



Faculty of Health, Science and Technology
Mathematics

Syllabus

Mathematics for Engineers I

Course Code:	MAGA81
Course Title:	Mathematics for Engineers I <i>Matematik för ingenjörer I</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 2024-03-07, and is valid from the Autumn semester 2024 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:

- give an account of and apply the arithmetic laws for elementary functions, as well as solve equations and inequalities involving elementary functions,
- perform arithmetic operations with complex numbers in Cartesian and polar form, and provide examples of situations where introducing complex numbers is natural,
- define, give an account of, and provide examples of concepts, such as domain, range, injectivity, surjectivity, and, where possible, determine the inverse of a function,
- calculate limits, determine continuity, and identify asymptotes of functions,
- differentiate sums, differences, products, quotients, and compositions of functions,

including implicit differentiation,

- use derivatives for function analysis, such as finding tangents and normals, local and global extreme values,
- apply the concept of derivatives to solve extreme value problems and related rates problems,
- combine various concepts, theorems, and problem-solving experiences, recognising analogies, and making generalisations within the field,
- assess the reasonableness of results and partial results, and, where possible, verify correctness.

Content

- Algebraic simplifications, completing the square, the factor theorem, equations and inequalities, absolute values.
- Polynomial, potency, logarithmic, exponential, trigonometric, and inverse trigonometric functions, their definitions, properties, and graphs.
- Complex numbers in Cartesian and polar form, de Moivre's theorem, vector representation of complex numbers.
- The concept of function, domain of definition, range of function, composition of functions, inverse functions.
- Limits of functions, continuity, asymptotes.
- Definition and rules for derivatives, derivatives of elementary functions, implicit differentiation.
- Function analysis: increasing and decreasing functions, extrema, concavity.
- Applications of derivatives: tangents and normals, extreme value problems, linearisations, related rates, Taylor polynomials, and l'Hôpital's rule.

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.

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 students in Engineering, one of the grades 5 (Pass with Distinction), 4 (Pass with Some Distinction), 3 (Pass), or 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.