Radiation detection

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 exercises, short presentations.

**Assessment methods**
Oral exam

**Supervision**
Assistants Yes

**Resources**

**Bibliography**
Radiation detection and measurement, Glenn F. Knoll. Wiley 2010

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