

## Mathematical Tools in Engineering: Linear Algebra (E001810)

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

Credits	3.0	Study time	90 h	Contact hrs	30.0 h
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Course offerings and teaching methods in academic year 2018-2019

A (semester 2)	Dutch	lecture	15.0 h
		seminar	15.0 h

Lecturers in academic year 2018-2019

Constales, Denis	TW16	lecturer-in-charge
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Offered in the following programmes in 2018-2019

	crdts	offering
<a href="#">Bachelor of Science in Engineering Physics</a>	3	A
<a href="#">Bridging Programme Master of Science in Engineering Physics</a>	3	A

Teaching languages

Dutch

Keywords

Linear transformations, eigenvalues, numerical methods

Position of the course

In-depth study of basic concepts from linear algebra to provide a sound basis for a number of courses of the bachelor and master in engineering/option physics, as well as for some applications in numerical methods.

Contents

- Operations on subspaces and dimension theorems
- Linear transformations, dual space, fundamental subspaces, multilinearity
- Invariant subspaces, Adjoint of an operator, relation between kernel and image
- Orthogonal projectors and Householder matrices: application to matrix reduction and QR factorisation
- Application of orthogonal polynomials in numerical integration
- Minimal polynomial, Cayley-Hamilton theorem
- Diagonalisation and simultaneous diagonalisation, spectral decomposition
- Similarity invariants, generalised eigenspaces and Jordan form
- Functions of matrices and efficient methods for exponentiation
- Numerical calculation of eigenvalues and convergence of iterative methods
- Singular values, unitary/orthogonal diagonalisation, positive definiteness
- Choleski and SVD decomposition, generalised inverse, condition numbers, diagonalisation of quadratic forms

Initial competences

Discrete Mathematics, Mathematical Analysis I: Functions of One Variable, Mathematical Analysis II: Functions of Several Variables, Geometry and Linear Algebra

Final competences

- 1 Have insight into linear analysis and apply it creatively and purposefully within one's own engineering discipline.
- 2 Use current models, methods and techniques of linear algebra in assignments.
- 3 Precision, perseverance and being critical.
- 4 Use the terminology of linear algebra correctly.
- 5 Complete concrete assignments according to plan.

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

Learning materials and price

Dutch syllabus distributed by VTK and additional course materials via Minerva.

References

see syllabus

Course content-related study coaching

The instructor can be contacted before or after the lectures, or by appointment.  
Interactive support via Minerva.

Evaluation methods

end-of-term evaluation

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

Written examination with open questions

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

Written examination with open questions

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation

not applicable

Extra information on the examination methods

Both theoretical and exercise part of the exam with closed book.

Calculation of the examination mark