Module description: Analysis 3

Module Code	t.BA.XXM6.AN3.19HS
ECTS Credits	4
Language of Instruction/Examination	German
Organizational Unit	IAMP
Module Coordinator	Nadin Stahn
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 topics covered by Analysis 3 are calculation with complex numbers and the solution of ODEs, including the Laplace transformation. In the second part, the focus is on multidimensional analysis and aspects of the vector analysis.
Module Content	**Complex numbers** • Gaussian number plane • Calculating with complex numbers • The trigonometric and the exponential form • Fourier series **Ordinary differential equations (ODEs)** • Fundamentals of ODEs • Laplace transformation • Linear ODEs of first order • Linear ODEs of second order with constant coefficients **Differential and integral calculus of multidimensional functions** • Functions in several variables • Partial differentiation • Tangent plane, directional derivative and selected applications • Multidimensional integration in several coordinates **Vector analysis** • Scalar and vector fields • Differential operators - gradient, divergence, rotation • Curvilinear integrals • Surface integrals • Divergence and circulation theorems (Gauss and Stokes theorems)
Prerequisite Knowledge	Analysis 1 und 2, Algebra und Statistik 1 und 2

Module description: Analysis 3

Learning Objectives (Competences)	Students...	Competencies	Taxonomies
	You know the basics of the arithmetic of complex numbers and can apply these correct.	F, M	K2, K3
	You can develop periodic functions in Fourier series.	F, M	K3
	You can decide for each ODE if it is linearly and if there exists an analytical solution method.	M, F	K3
	You know the main properties of the Laplace transformation.	M, F	K3
	You know the solution methods for linear ODE with constant coefficients of higher order and can apply these on examples.	F, M	K3
	You are familiar with fundamental forms, notations and properties of multidimensional functions.	M, F	K2, K3
	You are familiar with the main definitions and concepts of the differential calculus of multidimensional functions, particularly with partial derivative, gradient, directional derivative and tangent plane.	M, F	K3
	You can integrate multidimensional functions over general domains. You can transform such integrals in several coordinates.	F, M	K3
	You can calculate the work in a vector field. You can decide, if a vector field is conservativly and calculate the potential if applicable.	F, M	K3
	You know the Gauss theorem and the Stokes theorem and their physical interpretations.	F, M	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
	written exam	Grade	45	20	acc. to module agreement

Classroom Attendance Requirement	None
Learning material	• Papula, L. (2015). Mathematik für Ingenieure und Naturwissenschaftler Band 2 . 14. Edition. Wiesbaden: Springer. ISBN 978-3-658-07790-7. • Papula, L. (2016). Mathematik für Ingenieure und Naturwissenschaftler Band 3. 7. Edition. Wiesbaden: Springer. ISBN 978-3-658-11924-9. Chapter 1.
Comments	