

Module code (1.)	Module description (2.)	Category (3.)
MBI 1530 Stand: 06.10.2021	Numerics	Int. Master
	Degree program (4.)	Sustainable Engineering of Infrastructure
	Faculty (5.)	Civil Engineering and Conservation / Restoration

Module supervisor (6.)	N.N.
Type of module (7.)	P (obligatory)
Frequency (8.)	Annually
Standard semester of study (9.)	1st semester
Credits (ECTS) (10.)	5 ETCS
Assessment (11.)	coursework
Language of instruction (12.)	English
Admission requirements (13.)	-
Module is a requirement for (14.)	-
Module duration (15.)	1 semester
Mandatory registration (16.)	
Applicability of module (17.)	Civil Engineering

Course (18.)	Lecturer (19.)	Type (20.)	No. of students (max.) (21.)	No. of courses per week (22.)	Contact hours per week (23.)	Workload		
						Face-to-face (24.)	Self-study (25.)	
1 Numerics	N.N.	Seminar	25	1	4	60	90	
Total						4	60	90
Workload for the module (26.)							150	

Learning objectives (27.)	After successful participation in the module, students have knowledge of computer-aided numerical methods for the simulation of problems in structural and fluid mechanics as well as the ability to select and apply specific software.
Course contents (28.)	<p>The following topics will be covered in the module:</p> <ul style="list-style-type: none"> • systems of linear equations, Gaussian elimination, LU decomposition, Cholesky decomposition • eigenvalue problems • linear optimization • error analysis • Newton's method • numerical solution of initial value problems

	<ul style="list-style-type: none"> • finite-difference method for the solution of boundary value problems • finite element theory of deformations, stresses, strength and fracture • computational fluid dynamics and transport mechanisms • systems of linear equations • numerical interpolation, differentiation and integration • demonstration and introduction of software in the areas: road construction, civil engineering, infrastructure planning and foundation engineering • individually selected practical examples
Preliminary exam requirements and assessment	<p style="text-align: right;">(29.)</p> <ul style="list-style-type: none"> • Term paper and presentation
Literature	<p style="text-align: right;">(30.)</p> <ul style="list-style-type: none"> • Hermann Friedrich und Frank Pietschmann: Numerische Methoden: Ein Lehr- und Übungsbuch, De Gruyter, 2010 • Klaus-Jürgen Bathe: Finite-Elemente-Methoden, Springer, 2002 • Klaus Knothe, Heribert Wessels: Finite Elemente: Eine Einführung für Ingenieure, Springer, 4. Aufl. 2008 • User manuals, brief instructions and ample applications from software manufacturers