

Module title:	MATHEMATICS – BASIC CONCEPTS AND APPLICATIONS
Module coordinator:	Prof. Dr. rer. nat. Alexander Herzog
Lecturer(s):	Prof. Dr.-Ing. Joachim Günther Prof. Dr. rer. nat. Alexander Herzog Prof. Dr.-Ing. Matthias Rebhan External lectures
Language of instruction:	English
Degree programme:	International Management and Digital Engineering (B. Eng.) 1 st semester
Teaching method Hours per week (SWS):	Seminars, self-study, revision 4 +2 SWS
Study workload:	Attendance time: 90 hours Self-study, exam preparation: 60 hours
ECTS:	5 ECTS
Prerequisites:	Technical secondary school mathematics
Overview & applicability:	This module lays the foundations for: “Advanced Applied Mathematics”, “Data Structure and Algorithms”, “Electrical Engineering”, “Software Engineering”, “Physics”, “Data and Process Engineering” and “Machine Learning in Python”.
Learning objectives/ competencies	<p>Competence Level 1 “Review”:</p> <ul style="list-style-type: none"> • Students recall mathematical laws, principles of mathematical reasoning and properties. • Students can distinguish vectors from scalar quantities. • Students know the basic laws of linear algebra. <p>Competence Level 2 “Understand”:</p> <ul style="list-style-type: none"> • Students understand the basics principle of engineering computation. <p>Competence Level 3 “Apply”:</p> <ul style="list-style-type: none"> • Students can solve mathematical equations in all types of functions discussed in the lectures. • Students can differentiate and integrate all types of functions discussed in the lectures for both one- and multi-dimensional functions. • Students apply vector calculus. • Students apply operations of linear algebra. • Students can solve nonlinear equations by iterative numerical methods. • Students can implement differential and integral calculus on a computer. • Students are capable of processing numerical fitting procedures. <p>Competence Level 4 “Analyse”:</p>

	<ul style="list-style-type: none"> • Students can mathematize technological problems and solve the mathematical problems deduced from these. • Students discuss applications of the mathematical methods presented in the course.
Course content:	<ul style="list-style-type: none"> • Geometry and linear algebra • Univariate and multivariate functions • Differential calculus for univariate and multivariate functions • Integral calculus for univariate and multivariate functions
Assessment method:	<p>Written exam Duration: 90 minutes</p>
Literature: Recommended reading	<p>POTTER, Merle C., LESSING, Jack. L, ABOUFADEL Edward F, 2023: <i>Mathematical Methods for Engineering and Science</i>, 2nd edition Springer Cham, ISBN: 978-3-031-26150-3</p> <p>GLYN, James, 2015. <i>Modern engineering mathematics</i>. 5th edition. Pearson. ISBN: 978-1292080734</p> <p>CROFT, Anthony, 2015. <i>Mathematics for Engineers</i>. 4th. edition. Pearson/Prentice Hall. ISBN 978-1292077765</p>