



Faculty of Health, Science and Technology
Mathematics

Syllabus

Foundation course in Mathematics

Course Code:	MAGA51
Course Title:	Foundation course in Mathematics <i>Matematisk grundkurs</i>
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	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 2023-01-30, and is valid from the Autumn semester 2023 at Karlstad University.

Prerequisites

General admission requirements and Mathematics 4/E, or equivalent

Learning Outcomes

Upon completion of the course, students should be able to:

- read and interpret mathematical texts and correctly present elementary logical reasoning,
- work with algebraic expressions and absolute values, solve polynomial and root equations, and solve inequalities,
- work with complex numbers in Cartesian and polar form,
- examine functions in terms of concepts such as domain, range, and injectivity,
- define and sketch graphs of elementary functions and use their rules for calculations correctly,
- formulate, explain, and apply definitions of concepts such as limits, continuity, and

derivative,

- use limits and derivatives in calculations and problem-solving,
- use the derivative for function studies such as curve sketching, determining local and global extreme values, determining Taylor polynomials, and applying l'Hopital's rules in limit calculations,
- check results and assess their feasibility and accuracy, and
- demonstrate understanding of the subject by combining different concepts, theorems, and problem-solving experiences, discovering analogies and making generalisations.

Content

Instruction is in the form of lectures, exercises, and laboratory sessions.

Main course components:

- Basic logic and set theory: symbols and concepts, basic principles of logical reasoning and proofs
- Basic analytical geometry such as conic sections
- Algebraic simplification, completing the square, factor theorem, equations such as trigonometric equations, inequalities, and absolute values
- Complex numbers: Cartesian and polar form, de Moivre's formula
- Elementary functions: the concept of function, domain of definition, range of function, composition of functions, inverse functions
- Basic functions: polynomial, power, logarithmic, exponential, trigonometric, and inverse trigonometric functions, their definitions, properties, graphs, and rules for calculation
- Limits of sequences and functions, continuity, properties of continuous functions
- Definition of the derivative and calculation laws, chain rule, derivatives of elementary functions, implicit differentiation, the mean value theorem
- Basic applications of derivatives: tangents and normals, increasing and decreasing functions.
- Function studies: graph construction, extreme points, asymptotes, concavity
- Applications of derivatives: extreme value problems, linearisation, Taylor polynomial with error term using big-O notation and the Lagrange's form, l'Hopital's rules.

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.

If students have a decision from Karlstad University entitling them to Targeted Study Support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades

One of the grades Distinction (VG), Pass (G), or Fail (U) is awarded in the examination of the course. For Engineering students, one of the grades 5 (Pass with Distinction), 4 (Pass with Some Distinction), 3 (Pass), U (Fail) 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.