GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Simulation of Physics Phenomena and Detectors in Modern Physics (C003219)

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

Credits 6.0 **Study time 180 h**

Course offerings in academic year 2024-2025

Lecturers in academic year 2024-2025

Lowette, Steven	VUB	lecturer-in-charge

Offered in the following programmes in 2024-2025	**crdts**	**offering**

Teaching languages

English

Keywords

Position of the course

Contents

In modern physics, the use of computers is necessary to predict and provide reference to usually very sensitive measurements. The aim of this course is to provide an insight in the tools for modeling physics phenomena and detection of various kinds of signals encountered in the physical sciences and engineering. Many (astro)physical phenomena are of a complex nature but can to first order be simulated by making use of basic physics assumptions. In addition, the signal produced in most cutting edge measurements is subtle, requiring complex detectors that often severely distort the physics signal. This means it is not only necessary to understand basic physics processes but also the often complex physics happening in the detection device used to measure the basic physics, for example the behavior of electron-hole pairs in (photo)diodes, Johnson noise interfering with temperature-sensitive resistors or the multiplication of the signal created by few photons in a photomultiplier tube. Optimization of experimental design using simulations is to be discussed. Some simple examples will be examined by the students during the practical work.

Initial competences

The course is self-contained and is intended for students with thorough backgrounds in the physical sciences, so advanced courses in quantum physics, electromagnetism and thermodynamics are required. Programming knowledge is highly preferred. Therefore this course is accessible for students who finalized successfully a Bachelor in Physics. top

Final competences

1 The student will have detailed knowledge of modern instruments used to measure most physics phenomena, and also the application of these.
2 The student will have the knowledge to do a simple simulation to predict the outcome of a physics experiments.

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

Study material

None

References

Course content-related study coaching

Assessment moments

end-of-term and continuous assessment

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

Written assessment

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

Written assessment

Examination methods in case of permanent assessment

Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible

Calculation of the examination mark

Exam determines 100% of the final mark.