Only the german version of the module description as part of the study regulations is legally binding.

Module name	**Basic Numerical Methods**
Module number	CMS-COR-NUM
Senior Lecturer	Prof. Dr. Ivo Sbalzarini ivo.sbalzarini@tu-dresden.de
Qualification objectives	After completing the module, students master the basics of numerical mathematics and numerical simulation methods. They have a theoretical understanding of how a computer counts with finite floating point numbers, what errors and inaccuracies can occur, and how to mitigate and control them. They are familiar with basic numerical methods for the numerical solution and simulation of mathematical models, linear algebra models and common and partial differential equations. They can estimate the approximation errors of the methods and determine algorithmic intensity, and are able to implement the procedures themselves, adapt them to specific applications and optimise them.
Contents	The content of the module includes floating point arithmetic, rounding errors, erasing, numerical interpolation according to Lagrange, Newton, Aitken-Neville, hermitee and Splines, numerical solution of linear and non-linear equations and equation systems, Taylor developments, finite differences and their approximation errors, explicit and implicit time integrators, numerical stability, direct and iterative algorithms for matrixin version, numerical integration, discrete Fourier transforms, matrix decomposition, lenses for Poisson equation, and foundations of numeric partial differential equations.
Forms of teaching and learning	The module includes lectures of 2 SWS, exercises of 2 SWS and self-study. The language of the lectures and exercises will be English.

Eligibility for participation	Knowledge of sequential computer programming, algorithms and data structures, analysis of functions of one or more variables, linear algebra, vector and matrices calculation, probability calculation and bachelor level statistics are required. The following literature is suitable for preparation: 1. Algorithms – the spirit of computing. David Harel. Addison-Wesley, 2004, 2. C++ from the ground up. Herbert Schildt. McGraw-Hill, 2003, 3. Structure and Interpretation of Computer Programs. HAL Abelson, Gerald Jay Sussman. With Press, 1985, 4. Introduction to Algorithms, 2nd edition. Cormen, T.H., Leiserson, C.E., Rivest, R.L. With Press, 2001, 5. Multivariable Calculus with Applications (Undergraduate Texts in Mathematics). Terrell Lax. Springer, 2018, 6. Linear algebra. Jim Hefferon, http://joshua.smcvt.edu/linearalgebra/, 2008.
Usability	In the Masters Course Computational Modeling and Simulation, the module is a compulsory optional module of the basic technical training, to be selected in accordance with Annex 1 to the Specific Examination Regulations. The module cannot be chosen in the Master's Course Computational Modeling and Simulation if this or a module with substantially the same content from a Course with which the entry conditions under § 3 of the Studienordnung have been met has already been completed. The module provides the pre-requisites for the modules it designates under the pre-requisites for participation.
Conditions for the award of credits	Credits are awarded when the module test is passed. The module test consists of a 90-minute away day. The language of the test will be English.
Credits and marks	The module allows 5 credit points to be obtained. The module score corresponds to the test performance score.
Frequency of the module	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module covers 1 semester.