

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

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Module MAT-80-11B-M-4

Introduction to PDE (M, 4.5 LP)

Module Identification

Module Number	Module Name	CP (Effort)
MAT-80-11B-M-4	<i>Introduction to PDE</i>	4.5 CP (135 h)

Basedata

CP, Effort	4.5 CP = 135 h
Position of the semester	1 Sem. in WiSe
Level	[4] Bachelor (Specialization)
Language	[EN] English
Module Manager	Pinnau, René, Prof. Dr. (PROF DEPT: MAT) (/staff/27/)
Lecturers	Klar, Axel, Prof. Dr. (PROF DEPT: MAT) (/staff/18/) Pinnau, René, Prof. Dr. (PROF DEPT: MAT) (/staff/27/) Simeon, Bernd, Prof. Dr. (PROF DEPT: MAT) (/staff/34/) Surulescu, Christina, Prof. Dr. (PROF DEPT: MAT) (/staff/37/)
Area of study	[MAT-TEMA] Industrial Mathematics
Reference course of study	[MAT-88.105-SG] M.Sc. Mathematics (/mhb/FB-MAT/cos-538/)
Lifecycle-State	[NORM] Active

Notice

The module can be combined with the module **[MAT-80-11A-M-4]** (/mhb/modules/MAT-80-11A-M-4/) *Numerics of ODE* to the module **[MAT-80-11-M-4]** (/mhb/modules/MAT-80-11-M-4/) *Differential Equations: Numerics of ODE & Introduction to PDE*.

Without a proof of successful participation in the exercise classes, only 3 credit points will be awarded for the module.

Courses

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
2V+1U	MAT-80-11B-K-4 (/mhb/courses/MAT-80-11B-K-4/)	P	U-Schein	PL1	4.5	WiSe

- About **[MAT-80-11B-K-4]**: Title: "PDE: An Introduction"; Presence-Time: 42 h; Self-Study: 93 h
- About **[MAT-80-11B-K-4]**: 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: 84240 ("PDE: An Introduction")

Evaluation of grades

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

Contents

From **[MAT-80-11B-K-4] PDE: An Introduction** (/mhb/courses/MAT-80-11B-K-4/):

This course gives an introduction to the classical theory of partial differential equations. In particular, the following contents are dealt with:

- Classification and well-posed problems,
- Quasilinear equations: Cauchy problem,
- Wave equation: existence, uniqueness, stability, maximum principle,
- Poisson equation: separation ansatz, fundamental solutions, Green's function, maximum principle, existence and uniqueness,
- Heat equation: separation of variables, Fourier transformation, semigroups, maximum principle, existence and uniqueness.

Competencies / intended learning achievements

From **[MAT-80-11B-K-4] PDE: An Introduction** (/mhb/courses/MAT-80-11B-K-4/):

Upon completion of this module, the students have studied and understand the extension of ordinary differential equations to partial differential equations. They understand the proofs presented in the lecture and are able to comprehend and explain them.

By completing 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.

Literature

From **[MAT-80-11B-K-4] PDE: An Introduction** (/mhb/courses/MAT-80-11B-K-4/):

- L.C. Evans: Partial differential equations,
- F. John: Partial differential equations.

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)

Desirable is knowledge from the course [MAT-12-27-K-3] (/mhb/courses/MAT-12-27-K-3/) *Vector Analysis*.

Modules:

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

Courses

- [MAT-12-25-K-3] Introduction to Ordinary Differential Equations (2V+1U, 4.5 LP) (/mhb/courses/MAT-12-25-K-3/)

Requirements for attendance (formal)

None

References to Module / Module Number [MAT-80-11B-M-4]

Course of Study	Section	Choice/Obligation
[MAT-88.B84-SG] M.Sc. Actuarial and Financial Mathematics (/mhb/FB-MAT/cos-579/)	Statistics and Computational Methods	[WP] Compulsory Elective
[MAT-88.105-SG] M.Sc. Mathematics (/mhb/FB-MAT/cos-538/)	Pure Mathematics	[WP] Compulsory Elective
[MAT-88.105-SG] M.Sc. Mathematics (/mhb/FB-MAT/cos-538/)	Applied Mathematics	[WP] Compulsory Elective
[MAT-88.706-SG] M.Sc. Mathematics International (/mhb/FB-MAT/cos-553/)	Pure Mathematics	[WP] Compulsory Elective
[MAT-88.706-SG] M.Sc. Mathematics International (/mhb/FB-MAT/cos-553/)	Applied Mathematics	[WP] Compulsory Elective
[MAT-88.118-SG] M.Sc. Industrial Mathematics (/mhb/FB-MAT/cos-539/)	General Mathematics	[WP] Compulsory Elective
[MAT-88.276-SG] M.Sc. Business Mathematics (/mhb/FB-MAT/cos-548/)	General Mathematics	[WP] Compulsory Elective