



## COURSE SYLLABUS

# Mathematics for Intelligent Systems, 6 credits

*Mathematics for Intelligent Systems, 6 högskolepoäng*

---

<b>Course Code:</b>	TMIR29	<b>Education Cycle:</b>	Second-cycle level
<b>Confirmed by:</b>	Dean Jun 1, 2019	<b>Disciplinary domain:</b>	Natural sciences
<b>Valid From:</b>	Aug 1, 2019	<b>Subject group:</b>	MA1
<b>Version:</b>	1	<b>Specialised in:</b>	A1N

---

### Intended Learning Outcomes (ILO)

After a successful 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 ability to perform basic probability calculations involving random variables
- demonstrate ability to compute point and interval estimates of relevant statistical parameters from a random sample

Judgement and approach

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

### Contents

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

### Type of instruction

Lectures and tutorials.

The teaching is conducted in English.

### Prerequisites

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, 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 Fail.

Registration of examination:

Name of the Test	Value	Grading
Written examination	6 credits	5/4/3/U

### Course literature

Literature

The literature list for the course will be provided one month before the course starts.

Title: Probability, Statistics and Stochastic Processes,

Author: Olofsson, Andersson

Publisher: Wiley

ISBN: 9780470889749