Fundamentals of Mathematics

Token / Number:	GM
German title:	Grundlagen der Mathematik
Credits:	4 ECTS
Language:	German and English
Turn / Duration:	every Semester / 1 Semester
Module authority:	Prof. Dr. Karsten Urban
Training staff:	Tobias Born
Integration of module into courses of studies:	Suitable as an introductory course for the following master's programs Aktuarwissenschaften, M.Sc., Artificial Intelligence for Connected Industries Sensorsystemtechnik, M.Sc., Business Analytics, M.Sc., Computational Science and Engineering, M.Sc. Biopharmazeutisch-Medizintechnische Wissenschaften, M.Sc.
Requirements (contentual):	none
Learning objectives:	The introductory course "Fundamentals of Mathematics" provides students with basic knowledge of higher mathematics and is intended to facilitate the transition into part-time academic study or the switch from a university of applied sciences to a university. After completing the course, students will have an overview of the most important topics in analysis and linear algebra. In particular, they will have mastered elementary proof techniques and will be familiar with the basic concepts of set theory, vector spaces, and matrices. Additionally, they will understand key properties that characterize functions, especially continuity and differentiability. They will also have become familiar with the definitions of convergence for sequences and series and with the calculation of limits. Based on this introductory module, participants will be able to attend further, mathematically-oriented courses.
Content:	- Elementary Proof Techniques - Set Theory - Sequences and Series - Functions - Vector Spaces - Foundations of Linear Algebra
Literature:	- Meyberg, Vachenauer, *Höhere Mathematik I und II*, Springer-Verlag, 2003 - Estep, *Angewandte Analysis in einer Unbekannten*, Springer-Verlag, 2005 - Modler, Kreh, *Tutorium Analysis 1 und Lineare Algebra 1: Mathematik von Studenten für Studenten erklärt und dokumentiert*, Springer-Verlag, 2013 - Heuser, *Lehrbuch der Analysis*, Vieweg+Teubner, 2003 - Horn, Johnson, *Matrix Analysis*, Cambridge University Press, 2012

Modes of learning and teaching:	On-campus meetings: - Deepening exercises/case studies: 2,5 h - Exam: 1,5 h E-Learning: - Online seminar: 5 h - Self-Study based on the script: 52 h - Self-study (review of the contents of the lecture notes and the completion of exercise sheets): 40 h - Self-Study for exam preparation: 19 h
Estimation of effort:	Active Time: 2,5 h Self-Study: 71 h Exercises: 40 h Miscellaneous: 5 h Exam: 1,5 h Sum: 120 h
Course assessment and exams:	The following requirements need to be met to take the (written/oral) module exam: - Regular participation at attendance days or online seminars offered - Completion of an ungraded preliminary assignment The format, content, and scope of the preliminary work, as well as the type of examination, will be announced at the beginning of the course. In case of hardship, the candidate can write an informal request to the coordinator in order to be given admission to the exam. In case of sickness a doctor's certificate has to be submitted to the coordinator.
Requirements (formal):	none
Grading:	The grade of the module will be the grade of the exam.