Valid from 2024.HS

Module description: Analysis 3

Module Code	t.BA.XXM5.AN3.19HS
ECTS Credits	4
Language of Instruction/Examination	German
Organizational Unit	ICP
Module Coordinator	Christoph Kirsch
Legal Framework	The module description is part of the legal basis in addition to the general academic regulations. It is binding. During the first week of the semester a written and communicated supplement can specify the module description in more detail.
Module Characteristic	Type 3a 2 lecture lessons per semester week and class+ 2 lab bi-weekly lessons per semester and half-class
Module Description	The main topic of this module is the differential and integral calculus of generally vector-valued functions of several real variables. In addition, students are introduced to the (continuous) Fourier transform and learn about analytical methods for the solution of ordinary differential equations.
Module Content	**(Continuous) Fourier transform** • definitions, tables • Fourier series for periodic functions **Functions of several variables** • definition and visualization • continuity, differentiability • partial derivatives, differential operators • integral calculus, coordinate transforms • divergence theorem, Stokes' theorem, balance equations, scalar potentials for gradient fields **Ordinary differential equations** • slope field and integral curves of ordinary differential equations • substitution methods for special first order ordinary differential equations • solution of systems of linear ordinary differential equations
Prerequisite Knowledge	XXM4.AN1, XXM4.AN2, XXM5.LA1, XXM5.LA2

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Learning Objectives (Competences)

Students...	Competencies	Taxonomies
You know properties such as continuity and differentiability of functions of several variables, and you can visualize these functions appropriately.	F, M	K2, K3
You can rewrite arbitrary higher order ordinary differential equations as systems of first order ordinary differential equations.	M, F	K2, K3
You can formulate balance equations for the state variables of a physical system using the divergence theorem, and you can compute scalar potentials for gradient fields using Stokes' theorem.	F, M	K2, K3
You can compute partial derivatives of functions. You know the calculation rules for the differential operators gradient, divergence and curl and you can use them on examples.	M, F	K2, K3
You know the method of substitution for the solution of special first order ordinary differential equations, and you can use this method on examples.	M, F	K2, K3
You can solve systems of linear first order ordinary differential equations analytically.	F, M	K2, K3
You can compute Fourier transforms of functions in both directions with the help of tables. You can calculate Fourier series of periodic functions.	F, M	K2, K3
You know the slope field of a first order ordinary differential equation, and you can derive qualitative properties of the integral curves from it.	F, M	K2, K3
You know various definitions of the (continuous) Fourier transform, and you can work with tables of Fourier transform pairs.	F, M	K2, K3
You can integrate functions of several variables over general domains, and you can transform such integrals into arbitrary coordinates.	M, F	K2, K3

Performance Assessment

End-of-module exam	Assessment	Length (min.)	Weighting	Form
written exam	Grade	90	80	acc. to module agreement

Performance assessment during the semester	Assessment	Length (min.)	Weighting	Form
	Grade		20	acc. to module agreement

Classroom Attendance Requirement

None

Learning material

Comments

At least one graded assignment during the semester. Number and weighting of graded assignments equal among all lecturers.