ÖREBRO UNIVERSITET

**Course syllabus**
Third-cycle courses and study programmes

# Mathematical statistics for robotics, 3 credits

## *Matematisk statistik för robotik, 3 hp*

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| **Course Code/Codes** | 50DT047 |
| **Subject Area** | Computer Science (Datavetenskap) |
| **School/equivalent** | School of Science and Technology (Institutionen för naturvetenskap och teknik |
| **Valid from** | 2016-12-15 |
| **Approved** | 2016-12-15 |
| **Revised** | , |
| **Approved by** | Head of School Peter Johansson |
| **Translation to English, date and signature** | ,<br>, |

# 1 Course content

Main course contents:
- Outcomes, events, sample and state spaces,
- Joint and conditional probabilities, conditional independence,
- Univariate and multivariate random variables,
- Parametric and nonparametric probability distributions,
- Regression and classification,
- Random processes.

# 2 Outcomes

## 2.1 The course in relation to the doctoral programme

The course shall primarily refer to the following intended learning outcomes for third-cycle courses and study programmes as described in the Higher Education Ordinance, i.e. the doctoral student shall demonstrate:

*Knowledge and understanding*
- familiarity with the methods of the specific field of research in particular (part of outcome 2)

*Competence and skills*
- the capacity to support the learning of others (part of outcome 8)

*Judgement and approach*
- specialised insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used (outcome 10)

The intended learning outcomes are listed in the same order as in the general syllabus for the programme.

### 2.2 Intended course learning outcomes

To obtain a passing grade, the doctoral student shall demonstrate:

- Competence in manipulation of probabilities (on the level of understanding derivation of the recursive Bayes filter), including combinations of multivariate distributions, and marginal probabilities,
- understanding of Gaussian processes for regression and classification,
- understanding of statistical significance, including the ability to assess statistical claims about research results and implications of how research results are communicated to the general public,
- the ability to clearly demonstrate solutions to problems in mathematical statistics to peers in the course.

## 3 Reading list and other teaching material

The following course readings and teaching material will be used on the course:

*Reference material:*
Ronald E. Walpole (latest edition)
Probability & statistics for engineers & scientists
Prentice Hall
730 pages

Carl Edward Rasmussen and Christopher K. I. Williams (latest edition)
Gaussian Processes for Machine Learning
MIT Press
266 pages

## 4 Teaching formats

Teaching on the course takes the following format:

Lectures and seminars

## 5 Examination

The course is assessed through an examination in the format of

Solving handout assignments and presenting and discussing the solutions in group sessions.

## 6 Grades

Examinations on third-cycle courses and study programmes are to be assessed according to a two-grade scale with either of the grades ‘fail’ or ‘pass’ (local regulations).

The grade shall be determined by a teacher specifically nominated by the higher education institution (the examiner) (Higher Education Ordinance).

To obtain a passing grade on examinations included in the course, the doctoral student is required to demonstrate that he/she attains the intended course learning outcomes as described in section 2.2. Alternatively, if the course consists of multiple examinations generating credit, the doctoral student is required to demonstrate that he/she attains the outcomes that the examination in question refers to in accordance with section 5.

A student who has failed an examination is entitled to a retake.

If an examination consists of several examination components, and a student fails an examination component, the examiner may, as an alternative to a retake, set a make-up assignment with regard to the examination component in question.

A doctoral student who has failed an examination twice for a specific course or course element is entitled, upon his/her request, to have another examiner appointed to determine the grade.

# 7 Admission to the course

## 7.1 Admission requirements

To gain access to the course and complete the examinations included in the course, the applicant must be admitted to a doctoral programme at Örebro University.

## 7.2 Selection

Selection between applicants who have been admitted to doctoral programmes at Örebro University and who otherwise meet the admission requirements as listed above is made according to the following order of precedence:

If no other selection criteria are specified in this section, priority shall be given to applicants with a lower number of course credits left before the award of their degree over applicants with a higher number of remaining course credits. Should two or more students have equal number of credits, selection will be done through the drawing of lots. This also applies within any selection groups listed unless otherwise stated.

## 7.3 Other applicants than doctoral students admitted at Örebro University

Other applicants than doctoral students admitted at Örebro University may be given access to the course on the grounds of provisions for and/or agreements regarding contracted courses, joint degrees, national graduate schools or cooperation in other respects with other universities.

Any decisions on what such other applicants may be given access to the course are made separately and on the basis of the provisions and/or agreements that occasion the student to apply for the course.

For participation in the course in other respects, the same provisions shall apply as for doctoral students admitted to Örebro University.

# 8 Transfer of credits for courses, study programmes and other experience

Provisions on the transfer of credits can be found in the Higher Education Ordinance and on the university’s webpage.

## 9 Other information

The course is given in English

## Transitional provisions

None.