

Module Handbook

TUK MODHB Homepage

Course MAT-12-23-K-3

Introduction to Functional Analysis (2V+1U, 4.5 LP)

Course Type

SWS	Type	Course Form	CP (Effort)	Presence-Time / Self-Study
-	K	Lecture with exercise classes (V/U)	4.5 CP	93 h
2	V	Lecture		28 h
1	U	Exercise class (in small groups)		14 h
(2V+1U)			4.5 CP	42 h 93 h

Basedata

SWS	2V+1U
CP, Effort	4.5 CP = 135 h
Position of the semester	1 Sem. in WiSe
Level	[3] Bachelor (Core)
Language	[DE] German
Lecturers	Grothaus, Martin, Prof. Dr. (PROF DEPT: MAT) Hussein, Amru, Jun. Prof. Dr. (PROF DEPT: MAT) Ritter, Klaus, Prof. Dr. (PROF DEPT: MAT) + further Lecturers of the department Mathematics
Area of study	[MAT-GRU] Mathematics (B.Sc. year 1 and 2)
Lifecycle-State	[NORM] Active

Possible Study achievement

- Verification of study performance: **proof of successful participation in the exercise classes (ungraded)**

- Examination number (Study achievement): 83130 ("Exercise Class Introduction to Functional Analysis")
- Details of the examination (type, duration, criteria) will be announced at the beginning of the course.

Contents

- examples of Banach and Hilbert spaces;
- compactness, Heine-Borel, Arzela-Ascoli;
- bounded linear operators, adjoint operators, Neumann series;
- orthogonality, basis of a Hilbert space, Riesz representation, Lax-Milgram, selfadjoint operators, spectral theory.

Competencies / intended learning achievements

The students are familiar with the basic concepts, statements and methods of functional analysis; in particular, they have been introduced to the theory of infinite-dimensional spaces. Thus, advanced abstraction skills have been promoted.

Literature

- H.W. Alt: Lineare Funktionalanalysis,
- H. Heuser: Funktionalanalysis.

Materials

Further literature will be announced in the lecture(s); exercise material is provided.

Registration

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

Requirements for attendance (informal)

Modules:

- [MAT-10-1-M-2] Fundamentals of Mathematics (M, 28.0 LP)

Requirements for attendance (formal)

None

References to Course [MAT-12-23-K-3]

Module	Name	Context	
[MAT-12-10P-M-3]	Build-Up Module Mathematics (for Students of Physics)	WP: Obligation to choose	2V+1U, 5.0 LP
[MAT-12-20L_ERW-M-3]	Topic Module A: Mathematics in the Interplay between Abstraction and Concretisation	WP: Obligation to choose	2V+1U, 4.5 LP
[MAT-12-20L-M-3]	Topic Module A: Mathematics in the Interplay between Abstraction and Concretisation	WP: Obligation to choose	2V+1U, 4.5 LP
Course-Pool	Name		
[MAT-10-KPOOL-3]	Pure Mathematics (B.Sc. Mathematics)		
[PHY-M2-KPOOL-3]	Höhere Analysis (für Studierende der Physik)		

