



# HÖGSKOLAN I GÄVLE

## Linear Algebra 7.5cr

*Linjär algebra 7,5hp*

Set by Faculty of Engineering and Sustainable Development

### Version

**Set at**

**Valid from**

3/10/17

**HT2017**

<b>Level</b>	G1N
<b>Education level</b>	First cycle
<b>Course identifier</b>	MAG051
<b>Credits</b>	7.5cr
<b>Main field of study</b>	Mathematics
<b>Subject group</b>	Mathematics
<b>Disciplinary domain</b>	Natural sciences 100.0%

### Learning outcomes

After completion of the course the student shall be able to

1. account for basic concepts and theorems in linear algebra and be able to illustrate the concepts by describing basic applications within other fields, such as geometry, technology, physics and economics
2. demonstrate skills in working with equation systems, linear mapping, subspaces, vectors and matrices by solving problems formulated both from concrete and abstract starting points
3. use linear algebra and vector geometry to analyse and solve basic application problems within, for example, construction, electrical science and economics
4. model and solve larger application problems in linear algebra with mathematical computer programs
5. survey the theoretical structure of linear algebra.

### Course content

Vector algebra in two and three dimensions

Linear equation systems: homogeneous and inhomogeneous equations

Linear dependence and independence

Gaussian elimination: coefficient matrix, total matrix, row echelon form, reduced row echelon form

Matrices, matrix algebra

Invertibility

Eigenvalues, eigenvectors and diagonalisation  
 Vector spaces and subspaces of  $\mathbb{R}^n$   
 Row spaces, column spaces, kernels, rank  
 Linear mappings defined by matrices  
 Matrices defined by linear mappings, Invertibility, singularity  
 Bases and change of basis  
 Bases for subspaces and the concept of dimension  
 The dimension theorem  
 Orthogonal projection, orthogonal bases, the GramSchmidt process, the method of least squares  
 Orthogonal diagonalization  
 Diagonalization of quadratic forms

<b>Teaching</b>	Lectures, calculation tutorials and seminar exercises
<b>Prerequisites</b>	Ma D or Ma 4 (field-specific entry requirements A9/9, exceptions are given for Physics B (Physics 2) ,Chemistry A (Chemistry 1) and Mathematics E, or Algebra and Geometry 7.5 credits or equivalent
<b>Examination</b>	Written examination and computer laboration
<b>Grade</b>	A, B, C, D, E, Fx, F
<b>Other regulations</b>	Grading criteria are provided by the course coordinator or examiner at the beginning of the course.
<b>Sustainable environment</b>	Content with sustainable development is not relevant to this course.

<b>Module</b>	0010 Written examination	6cr	Grade: AF
	0020 Computer laboration	1.5cr	Grade: UG