Reg No: MAGA48/20252

Faculty of Health, Science and Technology
Mathematics

Syllabus

Applied Mathematics

Course Code:	MAGA48
Course Title:	Applied Mathematics *Tillämpad matematik*
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has less than 60 credits in first-cycle course/s as entry requirements (G1F)

Major Field of Study:
MAA (Mathematics)

Course Approval
The syllabus was approved by the Faculty of Health, Science and Technology 2025-03-04, and is valid from the Autumn semester 2025 at Karlstad University.

Prerequisites
Registered for Mathematics for Engineers I, 7.5 ECTS credits, and Mathematics for Engineers II, 7.5 ECTS credits, or equivalent

Learning Outcomes
Upon completion of the course, students should be able to:
- determine eigenvalues and eigenvectors,
- apply solution methods for ordinary differential equations and systems of ordinary linear differential equations,
- calculate partial derivatives and use these to solve problems,
- apply concepts and methods in descriptive statistics, perform basic calculations in probability theory, and use normal distribution to solve applied problems,
- combine different concepts, theorems, and problem-solving experiences, as well as identify analogies and make generalisations, and

- assess the reasonableness of results and intermediate results, and, where possible, verify their accuracy.

Content
The course covers the following:
- Vectors, matrices, eigenvalues and eigenvectors, tensors, some basic properties and applications (in elasticity).
- Linear ordinary differential equations of higher order, linear eigenvalue problems, eigenfunctions, systems of linear ordinary differential equations.
- Functions of several variables, partial derivatives, directional derivative, gradient, Hessian matrix, and minimisation/maximisation of functions, double integrals, and some simple partial differential equations.
- Descriptive statistics, measures of central tendency, and measures of dispersion.
- Basic probability theory.
- Some discrete and some continuous distributions, e.g., the normal distribution.
- Expectation value, variance, standard deviation.
- Point estimates and confidence intervals.

Reading List
See separate document.

Examination
Assessment is based on an individual written exam and a hand-in assignment.

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 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.

Required course for the Mechanical Engineering programme and the Innovation and Design Engineering programme.