Faculty of Health, Science and Technology
Mathematics

Syllabus

Foundation course in Mathematics

Course Code:	MAGA51
Course Title:	Foundation course in Mathematics *Matematisk grundkurs*
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 2019-03-04, and is valid from the Autumn semester 2019 at Karlstad University.

Prerequisites
General admission requirements plus field-specific eligibility A9 (Physics 2, Chemistry 1, Mathematics 4) or field-specific eligibility 9 (Physics B, Chemistry A, Mathematics E)

Learning Outcomes
Upon completion of the course, students should be able to:
- read and understand mathematical texts and correctly present elementary logical reasoning,
- work with algebraic expressions and absolute values, solve polynomial and root equations, solve inequalities, and deal with elementary finite sums,
- 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 master their rules for calculations,
- formulate, explain, and apply definitions of concepts such as limits, continuity, 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,
- perform checks of results and assess their feasability and accuracy,
- show 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
- Geometric and arithmetic sums, the sigma symbol
- Complex numbers: Cartesian and polar form, de Moivres formula, binomial equations, complex exponential functions
- 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 and a group assignment which requires students to use mathematics software and submit a written report which is then presented orally in a seminar.

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.