Module title		SM Code
Mathematics 2		**MA2**
Module lecturer	**Faculty**	
N.N.	Computer Science and Mathematics	
Module language	**Number of SWS / WSH**	**ETCS credits**
English	6 SWS / WSH	6
Teaching format		
Seminar-based teaching with approx. 20% practical component		

Semester according to the study plan	
2nd semester (Bachelor)	
Attendance/classroom hours	**Additional independent study**
84 hours	Preparation and follow-up work: 67 hours Exam preparation: 29 hours
Type of examination / Requirements for the award of the credit points	
Written exam: 90 minutes	

Teaching content

Complex numbers

- Normal, polar, and exponential forms
- Arithmetic
- Geometric interpretation

Power series

- Convergence behavior
- Methods of power series expansion

Complex functions

- Definition and geometric interpretation
- Exponential function and related functions
- Logarithm and general power

Differential and integral calculus of several variables

- Functions with several variables
- Partial differentiation and total differential
- Applications
- Local and global extreme values
- Multiple integrals

Ordinary differential equations

- Initial value and boundary value problems
- First-order differential equations
- Numerical solution methods
- Second-order linear differential equations with constant coefficients
- Higher-order differential equations
- Systems of differential equations

Learning objective: Professional competence

After successfully completing this module, students will be able to

- explain basic concepts, definitions, and examples of complex analysis, e.g., power series, elementary functions, multivariate real analysis, e.g., derivatives,multiple integrals, and ordinary differential equations, e.g., classification (1)
- correctly apply important convergence criteria to simple sequences of numbers (2)
- correctly apply important convergence criteria to simple number series (2)
- correctly determine convergence ranges of simple power series (2)
- confidently calculate with complex numbers and elementary complex functions (2)
- illustrate complex numbers and elementary complex functions geometrically (2)
- confidently calculate partial and total derivatives of multivariate real functions (2)

- correctly perform important integration methods for multivariate real functions (2)
- investigate the limit and continuity behavior of multivariate real functions (3)
- analyze the behavior of multivariate real functions (including extreme values) using differential calculus (3)
- analyze multivariate functions geometrically using multiple integration (3)
- correctly apply important solution methods to simple ordinary differential equations (3)

Literature

Recommended reading

- Stewart, J. (2014). *Calculus*. Cengage Learning
- Stry, Y., & Schwenkert, R. (2012). *Mathematik kompakt: für Ingenieure und Informatiker*. Springer-Verlag
- Westermann, T. (2011) *Mathematik für Ingenieure 1*. Springer-Verlag

The numbers in brackets indicate the levels to be achieved: (1)-know | (2)-can | (3)-understand and apply