# Nuclear energy

ECTS credits
4 credits

## In brief

**Course langage:** French

# Presentation

## Learning objectives

To give the elements for a complete understanding of the nuclear sector, its role in the current and future energy landscape, its strengths and weaknesses. Taking into account the various associated scientific, technological, environmental and societal aspects.

## Description of the programme

- Introduction: nuclear physics, fission reactions, fusion reactions.

Fission module :
- Architecture and operation of PWR and RNR nuclear reactors (JC. Klein)
- Basic principles of nuclear systems (JC. Klein)
- The fuel of nuclear reactors (Y. Pontillon)
- Review of the 3 major nuclear accidents: TMI, Chernobyl and Fukushima - lessons for nuclear safety (Y. Pontillon)
- Nuclear safety (J.C. Klein)

Fusion module :
- Introduction of controlled fusion (C. Grisolia)
- Physics of nuclear fusion and quantification of the yield in a reactor (C. Grisolia)
- Plasma physics and magnetic confinement (F. Schwander)
- Scaling laws for the design of a fusion reactor (F. Schwander)
- Physics of plasma/wall interaction (G. Ciraolo)
- Current status of fusion research - objectives and challenges of ITER (G. Ciraolo)"

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## Generic central skills and knowledge targeted in the discipline

C1 Central engineers create value through scientific and technical innovation
C2 Engineers at Centrale Paris master the complexity of the systems and problems they encounter
C3 Engineers at Centrale Paris manage programs
C4 Engineers at Centrale Paris manage in an ethical and responsible manner

## How knowledge is tested

Supervised homework

## Teaching team

1. Pontillon
   J.C. Klein
   C. Grisolia
   F. Schwander
   G. Ciraolo

## Sustainable Development Goal



Affordable and clean energy

| | | |
|---|---|---|
| **Total des heures** | | **56h** |
| CM | Master class | 24h |
| TD | Directed work | 28h |
| TP | Practical work | 4h |

# Useful info

## Name responsible for EU


### Lead Instructor

Frédéric Schwander

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