GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2023-2024

Nuclear Instrumentation (C003123)

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

Credits 6.0 **Study time 180 h**

Course offerings and teaching methods in academic year 2023-2024

A (semester 1)	English	Gent	lecture
			independent work

Lecturers in academic year 2023-2024

Van Hoorebeke, Luc	WE05	lecturer-in-charge
Mondelaers, Willy	WE05	co-lecturer

Offered in the following programmes in 2023-2024	crdts	offering
Master of Science in Teaching in Science and Technology(main subject Physics and Astronomy)	6	A
European Master of Science in Nuclear Fusion and Engineering Physics	6	A
Master of Science in Physics and Astronomy	6	A
Exchange Programme in Physics and Astronomy (Master's Level)	6	A

Teaching languages

English

Keywords

radiation interactions, radiation detectors, signal processing, particle accelerators, radiation sources

Position of the course

The goal of this course is to obtain fundamental knowledge on the techniques and technology used to produce and detect radiation.

Contents

The course consists of 2 separate parts:
Partim Interaction of radiation with matter and radiation detectors
- Radiation interactions: Interaction of heavy charged particles, Interaction of electrons and positrons, Interaction of photons, Interaction of neutrons
- Radiation detectors and their applications: General properties of radiation detectors, Gas-filled detectors, Scintillaton detectors, Semi conductor detectors, Cherenkov detectors, Neutron detection, Pulse processing

Partim Particle Accelerators
- Particle accelerators: Particle optics, Particle optics elements, Electrostatic and induction accelerators, Linear high frequency accelerators, Circular high frequency accelerators, Secundary beam production, Applications of accelerators

Initial competences

basic knowledge of subatomic physics, elementary knowledge of electronics, basic knowledge of statistics and calculus, basic knowledge of theory of relativity, basic knowledge computer programming.

Final competences

1 Insight in radiation interaction processes.
2 Insight in the operation of several types of radiation detectors and their application possibilities.
3 Insight in methods to obtain physical information from detector output.
4 Insight in methods to accelerate and transport charged particles.
5 Insight in techniques to produce particles and radiation.

6 Insight in design methods for modern particle accelerators and peripheral equipment.

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

Lecture, Independent work

Learning materials and price

syllabus (available in pdf format)
Cost: 15 EUR

References

* Glenn F. Knoll, Radiation Detection and Measurement, Third edition, Wiley (2000)
* W.R. Leo, Techniques for Nuclear and Particle Physics Experiments, Second revised
edition, Springer-Verlag (1994)
* S. Humphries, Jr., Principles of Charged Particle Acceleration, Wiley, N.Y. (1986)
* H. Wiedemann, Particle Accelerator Physics: Basic Principles and Linear Beam Dynamics, 2nd ed., Springer-Verlag (1999)
* M. Reiser, Theory and design of charged particle beams, Wiley, N.Y. (1994)

Course content-related study coaching

Possibility to ask questions before and after the lessons and with an appointment.
The Ufora system is used.

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

Oral assessment

Examination methods in case of permanent assessment

Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Extra information on the examination methods

permanent evaluation: evaluation of the solutions of the exercises that have to be solved at home during the semester.
period aligned evaluation: oral examination, closed book

Calculation of the examination mark

Permanent evaluation (25%) + periodic evaluation (75%)
For the second examination chance, the marks obtained for the permanent evaluation are retained.
Students that do not pass one of the parts of the course can be declaired as failed for the complete course.