PHYS-452 **Radiation detection**

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Cursus	Sem.	Type
Ing.-phys	MA1, MA3	Opt.
Nuclear engineering	MA1	Opt.
Physicien	MA1, MA3	Opt.

Language of teaching	English
Credits	3
Session	Winter
Semester	Fall
Exam	Oral
Workload	90h
Weeks	14
Hours	**3 weekly**
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

The course presents the detection of ionizing radiation in the keV and MeV energy ranges. It introduces the physical processes of radiation/matter interaction. It covers the several steps of detection, and the detectors, instrumentations and measurements methods commonly used in the nuclear field.

Content

- **Interaction of radiation with matter at low energies**: X-rays/gammas, charged particles and neutrons up to MeV range, ionisation, nuclear cross sections.
- **Characteristics and types of detectors:** gas detectors, semiconductor detectors, scintillators and optical fibers, fission chambers, meshed and pixel detectors
- **Signal processing and analysis:** types of electronics, signal collection and amplification, particle discrimination, spatial and time resolution
- **Nuclear instrumentation and measurements:** principle of measurements, spectrometry, common detection instrumentations, applications in nuclear engineering and R&D.

Keywords

radiation detection; radiation-matter interaction; ionizing radiation; detector; signal processing; nuclear instrumentation; measurement methods

Learning Outcomes

By the end of the course, the student must be able to:

- Explain interaction processes of ionising radiation and matter
- Describe the production of a detection signal and its processing
- Explain the operation of all types of commonly used detectors
- Assess / Evaluate the detection system and method required for a specific measurement

Transversal skills

- Communicate effectively with professionals from other disciplines.

Teaching methods

Lectures, exercices, presentations, practice.

Expected student activities

Attendance at lectures and excercices, short presentations.

Assessment methods

Oral exam

Supervision

Assistants	Yes

Resources

Bibliography

Radiation detection and measurement, Glenn F. Knoll. Wiley 2010
Practical Gamma-Ray Spectrometry, Gordon R. Gilmore, Wiley & Sons 2008

Ressources en bibliothèque

- Radiation detection and measurement, Glenn F. Knoll
- Practical Gamma-Ray Spectrometry, Gordon R. Gilmore