Faculty of Health, Science and Technology
Mathematics

Syllabus

Linear Algebra

Course Code:	MAGA53
Course Title:	Linear Algebra
	Linjär algebra
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has less than 60 credits in first-cycle course/s as entry requirements (G1F)

Major Field of Study:
MAA (Mathematics)

Course Approval
The syllabus was approved by the Faculty of Health, Science and Technology 2017-08-30, and is valid from the Spring semester 2018 at Karlstad University.

Prerequisites
Foundation course in Mathematics, 7.5 ECTS cr, and Calculus and Geometry, 7.5 ECTS cr, or equivalent.

Learning Outcomes
The aim of the course is that students acquire the knowledge in linear algebra which is required for their further studies, and for reading and understanding scientific and technical literature involving these concepts.

Upon completion of the course, students should be able to:
- give an account of and use basic concepts in linear algebra such as vector spaces, subspaces, linear independence, bases, dimension, linear transformations, isomorphism, inner product,
- solve systems of linear equations,
- perform and use basic matrix algebra, including calculating determinants, the inverse of a matrix and the rank of a matrix
- determine bases for vector spaces and matrices of linear transformations, and determine how these are related with change of bases,
- determine eigenvalues and eigenvectors, and diagonalize matrices,
- determine orthogonal projections and apply the least-squares method, as well as use the Gram-Schmidt method,
- perform orthonormal transformations on quadratic forms to analyze and classify curves in the plane and surfaces in space,
- use Mathematical software to solve problems in linear algebra,
- perform controls of result to assess their accuracy and reasonableness, and
- demonstrate understanding by combining different concepts, theorems and experiences of problem

solving and by seeing analogies and making generalizations.

Content
The course comprises the following main components:
- Systems of linear equations
- Matrix algebra, determinants
- Eigenvalues and eigenvectors, diagonalization
- Vector spaces, subspaces, coordinate systems, dimension, change of bases
- Linear transformations between vector spaces and matrix representation of linear transformations
- Inner product, orthogonality, Gram-Schmidt's orthogonalization, least square method, inner product spaces
- Spectral theorem for symmetric matrices, quadratic forms.

Reading List
See separate document.

Examination
Assessment is based on a written exam and hand in assignments.
The number of assessment opportunities is limited to three per academic year.

Grades
One of the grades U (Fail), 3 (Pass), 4 (Pass not without distinction), or 5 (Pass with distinction) is awarded in the examination of the course.

Quality Assurance
Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate
A course certificate will be provided upon request.

Additional information
The local regulations for studies at the Bachelor and Master' levels at Karlstad University stipulate the obligations and rights of students and staff.
Required course for the Master of Science Engineering programme, Mathematics programme and Physics programme.