GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2025-2026

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	crdts	offering
Master of Science in Physics and Astronomy	6	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; photomultipliers tubes and photodiodes; radiation spectroscopy with scintillators; neutrondetection; semiconductor diode detectors; tracking detectors; calorimeters; muon detection; particle identifi cationtechniques (time-of-fl ight, Cherenkov counters, Transition Radiation Detectors, dE/dx, calorimeter PID); neutrinodetection; 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.