

## COURSE SYLLABUS

### Mathematics for Intelligent Systems, 7.5 credits

*Matematik för intelligenta system, 7.5 högskolepoäng*

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Course Code:	TMAR21	Education Cycle:	Second-cycle level
Confirmed:	Aug 21, 2025	Disciplinary domain:	Natural sciences
Valid From:	Aug 31, 2026	Subject group:	Mathematics
		Specialised in:	A1N Second cycle, has only first-cycle course/s as entry requirements

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### Intended Learning Outcomes (ILO)

On completion of the course the student shall:

#### Knowledge and understanding

- show familiarity with the mathematical language used in set, vector and matrix calculations, as well as in probability and statistics theory

#### Skills and abilities

- demonstrate the ability to compute partial derivatives, find directional derivatives and identify the directions of fastest increase and decrease of a differentiable function
- demonstrate the ability to identify and classify local critical points of a function
- demonstrate the ability to perform basic probability calculations involving random variables
- demonstrate the ability to compute point and interval estimates of relevant statistical parameters from a random sample
- demonstrate the ability to perform hypothesis tests of various kinds
- demonstrate the ability to design an experiment using a single factor design

#### Judgement and approach

- demonstrate an understanding of the concept of random variability and judge the benefits and risks of using different statistical models

### Content

The course contains elements from various fields of mathematics and mathematical statistics used when intelligent systems and machine learning are developed, used and analyzed.

The course includes the following elements:

- Vector and matrix calculations, linear maps  $R_n$  to  $R_m$ , eigenvectors and eigenvalues.
- Partial and total order relations, complexity, Big-O notation
- Partial derivatives, gradients, local convexity and extrema for smooth functions  $R_n$  to  $R$
- Basic probability theory, Bayes' theorem
- Discrete and continuous random variables
- Probability distributions, in particular binomial and normal distribution
- Point and interval estimation
- Hypothesis tests
- Single factor design experiments

### Type of instruction

Lectures and tutorials.

Language of instruction is in English.

## Entry requirements

The applicant must hold the minimum of a bachelor's degree (i.e the equivalent of 180 ECTS credits at an accredited university) with at least 90 credits in Computer Engineering, Computer Science, Informatics, Information Systems, Information Technology or Electrical Engineering (with relevant courses in computer engineering), or equivalent. The bachelor's degree should comprise a minimum of 15 credits in mathematics. Proof of English proficiency is required.

## Examination and grades

The course is graded 5, 4, 3 or U.

Registration of examination:

Name of the Test	Value	Grading
Examination	7.5 credits	5/4/3/U

## Course literature

Please note that changes may be made to the reading list up until eight weeks before the start of the course.

Course material will be distributed during the course.