Faculty of Health, Science and Technology
Mathematics

Syllabus

Mathematics for Artificial Intelligence I

Course Code:	MAGA84
Course Title:	Mathematics for Artificial Intelligence I *Matematik för Artificiell Intelligens I*
Credits:	15
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 2026-02-12, and is valid from the Autumn semester 2026 at Karlstad University.

Prerequisites
General entry requirements plus upper secondary level Mathematics 3c/D or Mathematics Further level 1c.

Learning Outcomes
Upon completion of the course, students should be able to:
- give an account of key concepts in discrete mathematics and logic, analysis, and linear algebra,
- use methods relevant to the course to solve given mathematical problems, and
- analyse and assess the validity of a given mathematical, logical chain of reasoning.

Content
The course comprises three modules and covers areas of mathematics relevant to artificial intelligence.

Module 1: Discrete mathematics and logic (2.5 credits)
The module covers combinatorics, sets and relations, propositional logic, real and complex numbers. Key concepts include permutations, combinations, propositions, implication, equivalence, intersection, union, relation, and the concept of numbers.

Module 2: Analysis (5 credits)
The module covers function theory and differential and integral calculus in one and several dimensions. Key concepts include functions, injective and surjective functions, limits and continuity, derivatives, and integrals. Relevant methods include limit calculations, differentiation and integration techniques.

Module 3: Linear algebra with computations (7.5 credits)
The module covers the following key concepts: vectors, systems of linear equations, linear transformations, matrices, determinants, vector spaces, bases and change of bases, eigenvalues and eigenvectors, inner products, orthogonal sets, and quadratic forms. Relevant methods include vector computations, Gaussian elimination, matrix factorisations, determinant and eigenvalue calculations, the least squares method, and Gram-Schmidt orthogonalisation.

Reading List
See separate document.

Examination
Assessment is based on an individual on-campus written examination.

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 VG (Pass with Distinction), G (Pass), or U (Fail) 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.