

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

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## Module MAT-71-12-M-7

White Noise Analysis (M, 9.0 LP)

### Module Identification

Module Number	Module Name	CP (Effort)
MAT-71-12-M-7	<i>White Noise Analysis</i>	9.0 CP (270 h)

### Basedata

CP, Effort	9.0 CP = 270 h
Position of the semester	1 Sem. irreg.
Level	[7] Master (Advanced)
Language	[EN] English
Module Manager	Grothaus, Martin, Prof. Dr. (PROF   DEPT: MAT) (/staff/15/)
Lecturers	Lecturers of the department Mathematics
Area of study	[MAT-SPAS] Analysis and Stochastics
Reference course of study	[MAT-88.105-SG] M.Sc. Mathematics (/mhb/FB-MAT/cos-538/)
Lifecycle-State	[NORM] Active

### Courses

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
4V+2U	MAT-71-12-K-7 (/mhb/courses/MAT-71-12-K-7/)	P	-	PL1	9.0	irreg.

- About [MAT-71-12-K-7]: Title: "White Noise Analysis"; Presence-Time: 84 h; Self-Study: 186 h

### Examination achievement PL1

- Form of examination: **oral examination (20-30 Min.)**
- Examination Frequency: each semester
- Examination number: 86420 ("White Noise Analysis")

## Evaluation of grades

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

### Contents

From [MAT-71-12-K-7] **White Noise Analysis** (/mhb/courses/MAT-71-12-K-7/):

- introduction to the basics of distribution theory with specific focus on tempered distributions,
- construction of the White Noise space (Minlos theorem, chaos decomposition, T-transform, S-transform, Ito-Wiener-Segal isomorphism),
- introduction of test function spaces and spaces of generalised functions of White Noise Analysis (Hida and Kondratiev spaces),
- applications to Feynman path integrals and stochastic PDE.

### Competencies / intended learning achievements

Upon successful completion of this module, the students have gained in-depth knowledge of a subfield of functional analysis with applications to Feynman path integrals and stochastic PDE. They are able to name the essential propositions of the lecture as well as to classify and to explain the connections. They understand the proofs presented in the lecture and are able to reproduce and explain them. In particular, they can outline the conditions and assumptions that are necessary for the validity of the statements.

By completing the given exercises, the students have developed a skilled, precise and independent handling of the terms, propositions and techniques taught in the lecture. In addition, they have learnt how to apply these techniques to new problems, analyze them and develop solution strategies independently or by team work.

### Literature

From [MAT-71-12-K-7] **White Noise Analysis** (/mhb/courses/MAT-71-12-K-7/):

- T. Hida, H. H. Kuo, J. Potthoff, L. Streit: White Noise. An Infinite Dimensional Calculus,
- N. Obata: White Noise Calculus and Fock Space,
- H. H. Kuo: White Noise Distribution Theory,
- B. Simon: Functional Integration and Quantum Physics,
- Y.M. Berezansky and Y.G. Kondratiev: Spectral Methods in Infinite Dimensional Analysis.

### 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)

Knowledge from the module [MAT-70-11-M-4] (/mhb/modules/MAT-70-11-M-4/) *Functional Analysis* is useful, but not necessarily required.

#### Modules:

- [MAT-10-1-M-2] Fundamentals of Mathematics (M, 28.0 LP) (/mhb/modules/MAT-10-1-M-2/)
- [MAT-60-11-M-4] Probability Theory (M, 9.0 LP) (/mhb/modules/MAT-60-11-M-4/)

#### Courses

- [MAT-12-23-K-3] Introduction to Functional Analysis (2V+1U, 4.5 LP) (/mhb/courses/MAT-12-23-K-3/)
- [MAT-12-28-K-3] Measure and Integration Theory (2V+1U, 4.5 LP) (/mhb/courses/MAT-12-28-K-3/)

### Requirements for attendance (formal)

None

## References to Module / Module Number [MAT-71-12-M-7]

Module-Pool	Name
<a href="#">[MAT-70-MPOOL-7 (/mhb/modulepools/MAT-70-MPOOL-7/)]</a>	Specialisation Stochastic Analysis (M.Sc.)
<a href="#">[MAT-AM-MPOOL-7 (/mhb/modulepools/MAT-AM-MPOOL-7/)]</a>	Applied Mathematics (Advanced Modules M.Sc.)
<a href="#">[MAT-RM-MPOOL-7 (/mhb/modulepools/MAT-RM-MPOOL-7/)]</a>	Pure Mathematics (Advanced Modules M.Sc.)