Simulation Methods I – Introduction to Numerical Methods

Course number	7220
Hours per week:	4
ECTS:	5
Scheduled:	Summer Term
Format	Lecture
Examination:	Written exam (90 min.)
Lecturer:	Prof. Dr. Sautter
Objectives:	**Knowledge:** The students have an overview of the most important basic numerical methods and of the simulation software MATLAB. They know pros and cons of numerical methods and the necessity of numerical methods in the field of simulation. **Skills:** The students can use numerical solvers available in MATLAB to solve technical problems and they can implement basic numerical methods in MATLAB themselves. **Competences:** The students are able to choose, apply and parameterize appropriate MATLAB solvers. They question numerical results and scrutinize them with respect to the underlying physical or technical problem.
Contents:	Introduction to numerical methods and simulation: - complexity of algorithms - vector- and matrix norms - linear and nonlinear systems - interpolation - quadrature - ordinary differential equations - finite difference method in 1D - optimization MATLAB for numerical computing and simulations Simulations from various fields of application
Pre-requisites	Engineering Mathematics I & II, Computer Science I & II
Recommended Reading:	Chapra, S.: Applied Numerical Methods with MATLAB for Engineers and Scientists, McGraw-Hill Chattot, J.-J.: Computational Aerodynamics and Fluid Dynamics, Springer-Verlag Moler, C.: Numerical Computing with MATLAB, SIAM Munz, C.-D./Westermann, T.: Numerische Behandlung gewöhnlicher und partieller Differenzialgleichungen – Ein interaktives Lehrbuch für Ingenieure, Springer-Verlag All books in the current edition