Advanced Mathematics – Differential Equations, Taylor Expansion and Integral Transforms

Token / Number:	GM-Dif
German title:	Vertiefungskurs Mathematik – Differentialgleichungen, Taylorentwicklung und Integraltransformation
Credits:	3 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 Artificial Intelligence for Connected Industries Sensorsystemtechnik, M.Sc., Computational Science and Engineering, M.Sc.
Requirements (contentual):	Fundamentals of Mathematics
Learning objectives:	The introductory microcredential Ädvanced Mathematics – Differential Equations, Taylor Expansion, and Integral Transforms "provides students with in-depth knowledge of differential equations, Taylor Expansion, and integral transforms, and helps them transition into part-time academic studies or from a university of applied sciences to a university. Upon completion of the course, students will have an overview of the theory of Taylor expansions and series, integral transforms, and integral calculus. Furthermore, students will be able to characterize given differential equations and solve them in special cases. This foundational module enables participants to attend more advanced mathematics-oriented courses.
Content:	- Taylor Series and Expansions - Integral Calculus - Integral Transforms - Ordinary Differential Equations
Literature:	- Meyberg, Vachenauer (2003). *Höhere Mathematik I und II*, Springer-Verlag - Modler, Kreh (2013). *Tutorium Analysis 1 und Lineare Algebra 1: Mathematik von Studenten für Studenten erklärt und dokumentiert*, Springer-Verlag - Heuser (2003). *Lehrbuch der Analysis*, Vieweg+Teubner - Burg, K., Haf, H., Wille, F. (2002). *Höhere Mathematik für Ingenieure. Band III Gewöhnliche Differentialgleichungen, Distributionen, Integraltransformationen* (4. Aufl., Bd. 3), B. G. Teubner GmbH Stuttgart/Leipzig/Wiesbaden - Burg, K., Haf, H., Wille, F. (2003). *Höhere Mathematik für Ingenieure. Band I Analysis* (6. Aufl., Bd. 1), B. G. Teubner GmbH Stuttgart/Leipzig/Wiesbaden - Arendt, W., Urban, K. (2018). *Partielle Differenzialgleichungen. Eine Einführung in analytische und numerische Methoden* (2. Aufl.), Springer-Verlag GmbH Deutschland.

Modes of learning and teaching:	On-campus meetings: - Deepening exercises/case studies: 2 h - Exam: 1 h E-Learning: - Online seminar: 4 h - Self-Study based on the script: 39 h - Self-study (review of the contents of the lecture notes and the completion of exercise sheets): 30 h - Self-Study for exam preparation: 14 h
Estimation of effort:	Active Time: 2 h Self-Study: 53 h Exercises: 30 h Miscellaneous: 4 h Exam: 1 h Sum: 90 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.