

## Particle Radiation Detection and Measurement (C004560)

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 6.0**

**Study time 180 h**

**Course offerings in academic year 2025-2026**

A (semester 1)

English

Gent

**Lecturers in academic year 2025-2026**

Tytgat, Michael

WE05

lecturer-in-charge

**Offered in the following programmes in 2025-2026**

[Master of Science in Physics and Astronomy](#)

**crdts**

6

**offering**

A

**Teaching languages**

English

**Keywords**

particle detectors, nuclear and particle physics instrumentation

**Position of the course**

The students are provided a broad overview of detection techniques and technologies that are commonly used in experimental particle and nuclear physics as well as in applied fields such as medical physics and nuclear industry.

**Contents**

Radiation sources; interactions of particles and radiation with matter; general properties of radiation detectors; gaseous detectors (ionization chambers, proportional counters, Geiger-Mueller counters, RPCs/MPGDs); scintillation counters; photomultiplier tubes and photodiodes; radiation spectroscopy with scintillators; neutrontechniques; semiconductor diode detectors; tracking detectors; calorimeters; muon detection; particle identification techniques (time-of-flight, Cherenkov counters, Transition Radiation Detectors, dE/dx, calorimeter PID); neutrino detection; ageing and radiation effects; pulse processing; selected detector applications outside of particle physics.

**Initial competences**

Students must have followed bachelor's level courses in experimental physics, statistics, and nuclear and particle physics.

**Final competences**

1 <https://www.vub.be>

2 Students acquire general knowledge of common detection techniques in experimental nuclear and particle physics.

3 Students become familiar with some basic tools used in detector laboratory setups.

**Conditions for credit contract**

Access to this course unit via a credit contract is determined after successful competences assessment

**Conditions for exam contract**

This course unit cannot be taken via an exam contract

**Teaching methods**

Seminar, Lecture, Practical

**Extra information on the teaching methods**

Assignments include coding exercises related to selected lecture topics (e.g. bethe-

bloch formula, particle identification, photomultiplier ...)

Laboratory session includes a practical particle detector exercise that students carry out in small groups

**Study material**

None

**References**

References will be given during the introductory lecture.

**Course content-related study coaching**

Direct interaction during lectures.

In-person questions are possible by appointment.

**Assessment moments**

end-of-term and continuous assessment

**Examination methods in case of periodic assessment during the first examination period**

Oral assessment

**Examination methods in case of periodic assessment during the second examination period****Examination methods in case of permanent assessment**

Assignment

**Possibilities of retake in case of permanent assessment**

not applicable

**Extra information on the examination methods**

Oral assessment with written preparation (closed book).

Continuous assessment via reports on coding assignments and laboratory session.

**Calculation of the examination mark**

Final grade is composed of 75% oral assessment and 25% continuous assessment.

**Facilities for Working Students**

Recording of lectures can be made available.