

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

Module name	Physics based graphics
Module number	INF-25-Ma-FVC-PBG
Responsible lecturer	Prof. Dr. Stefan Gumhold stefan.gumhold@tu-dresden.de
Qualification objectives	Students will have an overview of the use of physics in computer graphics. You know Newton's axioms and the most important laws of force. They can derive equations of motion and explain the rendering equation in various forms, including its components and interrelationships. You master Monte Carlo and cache-based solution procedures, can implement them and analyze them in terms of runtime, errors and bias. In addition, they have knowledge of reflection and emission models as well as their suitability for the approximation of materials and light sources. They are familiar with the basics of physics-based animation, as well as the numerical solution of ordinary differential equations and the simulation of particle-based phenomena in computer graphics. In addition, they are familiar with rigid body modeling and the treatment of collisions. In fluid simulation, they are familiar with the Navier-Stokes equation as well as efficient solutions for incompressible fluids that are suitable for rapid simulation.
contents	Contents of the module are physical basics, such as numerical solving of differential equations, global lighting and physically based simulation. In global lighting, the rendering equation and models for surface representation and light sources are included, as well as stochastic and cache-based solution methods for the rendering equation. In the physics-based simulation, simulation techniques for rigid bodies including collision treatment as well as selected topics from the knowledge areas of fluid simulation, clothing simulation and softbody simulation are the content of the module.
Forms of teaching and learning	The module includes lectures in the scope of 2 SWS, exercises in the scope of 2 SWS and self-study. The teaching language of the lectures and exercises is English.
Requirements for participation	In the degree program Computer Science, the competencies to be acquired in the modules INF-25-Ma-FVC-FCG Foundations of Computer Graphics are required.
usability	The module is a compulsory elective module in the field of Visual Computing and Machine Learning in the diploma course Computer Science in the main course of study, which must be chosen in accordance with Annex 2 to the examination regulations. The module in the Master's programme Computer Science is a compulsory elective module in the Open Track in the field of Visual Computing and Machine Learning as well as the supplement, which must be selected in accordance with Annex 2 to the examination regulations. The module can only be selected once in

	the Master's programme Computer Science. In the Master's programme in Media Informatics, the module is a compulsory elective module in the field of specialisation modules, which must be chosen in accordance with Section 27(3) of the Examination Regulations. The module cannot be selected in the Master's degree program Computer Science and the Master's degree program Media Informatics if this or a substantially identical module from a degree program with which the admission requirements according to § 3 of the study regulations have been fulfilled, has already been completed. The module creates the prerequisites for the modules, which it names under prerequisites for participation.
Conditions for awarding credits	The credit points are earned when the module examination has been passed. The module examination consists of a non-public oral examination performance as an individual examination of 20 minutes duration. Oral is the solving of exercise tasks in the amount of 15 hours. The language of the exam is English.
Credits and grades	6 credit points can be earned through the module. The module grade corresponds to the grade of the examination performance.
Frequency of the module	The module is offered every winter semester.
workload	The total workload is 180 hours.
Duration of the module	The module covers one semester.