Program of Studies:	**Master Program Bioinformatics**
Name of the module:	**Computer Graphics**
Abbreviation:	**I-M-2**
Subtitle:	Core Lecture
Modules:	Lecture: 4 h (weekly) Tutorial: 2 h (weekly)
Semester:	1st -3rd semester/at least every two years
Responsible lecturer:	Prof. Dr. Philipp Slusallek
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Language:	English
Level of the unit/ Mandatory or not:	Graduate course / mandatory elective
Total workload:	270 h = 90 h of classes and 180 h private study
Credits:	9
Entrance requirements:	Solid knowledge of linear algebra is recommended.
Aims/Competences to be developed:	This course provides the theoretical and practical foundation for computer graphics. It gives a wide overview of topics, techniques, and approaches used in various aspects of computer graphics but has some focus on image synthesis or rendering. The first part of the course uses ray tracing as a driving applications to discuss core topics of computer graphics, from vector algebra all the way to sampling theory, the human visual system, sampling theory, and spline curves and surfaces. A second part then uses rasterization approach as a driving example, introducing the camera transformation, clipping, the OpenGL API and shading langue, plus advanced techniques. As part of the practical exercises the students incrementally build their own ray tracing system. Once the basics have been covered, the students participate in a rendering competition. Here they can implement their favorite advanced algorithm and are asked to generate a high-quality rendered image that shows their techniques in action.

Content:	- Introduction - Overview of Ray Tracing and Intersection Methods - Spatial Index Structures - Vector Algebra, Homogeneous Coordinates, and Transformations - Light Transport Theory, Rendering Equation - BRDF, Materials Models, and Shading - Texturing Methods - Spectral Analysis, Sampling Theory - Filtering and Anti-Aliasing Methods - Recursive Ray Tracing & Distribution Ray-Tracing - Human Visual System & Color Models - Spline Curves and Surfaces - Camera Transformations & Clipping - Rasterization Pipeline - OpenGL API & GLSL Shading - Volume Rendering (opt.)
Assessment/Exams:	- Successful completion of weekly exercises (30% of final grade) - Successful participation in rendering competition (10%) - Mid-term written exam (20%, final exam prerequisite) - Final written exam (40%) - In each of the above a minimum of 50% is required to pass A re-exam typically takes place during the last two weeks before the start of lectures in the following semester.
Grade:	The grade is derived from the above assessments. Possible changes will be announced at the beginning of each semester.
Literature:	Will be announced in the lecture.