

## COURSE SYLLABUS

### Doctoral course: Probability theory, 7.5 credit points

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Course code:  
Reviewed by: RFB  
Approved by: RFB  
Valid as of:  
Version: I  
Reference number:

Education Cycle: Third cycle, doctoral program course  
Doctoral program subject: Statistics

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#### **Purpose:**

This course gives a solid background in and understanding of important results and methods in probability theory at an advanced level. The objective of the course is to give students a solid knowledge of important theorems within probability theory. The course should also enable them to apply advanced probability theory to building probability models in applications. Finally, to be able to solve complicated probabilistic problems and explain various convergence concepts in probability.

#### **Intended learning outcomes:**

On completion of the course, the students will be able to (see content for specific theorems and convergence concepts covered):

##### *Knowledge and understanding*

1. Demonstrate a deep understanding of important theorems within probability theory.
2. Demonstrate a deep understanding of various convergence concepts in probability theory

##### *Skills and abilities*

3. To prove important theorems in probability theory
4. To solve advanced problems in probability theory

##### *Judgement and approach*

5. To critically apply central results in probability theory on typical probabilistic problems.

#### **Content:**

This course deals with random variables in one and several dimensions, conditional distributions, moment generating functions and characteristic functions, multivariate normal distributions, quadratic forms criteria for random variables, the Borel-Cantelli lemmas, convergence via transforms, the central limit theorem and strong law of large numbers. We also cover Markov processes as an introduction to stochastic processes.

#### **Type of Instruction/Teaching format:**

The course is designed as a series of lectures and problem-solving sessions. Grading is based on individual performance via oral presentations and written hand ins.

**Prerequisites:**

Admitted to a doctoral program in statistics/biostatistics/econometrics or a related subject of a university or a recognized business school.

**Examination and grades:**

Course assessment consists of two elements

- Oral presentation deals with ILOs 1,2,3,4,5
- Written assignments deals with ILOs 1,2,3,4,5

Each of these two elements must be passed to obtain a pass in the course.

The grades given are pass or fail.

**Course evaluation:**

A course evaluation will be conducted at the end of the course.

**Literature:**

Grimmett, G., Stirzaker, D. (2020). Probability and Random Processes, 4. ed., Oxford University Press,