GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Linear Algebra and Geometry I (C003554)

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 2024-2025

A (semester 1)	Dutch	Gent	lecture
			seminar

Lecturers in academic year 2024-2025

Van Antwerpen, Arne	WE01	lecturer-in-charge
De Medts, Tom	WE01	co-lecturer

Offered in the following programmes in 2024-2025	**crdts**	**offering**
Bachelor of Arts in Moral Sciences	6	A
Bachelor of Arts in Philosophy	6	A
Bachelor of Science in Mathematics	6	A

Teaching languages

Dutch

Keywords

Vector spaces, matrices, determinants, linear maps, affine spaces

Position of the course

The course consists of a broad foundation in the theory of vector spaces and linear algebra over arbitrary fields, which is then applied to the concrete situation of Euclidean spaces. The course is set up in such a way that it will stimulate the student to get skilled in abstract mathematical reasoning, without ignoring the applications to other areas, in particular to physics.

Contents

After a general introduction including the required basic notions, the course takes off with a thorough study of vector spaces over arbitrary fields, and the related linear maps and linear operators; afterwards, spaces of homomorphisms and dual spaces are introduced.
In the next part, the theory of matrices and determinants is considered, as well as its connection with linear maps, and their importance for coordinate transformations.
Then the linear operators are the subject of a deeper study, including the eigenvalue problem, diagonalization of matrices, and the Cayley-Hamilton theorem.
The theory built up so far is then used in a treatment of Euclidean spaces in n dimensions. The emphasis is on the geometric interpretation, including a study of subspaces, lines, hyperplanes, and of the Euclidean group, including subgroups that are relevant for mathematical and physical purposes.

Initial competences

This course is attuned to college mathematics, in particular Euclidean planes and Euclidean threedimensional spaces.

Final competences

1 Analyse and solve a problem (theoretical, practical, or arising from an application) situated in vector spaces, in theory of matrices and determinants, or in Euclidean geometry.
2 Use the new techniques both in pure mathematical or in applied context (including physics).

3 Perform (simple) abstract reasonings, and write down the arguments in a rigorous proof.

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

Lectures in which the theory is presented.
Exercises classes in which the students solve exercises under supervision.

Study material

Type: Syllabus

Name: Linear Algebra and Geometry 1
Indicative price: Free or paid by faculty
Optional: no
Language : Dutch
Number of Pages : 186
Oldest Usable Edition : 2023-2024
Available on Ufora : Yes
Available through Student Association : Yes

References

- P. Igodt & W. Veys, "Lineaire algebra", Universitaire Pers Leuven, 2011. ISBN 978-90-5867-879-9. [in Dutch.]
- Gilbert Strang, "Introduction to Linear Algebra", Fourth Edition, Wellesley-Cambridge Press, ISBN: 9780980232714

Course content-related study coaching

Students can ask questions on the theory and the exercises before, during and after the lectures. This is also possible on appointment or by email. There is interactive support via the Ufora forum.

Assessment moments

end-of-term assessment

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

Written assessment with open-ended questions

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

Written assessment with open-ended questions

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

The complete examination (both theory and exercises) are in written form, and open-book. The examination is made up in such a way that a large part of the course is covered, and such that it can be examined whether the students have sufficient understanding of the material.

Calculation of the examination mark

Theory and exercises are equally important for the computation of the end score (50% each).