



UNIVERSITÀ  
degli STUDI  
di CATANIA



DIPARTIMENTO DI FISICA E ASTRONOMIA  
“ETTORE MAJORANA”

DOTTORATO DI RICERCA IN FISICA  
CICLO XXXIX A.A. 2023/2024

---

## TITLE

Introduction to reactor kinetics

2 or 3 CFU

### Teaching staff

**Name Surname: Domiziano Mostacci**

**Email:** domiziano.mostacci@unibo.it

**Office:**

**Reception hours:** on Teams, by appointment (send e-mail)

---

### Program of the course:

Basics of reactor kinetics: relation to reactor statics; prompt and delayed neutrons, characteristic times; controllability of nuclear reactors; effective multiplication factor.

The "point model": simplifying assumptions and derivation of point kinetics equations; constant reactivity; INHOUR equation; simplified models (small, large reactivity, 2 groups of delayed neutrons).

Overview of space kinetics; adjoint flux. Intrinsic reactivity changes: reactivity temperature coefficients; reactivity feedback models; power excursions.

Stability: linear stability of nuclear reactors.

**Prerequisites:** working knowledge of macroscopic cross sections and of the diffusion equation.

## **Bibliography:**

David Hetrick: Dynamics of Nuclear Reactors, American Nuclear Society, 1993

Jeffrey Lewins: Nuclear Reactor Kinetics and Control, Pergamon Press, 1978

Robert Keepin: Physics of Nuclear Kinetics, Addison Wesley, 1965