GHENT UNIVERSITY

# Course Specifications

Valid as from the academic year 2026-2027

## Physics for Citizens (C004225)

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

**Credits 4.0** **Study time 120 h**

**Course offerings and teaching methods in academic year 2026-2027**

| | | | |
|---|---|---|---|
| A (semester 1) | Dutch | Gent | seminar |
| | | | lecture |

**Lecturers in academic year 2026-2027**

| | | |
|---|---|---|
| Caluwaerts, Steven | WE05 | lecturer-in-charge |
| Dobur, Didar | WE05 | co-lecturer |
| Smet, Philippe | WE04 | co-lecturer |

| Offered in the following programmes in 2026-2027 | crdts | offering |
|---|---|---|
| Bachelor of Arts in Archaeology | 4 | A |
| Bachelor of Laws in Laws | 4 | A |
| Bachelor of Science in Business Administration | 4 | A |
| Bachelor of Science in Business Economics | 4 | A |
| Bachelor of Science in Economics | 4 | A |
| Bachelor of Science in Economics (Double Degree) | 4 | A |
| Bachelor of Science in Physics and Astronomy | 4 | A |
| Master of Science in Complementary Studies in Economics | 4 | A |
| Ghent University Elective Courses | 4 | A |
| Ghent University Elective Courses | 4 | A |
| Ghent University Elective Courses | 4 | A |
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| Ghent University Elective Courses | 4 | A |
| Ghent University Elective Courses | 4 | A |
| Master of Science in Teaching in Languages (abridged programme)(main subject African Languages and Cultures) | 4 | A |
| Master of Science in Teaching in Arts and Humanities (abridged programme)(main subject Archaeology) | 4 | A |
| Master of Science in Teaching in Arts and Humanities (abridged programme)(main subject Art History, Musicology and Theatre Studies) | 4 | A |
| Master of Science in Teaching in Science and Technology (abridged programme)(main subject Biochemistry and Biotechnology) | 4 | A |
| Master of Science in Teaching in Science and Technology (abridged programme)(main subject Bioengineering) | 4 | A |
| Master of Science in Teaching in Science and Technology (abridged programme)(main subject Biology) | 4 | A |
| Master of Science in Teaching in Economics (abridged programme)(main subject Business Administration) | 4 | A |
| Master of Science in Teaching in Economics (abridged programme)(main subject Business Economics) | 4 | A |
| Master of Science in Teaching in Science and Technology (abridged programme)(main subject Chemistry) | 4 | A |

| | | |
|---|---|---|
| Master of Science in Teaching in Social Sciences (abridged programme)(main subject Communication Science) | 4 | A |
| Master of Science in Teaching in Science and Technology (abridged programme)(main subject Computer Science) | 4 | A |
| Master of Science in Teaching in Social Sciences (abridged programme)(main subject Criminological Sciences) | 4 | A |
| Master of Science in Teaching in Languages (abridged programme)(main subject East European Languages and Cultures) | 4 | A |
| Master of Science in Teaching in Economics (abridged programme)(main subject Economics) | 4 | A |
| Master of Science in Teaching in Behavioural Sciences (abridged programme)(main subject Educational Sciences) | 4 | A |
| Master of Science in Teaching in Science and Technology (abridged programme)(main subject Engineering and Technology) | 4 | A |
| Master of Science in Teaching in Science and Technology (abridged programme)(main subject Geography and Geomatics) | 4 | A |
| Master of Science in Teaching in Science and Technology (abridged programme)(main subject Geology) | 4 | A |
| Master of Science in Teaching in Arts and Humanities (abridged programme)(main subject History) | 4 | A |
| Master of Science in Teaching in Social Sciences (abridged programme)(main subject Laws) | 4 | A |
| Master of Science in Teaching in Science and Technology (abridged programme)(main subject Mathematics) | 4 | A |
| Master of Science in Teaching in Health Sciences (abridged programme)(main subject Medical Sciences) | 4 | A |
| Master of Science in Teaching in Arts and Humanities (abridged programme)(main subject Moral Sciences) | 4 | A |
| Master of Science in Teaching in Languages (abridged programme)(main subject Oriental Languages and Cultures) | 4 | A |
| Master of Science in Teaching in Health Sciences (abridged programme)(main subject Pharmaceutical Sciences) | 4 | A |
| Master of Science in Teaching in Arts and Humanities (abridged programme)(main subject Philosophy) | 4 | A |
| Master of Science in Teaching in Science and Technology (abridged programme)(main subject Physics and Astronomy) | 4 | A |
| Master of Science in Teaching in Social Sciences (abridged programme)(main subject Political Science) | 4 | A |
| Master of Science in Teaching in Behavioural Sciences (abridged programme)(main subject Psychology) | 4 | A |
| Master of Science in Teaching in Economics (abridged programme)(main subject Public Administration and Management) | 4 | A |
| Master of Science in Teaching in Health Sciences (abridged programme)(main subject Social Health Sciences) | 4 | A |
| Master of Science in Teaching in Social Sciences (abridged programme)(main subject Sociology) | 4 | A |
| Master of Science in Teaching in Health Sciences (abridged programme)(main subject Veterinary Medicine) | 4 | A |
| Master of Science in Teaching in Arts and Humanities (abridged programme) | 4 | A |
| Master of Science in Teaching in Languages (abridged programme) | 4 | A |
| Master of Science in Teaching in Behavioural Sciences (abridged programme) | 4 | A |
| Master of Science in Teaching in Economics (abridged programme) | 4 | A |
| Master of Science in Teaching in Health Sciences (abridged programme) | 4 | A |
| Master of Science in Teaching in Physical Education (abridged programme) | 4 | A |
| Master of Science in Teaching in Science and Technology (abridged programme) | 4 | A |
| Master of Science in Teaching in Social Sciences (abridged programme) | 4 | A |

**Teaching languages**

Dutch

**Keywords**

Physics, weather and climate, energy, mobility, sustainability, (science) communication, literature search, ethics

**Position of the course**

We live in a rapidly changing world with many challenges that have a pronounced physics component. Knowledge of some basic physical principles is therefore indispensable for any informed citizen - from minister to activist, from CEO to journalist, from doctor to lawyer. The purpose of this (university-wide) elective course is to provide these basic principles and to illustrate their applicability by means of concrete examples and practical situations. No advanced physics knowledge is therefore required for this course; students will learn precisely how to place current technological and social issues, such as energy and climate, in a scientific context based on a limited number of basic physical principles, and thus to view them with a better-founded view. In more advanced physics lessons, this important step from basic principles to applications is often buried under abstract formulas, as such the course will also be interesting for the more scientifically oriented student. The course is built around four modules: energy, technology, climate and modern physics.

**Contents**

1) The basic principles of electricity, energy conversion, transport and storage are discussed on the basis of concrete examples. Based on efficiency and characteristics of different energy sources (sun, wind, fossil, biomass, geothermal, hydropower, nuclear) you learn to interpret and compose an energy mix. In the case of nuclear energy, the entire life cycle of the nuclear fuel is considered, including the impact of radiation on humans. The energy aspects of mobility (from bikes to space travel) are discussed.
2) The electromagnetic spectrum is covered from x-rays to radio waves, in light of contemporary applications in medical imaging to wireless communication. Absorption and emission of radiation as a driving force in the energy balance of the atmosphere. Basic principles of quantum mechanics and the resulting insights into the material building blocks, from atoms and molecules to macroscopic materials. Applications such as lasers, LED, solar panels and transistors. The Second Quantum Revolution: Quantum Cryptography, Quantum Simulation, and Quantum Computing.
3) The impact of climate change and climate mitigation and adaptation policy is felt in almost all aspects of our society (housing, energy, health, agriculture,...). The atmosphere is a complex system and the study of the climate is based on scientific insights that are often based on physics, e.g. conservation laws, thermodynamics, radiation physics, ... Important aspects of climate science and their physical basis are studied (radiation balance, sea level rise, heat islands , dynamics of the atmosphere, climate projections and associated uncertainties, ...). These basic knowledge and skills make it possible to work in a critical manner with information about climate and climate change, such as IPCC reports, climate models, climate projections.
4) With large, complex and / or expensive research infrastructure (CERN, gravitational wave detectors, space missions, ...) physicists continue to search for the building blocks of matter and explore unknown territories. The direct application potential of e.g. neutrinos and gravitational waves seems limited, so why should we invest resources in this? Finally, the state of affairs is outlined in applications such as nuclear fusion or high-temperature superconductivity, which create high expectations but prove difficult to realize.

**Initial competences**

No specific prior knowledge related to mathematics or physics is required. The student has sufficient knowledge of English.

**Final competences**

1 To be able to identify and quantify the physical aspects in socially relevant issues related to energy, technology or climate change.
2 To be able to fact check and interpret elements in a debate from a physical framework.
3 To have a good understanding of the relevant physical basic principles and to be able to calculate in orders of magnitude.
4 To be able to work and communicate in a group, towards both peers and the general public.

**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

**Extra information on the teaching methods**

The series of lessons is built up on the basis of lectures supplemented with guided exercises (orders of magnitude, units, basic laws, ...). Lessons are structured on the basis of reading assignments, peer instruction and argumentation in a debate. Subject to technical limitations, the lecture recordings will be made available shortly after the lectures and will remain online until after the second examination period.
The application of the basic physical principles to concrete problems is done on the basis of specific assignments, which are carried out individually or in a small group. These assignments are based on current data and issues (energy supply, energy mix of a particular country or region, graphs from IPCC reports,...), whereby the basic assumptions must be interpreted and from which conclusions or recommendations must be drawn. Finally, the students also look critically at science messages in the media or on social media, with a focus on physical correctness. The series of lectures concludes with a debate on a number of current topics. Attendance at this session is mandatory.

**Study material**

Type: Handbook

Name: Sustainable Energy - Without the hot air
Indicative price: Free or paid by faculty
Optional: yes
Language : English
Author : David MacKay
Online Available : Yes
Additional information: https://www.withouthotair.com/

Type: Slides

Name: slides lectures
Indicative price: Free or paid by faculty
Optional: yes

Type: Audiovisual Material

Name: lecture recordings
Indicative price: Free or paid by faculty
Optional: yes

**References**

John M. Wallace & Peter V. Hobss. Atmospheric Science, An Introductory Survey, Academic Press; Richard A. Muller, Physics for Future Presidents: The Science behind the Headlines, WW Norton and Co; David MacKay, Sustainable Energy - Without the hot air (via https://www.withouthotair.com/)

**Course content-related study coaching**

De lesgevers zijn bereikbaar na afspraak voor verdere toelichting en feedback. Op ufora zijn discussiefora beschikbaar waar vragen gepost kunnen worden.

**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**

Participation, Assignment

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

examination during the second examination period is possible

**Extra information on the examination methods**

For the evaluation of this course, a combination is chosen between a written exam, in which, for example, a number of propositions must be assessed from a physical framework, and permanent evaluation based on different assignments (science communication, interpretation of reports and graphs, substantiated positions, case studies,...).
The written exam contains both multiple choice and open questions.

**Calculation of the examination mark**

Permanent evaluation: 10/20
Written exam: 10/20

**Facilities for Working Students**

Recordings of lectures will be made available. Possibility of feedback after appointment during and after office hours