

Module Handbook

TUK MODHB Homepage

Module MAT-70-13-M-7

Inverse Problems (M, 9.0 LP)

Module Identification

Module Number	Module Name	CP (Effort)
MAT-70-13-M-7	<i>Inverse Problems</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	Steidl, Gabriele, Prof. Dr. (PROF DEPT: MAT)
Lecturers	Steidl, Gabriele, Prof. Dr. (PROF DEPT: MAT) + further Lecturers of the department Mathematics
Area of study	[MAT-SPAS] Analysis and Stochastics
Reference course of study	[MAT-88.105-SG] M.Sc. Mathematics
Lifecycle-State	[NORM] Active

Courses

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
4V+2U	MAT-70-13-K-7	P	-	PL1	9.0	irreg.

- About [MAT-70-13-K-7]: Title: "Inverse Problems"; Presence-Time: 84 h; Self-Study: 186 h

Examination achievement PL1

- Form of examination: **oral examination (20-30 Min.)**
- Examination Frequency: irregular (by arrangement)
- Examination number: 86260 ("Inverse Problems")

Evaluation of grades

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

Contents

From [MAT-70-13-K-7] Inverse Problems:

- introductory examples,
- ill-posed operator equations,
- regularisation methods (singular value decomposition, Tikhonov regularization, iterative methods, multi-resolution techniques).

Competencies / intended learning achievements

Upon successful completion of this module, the students have gained mathematical skills in the area of inverse problems (to be able to get information about inaccessible data from measurable and/or observable effects). They understand and master stabilisation and regularisation techniques and they are able to justify the theory by experiments (clarification by means of examples). They understand the mathematical background required for the algorithms and can critically assess the possibilities and limitations of their use. They understand the proofs presented in the lecture and are able to reproduce and explain them. In particular, they can critically assess, what conditions are necessary for the validity of the statements.

By solving the given exercise problems, they have gained a precise and independent handling of the terms, propositions and methods of the lecture. In addition, they have learnt to apply the methods to new problems, analyze them and develop solution strategies independently or by team work.

Literature

From [MAT-70-13-K-7] Inverse Problems:

- D. Colton, R. Kress: Inverse Acoustic and Electromagnetic Scattering Theory,
- A. Kirsch: An Introduction to the Mathematical Theory of Inverse Problems,
- A. Louis: Inverse und schlecht gestellte Probleme,
- A. Rieder: Keine Probleme mit inversen Problemen.

Requirements for attendance of the module (informal)

Modules:

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

Courses

- [MAT-12-23-K-3] Introduction to Functional Analysis (2V+1U, 4.5 LP)

Requirements for attendance of the module (formal)

None

References to Module / Module Number [MAT-70-13-M-7]

Module-Pool**Name**

[MAT-65-MPOOL-7]

Specialisation Image Processing and Data Analysis
(M.Sc.)

[MAT-AM-MPOOL-7]

Applied Mathematics (Advanced Modules M.Sc.)