GHENT UNIVERSITY

Course Specifications

From the academic year 2016-2017 up to and including the

Linear Algebra and Geometry I (C003554)

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

Credits	6.0	Study time	180 h	Contact hrs	60.0 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 1)	Dutch	seminar: coached exercises	30.0 h
		lecture	30.0 h

Lecturers in academic year 2018-2019

Weiermann, Andreas	WE16	lecturer-in-charge

Offered in the following programmes in 2018-2019	crdts	offering
Bachelor of Arts in Philosophy	6	A
Bachelor of Science in Physics and Astronomy	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 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. For the mathematics students: Perform (simple) abstract reasonings, and write down the arguments in a rigorous proof.

4 For the physics and astronomy students: Apply computational linear algebraic skills in a useful manner, and think critically about mathematical arguments.

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, seminar: coached exercises

Extra information on the teaching methods

Lectures in which the theory is presented.
Exercises classes in which the students solve exercises under supervision.
The theory lectures are given for all students simultenously. The exercise classes take place in two groups, namely one group with the mathematics students, and one group with the other students (mainly physics and astronomy students).

Learning materials and price

A printed syllabus will be sold when the course starts. Price: 10 euro.

References

- P. Igodt & W. Veys, "Lineaire algebra", Universitaire Pers Leuven, 2011. ISBN 978-90-5867-879-9. [in Dutch.]
- J. S. Golan, "Foundations of Linear Algebra", Kluwer Texts in the Mathematical Sciences, Volume 11, 1995. ISBN 978-9048145928.
- A. I. Kostrikin, Y. I. Manin, "Linear Algebra and Geometry", Gordon and Breach, 1989. ISBN 978-2881246838.

Course content-related study coaching

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

Evaluation methods

end-of-term evaluation

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

Written examination with open questions, open book examination

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

Written examination with open questions, open book examination

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation

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 student has sufficient understanding of the material.
The mathematics students get a different exam than the other students, in agreement with the difference in the final competences.

Calculation of the examination mark

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