

Probability and Statistics

Title	Probability and Statistics
Semester	F2024
Master programme in	Matematik / Mathematical Physical Modelling / Mathematical Computer Modelling / Mathematical Bioscience / Physics and Scientific Modelling
Type of activity	Course
Teaching language	English
Study regulation	Read about the Master Programme and find the Study Regulations at ruc.dk Læs mere om uddannelsen og find din studieordning på ruc.dk

REGISTRATION AND STUDY ADMINISTRATIVE

Registration	Sign up for study activities at stads selvbetjening within the announced registration period, as you can see on the Studyadministration homepage. When signing up for study activities, please be aware of potential conflicts between study activities or exam dates. The planning of activities at Roskilde University is based on the recommended study programs which do not overlap. However, if you choose optional courses and/or study plans that goes beyond the recommended study programs, an overlap of lectures or exam dates may occur depending on which courses you choose.
Number of participants	
ECTS	5
Responsible for the activity	Jesper Schmidt Hansen (jschmidt@ruc.dk)
Head of study	Jesper Schmidt Hansen (jschmidt@ruc.dk)
Teachers	
Study administration	INM Registration & Exams (inm-exams@ruc.dk)
Exam code(s)	U60166

ACADEMIC CONTENT

Overall objective	The overall objective of the course in Probability and Statistics is to endow the student with a fundamental understanding of how the mathematical theory of probability and statistics is constructed, enabling the student to critically reflect on how statistical analysis of data is applied.
Detailed description of content	Probability theory as an axiomatic mathematical theory: • The classical mathematical formalisation and clarification of the concepts of probability. • This includes probability spaces, probability distribution, independence, contingent probability, probability distributions on final, countable quantities and continuous distributions on the real axis • The most common distributions Statistics: • Resampling techniques and non-parametric statistics • Introduction to likelihood-based statistical inference • Examples
Course material and Reading list	There is no formal text-books in this course. The curriculum consists of former lecture notes which will be handed out through moodle.
Overall plan and expected work effort	The course will be planned as a mixture of lectures and solving of exercises including discussions of exercises. The workload is 5 ECTS corresponding to 135 hours The stipulated workload distribution is: • Pre-class 42 hours • Classes 42 hours • Post classes 42 hours • Exam preparation 10 hours.
Format	
Evaluation and feedback	The course includes formative evaluation based on dialogue between the students and the teacher(s). Students are expected to provide constructive critique, feedback and viewpoints during the course if it is needed for the course to have better quality. Every other year at the end of the course, there will also be an evaluation through a questionnaire in SurveyXact. The Study Board will handle all evaluations along with any comments from the course responsible teacher. Furthermore, students can, in accordance with RUCs 'feel free to state your views' strategy through their representatives at the study board, send evaluations, comments or insights form the course to the study board during or after the course.
Programme	The course will be planned as a mixture of lectures and solving of exercises including discussions of exercises. Class by Class program will emerge on Moodle during the course with the following themes.

Probability theory:

- The classical mathematical formalisation and clarification of the concepts of probability.
- This includes probability spaces, probability distribution, independence, contingent probability, probability distributions on final, countable quantities and continuous distributions on the real axis
- The most common distributions

Statistics:

- Resampling techniques and non-parametric statistics
- Introduction to likelihood-based statistical inference
- Examples

ASSESSMENT

Overall learning outcomes

After the course the student will be able to

- compute with and understand the theory behind probability distributions, and model random phenomena using probability theory, stochastic variables and mathematical reasoning,
- apply parametric statistics to data, in particular in formulating hypotheses, assessing estimators, computing test probabilities and interpreting the results using mathematical and statistical reasoning,
- apply digital tools for statistical investigations, model simulation, and analysis,
- describe and explain the mathematical structure of probability theory,
- demonstrate in-depth understanding of how parametric statistics is built upon probability theory.
- analyse, evaluate and formulate models of stochastic phenomena using mathematical and statistical reasoning.
- present stochastic and statistical theories and methods in a clear and concise manner using mathematical formalism

Form of examination

Individual oral exam without time for preparation.

Time allowed for exam including time used for assessment: 30 minutes.

Permitted support and preparation materials: All.

Assessment: 7-point grading scale.

Moderation: Internal co-assessor.

Form of Re-examination

Samme som ordinær eksamen / same form as ordinary exam

Type of examination in special cases

Examination and assessment criteria

The exam is an individual oral exam without time for preparation.

The exam will begin with a student presentation of a randomly chosen exercise known to the student. The presentation may be interrupted by clarifying questions, and the presentation will be followed by a discussion and questioning within the curriculum of the course.

The Assessment criteria for the written part of the exam

- compute with and understand the theory behind probability distributions, and model random phenomena using probability theory, stochastic variables and mathematical reasoning,
- apply parametric statistics to data, in particular in formulating hypotheses, assessing estimators, computing test probabilities and interpreting the results using mathematical and statistical reasoning,
- apply digital tools for statistical investigations, model simulation, and analysis,
- describe and explain the mathematical structure of probability theory
- demonstrate in-depth understanding of how parametric statistics is built upon probability theory.
- analyse, evaluate and formulate models of stochastic phenomena using mathematical and statistical reasoning.
- present stochastic and statistical theories and methods in a clear and concise manner using mathematical formalism

The assessment of the oral exam is based on the student's ability to meet the criteria mentioned above and their ability to

- clearly present and communicate the scientific content of the course
- engage in a scientific dialogue and discussion with the assessor and co assessor

Furthermore, whether the performance meets all formal requirements in regard to both for the written og oral exam

Exam code(s) Exam code(s) : U60166

Course days:

Hold: 1

Probability and Statistics (MATHBIO)

time 16-02-2024 10:15 til
 16-02-2024 12:00

location 27.1-052 - lokale 2 (20)

Teacher Jesper Schmidt Hansen (jschmidt@ruc.dk)

Probability and Statistics (MATHBIO)

time 19-02-2024 08:15 til
 19-02-2024 10:00

location 27.1-052 - lokale 2 (20)

Probability and Statistics (MATHBIO)

time 23-02-2024 10:15 til
23-02-2024 12:00

location 27.1-052 - lokale 2 (20)

Probability and Statistics (MATHBIO)

time 26-02-2024 08:15 til
26-02-2024 10:00

location 27.1-052 - lokale 2 (20)

Probability and Statistics (MATHBIO)

time 01-03-2024 10:15 til
01-03-2024 12:00

location 27.1-052 - lokale 2 (20)

Probability and Statistics (MATHBIO)

time 04-03-2024 08:15 til
04-03-2024 10:00

location 27.1-052 - lokale 2 (20)

Probability and Statistics (MATHBIO)

time 08-03-2024 10:15 til
08-03-2024 12:00

location 27.1-052 - lokale 2 (20)

Probability and Statistics (MATHBIO)

time 11-03-2024 08:15 til
11-03-2024 10:00

location 27.1-052 - lokale 2 (20)

Probability and Statistics (MATHBIO)

time 15-03-2024 10:15 til
15-03-2024 12:00

location 27.2-054 - lokale 3 (40)

Probability and Statistics (MATHBIO)

time 21-03-2024 12:15 til
21-03-2024 14:00

location 27.1-052 - lokale 2 (20)

Probability and Statistics (MATHBIO)

time 22-03-2024 10:15 til
22-03-2024 12:00

location 27.1-052 - lokale 2 (20)

Probability and Statistics (MATHBIO) - Note: 27.2

time 05-04-2024 10:15 til
05-04-2024 12:00

location 27.2-054 - lokale 3 (40)

Probability and Statistics (MATHBIO) - Note: Time and location

time 08-04-2024 10:15 til
08-04-2024 12:00

forberedelsesnorm ikke valgt

forberedelsesnorm D-VIP ikke valgt

location 27.2-054 - lokale 3 (40)

Teacher Jesper Schmidt Hansen (jschmidt@ruc.dk)

Probability and Statistics (MATHBIO)

time 12-04-2024 10:15 til
12-04-2024 12:00

location 27.1-052 - lokale 2 (20)

Probability and Statistics (MATHBIO) - Note: Time and location

time	15-04-2024 10:15 til 15-04-2024 12:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt
location	27.2-054 - lokale 3 (40)
Teacher	Jesper Schmidt Hansen (jschmidt@ruc.dk)

Probability and Statistics (MATHBIO)

time	19-04-2024 10:15 til 19-04-2024 12:00
location	27.1-052 - lokale 2 (20)

Probability and Statistics (MATHBIO) - Note: Time and location

time	22-04-2024 10:15 til 22-04-2024 12:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt
location	27.2-054 - lokale 3 (40)
Teacher	Jesper Schmidt Hansen (jschmidt@ruc.dk)

Probability and Statistics (MATHBIO)

time	26-04-2024 10:15 til 26-04-2024 12:00
location	27.1-052 - lokale 2 (20)

Probability and Statistics (MATHBIO)

time	29-04-2024 08:15 til 29-04-2024 10:00
location	27.1-052 - lokale 2 (20)

Probability and Statistics (MATHBIO)

time 03-05-2024 10:15 til
03-05-2024 12:00

location 27.1-052 - lokale 2 (20)

Probability and Statistics (MATHBIO)

time 06-05-2024 08:15 til
06-05-2024 10:00

location 27.1-052 - lokale 2 (20)

Probability and Statistics (MATHBIO)

time 10-05-2024 10:15 til
10-05-2024 12:00

location 27.1-052 - lokale 2 (20)

Probability and Statistics - Exam (MATHBIO)

time 17-06-2024 08:15 til
17-06-2024 16:00

location 27.1-052 - lokale 2 (20)

Probability and Statistics - Reexam (MATHBIO)

time 08-08-2024 08:15 til
08-08-2024 16:00

location 27.1-052 - lokale 2 (20)