Summary
The course will cover the physics of particle detectors. It will introduce the experimental techniques used in nuclear and particle physics. The lecture includes the interaction of particles with matter, scintillators, gas chambers, silicon, and detectors for particle ID.

Content
**Interaction of particles in matter:** ionization (Bethe-Bloch formula), interaction of electrons and photons (electromagnetic showers, radiation length and critical energy).

**General characteristics of detectors:** linearity, efficiency, resolution and Fano factor.

Gas detectors: ionization, proportional and Geiger-Muller counters, multiwire proportional, drift and time-projection chambers, micro-pattern gas detectors.

**Semiconductor detectors:** pn junction, silicon and germanium diode detectors, silicon microstrip and pixel detectors.

**Scintillators:** organic and inorganic scintillators, wavelength shifters and light guides.

**Photodetectors:** photomultipliers, photodiodes and other alternatives.

**Applications:** momentum measurement in magnetic fields, calorimetry, particle identification.

Learning Prerequisites
**Recommended courses**
Elementary particle I, knowledge in nuclear and particle physics

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

- Categorize processes
- Describe energy deposite processes
- Quantify available signal

Transversal skills
- Communicate effectively with professionals from other disciplines.

Teaching methods
Slides, blackboard and exercises in class

Assessment methods
written reports during the semester

Supervision
Office hours No
Assistants No
Forum No
Others During exercises and at office if required

Resources

Bibliography
K. Kleinknecht: Detectors for Particle Radiation, Cambridge
W. R. Leo: Techniques for Nuclear and Particle Physics Experiments, Springer