear energy will be offered, from which nuclear fission and nuclear fusion reactions will be explored. The operation of relevant nuclear reactors will be examined, highlighting their limitations and potential in the context of sustainable energy production.

## Learning goals

## General goal

To provide adequate knowledge of energy production with nuclear fission and nuclear fusion reactors, to become informed and develop an independent opinion on the use of this energy source in the energy transition.

## Specific skills and competences

Understanding of the phenomenon of radioactivity and the processes underlying nuclear energy.
Understanding of the operation of a nuclear fission and nuclear fusion reactor.
Awareness of the advantages and disadvantages of nuclear energy and development of skills to prepare, analyze and critically evaluate articles related to nuclear energy.
Ability to present research or technical information.

## Sustainable Development Goals of the 2030 UN Agenda

Goal 7: Affordable and clean energy

## Breakdown of meetings

The 12-hour module is divided as follows: 6 meetings, two hours each.
Detail:
2 hours: The concept of nuclear reaction and the phenomena of fission and fusion. Introduction to radioactivity and its biological effects (D. Chiesa)
2 hours: The operation of a nuclear fission reactor. Chernobyl and Fukushima: what were the causes of the worst nuclear accidents in history? (D. Chiesa)
2 hours: The different types of fission reactors currently in use and under development. The problem of nuclear waste management. Limits and prospects of fission in the context of the energy transition (D. Chiesa)
2 hours: Advantages and disadvantages of fusion versus fission. Magnetic confinement and inertial fusion. How would a fusion reactor work? (M. Cavedon)
2 hr: The ITER, SPARC and NIF experiments: the state of nuclear fusion research (M. Cavedon)
2 hr: Current status and prospects for the future of nuclear energy while respecting the principles of sustainability (M. Cavedon)

## Number of participants

There is no numerical limit on participants.
The module is delivered remotely.

## Language used in meetings

Italian

## Delivery period of the module

April-May 2025

## Methods of assessing the outcomes of the learning process

Closed-question test (True/False, multiple-choice quiz, ...)

## Department of affiliation of the teacher

Department of Physics

## Sustainable Development Goals

AFFORDABLE AND CLEAN ENERGY