



Faculty of Health, Science and Technology  
Mathematics

# Syllabus

## Mathematics for Engineers I

<b>Course Code:</b>	MAGA44
<b>Course Title:</b>	Mathematics for Engineers I <i>Matematik för ingenjörer I</i>
<b>Credits:</b>	7.5
<b>Degree Level:</b>	Undergraduate level
<b>Progressive Specialisation:</b>	First cycle, has only upper-secondary level entry requirements (G1N)

**Major Field of Study:**  
MAA (Mathematics)

### Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2019-03-04, and is valid from the Autumn semester 2019 at Karlstad University.

### Prerequisites

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

### Learning Outcomes

Upon completion of the course students 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 complex numbers using Cartesian and polar coordinates, and shift between these forms,

- apply basic concepts of vector algebra in two and three dimensions in solving problems,
- solve systems of linear equations and use elementary matrix algebra,
- explore functions with regard to concepts such as domain of function, range of function, and injectivity, and when applicable, determine their inverse functions,
- use calculation rules for limit values 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,
- demonstrate understanding by combining different concepts, theorems, and experiences from examples in problem-solving exercises, finding analogies, and making generalisations.

### **Content**

- 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, binomic equations.
- Elementary linear algebra: linear equation systems, Gaussian 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 an individual written exam and a group assignment which requires students to use mathematics software and submit a written report which is then presented orally in a seminar. The number of examination 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 Engineering Programmes in building and construction, electronics, energy and environmental science, innovation and design, surveying and geographical IT, mechanics, mecatronics, and computer science.

