TECHNISCHE HOCHSCHULE LÜBECK

Module: Selected Topics in Engineering Mathematics

Level	Master	**Short Name**	SeToMa
Responsible Lecturers	Kral, Roland, Prof. Dr.-Ing.		
Department, Facility	Mechanical Engineering and Business Administration		
Course of Studies	Mechanical Engineering, Master		
Compulsory/elective	Compulsory	**ECTS Credit Points**	5
Semester of Studies	1	**Semester Hours per Week**	4
Length (semesters)	1	**Workload (hours)**	150
Frequency	SuSe and WiSe	**Presence Hours**	60
Teaching Language	English	**Self-Study Hours**	90

The following section is filled only if there is **exactly one** module-concluding exam.

Exam Type	Written Exam	**Exam Language**	English
Exam Length (minutes)	120	**Exam Grading System**	One-third Grades
Learning Outcomes	After successful completion of this course, the students are able to • understand mathematical proofs • to apply advanced mathematical methods to engineering problems. • to solve individual problems with the aid modern software tools like MATLAB • to describe and analyze the behavior of dynamical systems mathematically.		
Participation Prerequisites	Mathematics I, II, III (Bachelor Level)		

The previous section is filled only if there is **exactly one** module-concluding exam.

Consideration of Gender and Diversity Issues	✔ Use of gender-neutral language (THL standard) ✔ Target group specific adjustment of didactic methods ✘ Making subject diversity visible (female researchers, cultures etc.)
Applicability	will be used in other courses like Simulation and Control, Selected Topics of Finite Element Methods, Mechanics of Solids, Toolbox for Fluid Mechanical Design.
Remarks	

TECHNISCHE HOCHSCHULE LÜBECK

Module Course: Selected Topics in Engineering Mathematics (Lecture)

(of Module: Selected Topics in Engineering Mathematics)

Course Type	Lecture	**Form of Learning**	Presence
Mandatory Attendance	no	**ECTS Credit Points**	5
Participation Limit		**Semester Hours per Week**	4
Group Size		**Workload (hours)**	150
Teaching Language	English	**Presence Hours**	60
Study Achievements ("Studienleistung", SL)		**Self-Study Hours**	90
SL Length (minutes)		**SL Grading System**	

The following section is filled only if there is a course-specific exam.

Exam Type		**Exam Language**	
Exam Length (minutes)		**Exam Grading System**	
Learning Outcomes			
Participation Prerequisites			

The previous section is filled only if there is a course-specific exam.

Contents	Linear Algebra: Bases, change of base, orthogonal, unitary symmetric and positive definite matrices, rotations, eigenvalues and eigenvectors, normal form or Schur, principle vectors, Theorem of Cayley-Hamilton, block-diagonal normal form Linear Differential Equations (ODEs): Matrix exponential function, linear differential equation of order n, solution for linear system, stability Boundary Value and Eigenvalue Problems: Fundamental matrices, linear boundary value problem for systems of differential equations, linear boundary value problems for differential equations of order n, Green functions, eigenvalue problems Partial Differential Equations (PDEs): Basic definitions and introductory examples, DPEs of order 2, classification, separation of variables, vibrating string, heat transfer, problem of Dirichlet, solution with Green's functions
Literature	• Kreyszig, Erwin: Advanced Engineering Mathematics, Wiley & Sons

	• Shima/Nakuyama: Higher Mathematics for Physics and Engineering, Berlin: Springer-Verlag • Mayberg/Vachenauer: Höhere Mathematik 1, 2: Berling: Springer-Verlag
Remarks	