

Module Handbook (<https://modhb.uni-kl.de/>)

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## Module MAT-14-14-M-3

Stochastic Methods (M, 9.0 LP)

### Module Identification

Module Number	Module Name	CP (Effort)
MAT-14-14-M-3	<i>Stochastic Methods</i>	9.0 CP (270 h)

### Basedata

CP, Effort	9.0 CP = 270 h
Position of the semester	1 Sem. in WiSe
Level	[3] Bachelor (Core)
Language	[DE] German
Module Manager	Sass, Jörn, Prof. Dr. (PROF   DEPT: MAT) (/staff/31/)
Lecturers	Korn, Ralf, Prof. Dr. (PROF   DEPT: MAT) (/staff/19/) Redenbach, Claudia, Prof. Dr. (PROF   DEPT: MAT) (/staff/28/) Ritter, Klaus, Prof. Dr. (PROF   DEPT: MAT) (/staff/29/) Sass, Jörn, Prof. Dr. (PROF   DEPT: MAT) (/staff/31/)
Area of study	[MAT-GRU] Mathematics (B.Sc. year 1 and 2)
Reference course of study	[MAT-82.276-SG] B.Sc. Business Mathematics (/mhb/FB-MAT/cos-516/)
Lifecycle-State	[NORM] Active

### Courses

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
4V+2U	MAT-14-14-K-3 (/mhb/courses/MAT-14-14-K-3/)	P	U-Schein	PL1	9.0	WiSe

- About [MAT-14-14-K-3]: Title: "Stochastic Methods"; Presence-Time: 84 h; Self-Study: 186 h
- About [MAT-14-14-K-3]: The study achievement [U-Schein] proof of successful participation in the exercise classes (ungraded) must be obtained.

## Examination achievement PL1

- Form of examination: **oral examination (20-30 Min.)**
- Examination Frequency: each semester
- Examination number: 82057 ("Module Exam Measure Stochastic Methods")

## Evaluation of grades

The grade of the module examination is also the module grade.

### Contents

From [MAT-14-14-K-3] Stochastic Methods (/mhb/courses/MAT-14-14-K-3/):

Fundamentals of probability theory:

- basic concepts of probability theory (probability space, random variable, distribution),
- distribution of real-valued random variables (binomial, Poisson, exponential and normal distribution, etc.),
- expected value, variance, covariance,
- distribution of random vectors, multivariate normal distribution as an example,
- conditional probability, independence,
- law of large numbers,
- central limit theorem.

Fundamentals of statistics:

- parameter estimator,
- interval estimator,
- tests.

Outlook on the following areas:

- Monte Carlo simulation,
- linear regression,
- big data and machine learning,
- Markov chains.

### Competencies / intended learning achievements

Building on the knowledge acquired in the first year of their mathematical studies, the students have acquired basic theoretical and practical knowledge in an area of practical/applied mathematics.

They know and understand stochastic concepts and the basic constructions, results and methods of probability theory and statistics. They can reproduce the proofs and independently prove or disprove statements. They are able to apply stochastic methods to simple practical problems.

In the exercise classes the students have acquired a confident, precise and independent handling of the terms, propositions and methods from the lecture.

### Literature

From [MAT-14-14-K-3] Stochastic Methods (/mhb/courses/MAT-14-14-K-3/):

- D. Williams: Weighing the Odds - A Course in Probability and Statistics,
- H.O. Georgii: Stochastik - Einführung in die Wahrscheinlichkeitstheorie und Statistik,
- U. Krengel: Einführung in die Wahrscheinlichkeitstheorie und Statistik,
- K.L. Chung: Elementare Wahrscheinlichkeitsrechnung und stochastische Prozesse.

### Registration

Registration for the exercise classes via the online administration system URM (<https://urm.mathematik.uni-kl.de>) (<https://urm.mathematik.uni-kl.de>).

### Requirements for attendance (informal)

#### Modules:

- [MAT-10-1-M-2] Fundamentals of Mathematics (M, 28.0 LP) (</mhb/modules/MAT-10-1-M-2/>)

### Requirements for attendance (formal)

For students of the (Bachelor's) study programmes of the Department of Mathematics, the proof of successful participation in the exercise classes of "Fundamentals of Mathematics I" or "Fundamentals of Mathematics II" (e.g. from the module **[MAT-10-1-M-2]** (</mhb/modules/MAT-10-1-M-2/>) *Fundamentals of Mathematics*) is prerequisite for participation in the module examination.

## References to Module / Module Number [MAT-14-14-M-3]

Course of Study	Section	Choice/Obligation
[MAT-82.276-SG] B.Sc. Business Mathematics ( <a href="/mhb/FB-MAT/cos-516/">/mhb/FB-MAT/cos-516/</a> )	Business Mathematics	[P] Compulsory