



Faculty of Health, Science and Technology  
Mathematics

### Syllabus

#### Course Approval

The syllabus was approved by the Faculty Board of Health, Science and Technology on 19 March 2014, and is valid from the Autumn semester of 2014 at Karlstad University.

**Course Code:** MAGA44

**Mathematics for Engineers I, 7.5 ECTS Credits**

**(Matematik för ingenjörer I, 7.5 Swedish credit points)**

**Degree Level:** Bachelor

**Progressive Specialisation:** G1N (First cycle, has only upper-secondary level entry requirements)

#### Language of Instruction

Swedish

#### Prerequisites

General admission requirements and upper secondary school Mathematics 3C or D

#### Major Field of Study

MAA (Mathematics)

#### Learning Outcomes

Upon completion of the course a student should be able to:

- calculate with algebraic expressions and absolute values, solve equations and inequalities including exponential and logarithmic functions, trigonometrical functions, polynomials, square roots, and absolute values,
- define and draw graphs for the elementary functions and use computational laws with good certainty for these,
- perform calculations with Cartesian and polar of complex numbers and shift between these forms
- apply basic concepts of vector algebra in two and three dimensions in solving problems,
- solve linear equation systems and use elementary matrix algebra,
- explore functions with regard to concepts such as domain of function, range of function, and injectivity, and if needed, determine their inverse functions,
- use calculation rules for the evaluation of limits and draw conclusions on the properties of functions using limits and properties of elementary functions,
- check results and partial results and verify that they are correct or reasonable,
- compute determinants, find matrix inverses and use the results to find the set of solutions to given linear systems of equations,
- combine concepts, theorems, and experiences from examples, find analogies, and make generalisations.

#### Content and Form of Instruction

- Algebraic simplifications, completing the square, the factor theorem, equations and inequalities, trigonometric equations, absolute values.
- Elementary functions: polynomial; potency, logarithmic, exponential, trigonometric and inverse trigonometric functions, their definitions, properties, graphs and calculation rules.

- Complex numbers: Cartesian and polar form. de Moivre's theorem, binomial equations.
- Elementary linear algebra: linear equation system, Gauss elimination, matrices, calculation rules for matrices, inverse matrices, determinants of second and third orders.
- Vectors in the plane and space, scalar and vector products, equations for lines and planes, dot products, lines and planes in space.
- Elementary functions: the concept of function, domain of definition, range of function, composition of functions, inverse functions.
- Limits of functions, continuity, asymptotes.

## Reading List

See separate document.

## Examination

Assessment is based on a written exam. The number of examination opportunities for earning a Pass grade 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 assessment is based on student views and experiences as reported in written course evaluations and/or group discussions. Students will be informed of the result of the evaluation and of the measures to be taken.

## Course Certificate

A course certificate will be provided upon request.

## Additional Information

Students who enrolled before 1 July 2007 will complete their studies in accordance with the requirements of the earlier admission. Upon completion students may request degree and course certificates to be issued under the current ordinance if they meet its requirements.

Required course for the engineering programmes building construction, electronics, energy and environmental science, innovation and design, surveying and geographical IT, mechanics, mechatronics, and computer science.

The local regulations for studies at the Bachelor's and Master's levels at Karlstad University stipulate the obligations and rights of students and staff.

Karlstads universitet 651 88 Karlstad, Sweden  
 Tel +46-54-700 10 00 Fax +46-54-700 14 60  
[information@kau.se](mailto:information@kau.se) [www.kau.se](http://www.kau.se)