

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:	1 st -3 rd Semester / at least once 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
Course type/weekly hours:	Lecture 4 h (weekly) Tutorial 2 h (weekly) Tutorials in groups of up to 20 students
Total workload:	270 h = 90 h of classes and 180 h private study
Credits:	9
Entrance requirements:	For graduate students: none .
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 focuses on image synthesis or rendering. After introducing of physical background and the representations used in graphics it discusses the two basic algorithms for image synthesis: ray tracing and rasterization. In this context we present related topics like texturing, shading, aliasing, sampling, and many more. As part of the practical exercises the students incrementally build their own ray tracing system or hardware-based visualization application. A final rendering competition allows students to implement their favorite advanced algorithm and use it in a high-quality rendering.

Content:	<p>Fundamental of digital image synthesis</p> <ul style="list-style-type: none"> - Physical laws of light transport - Human visual system and perception - Colors and Tone-Mapping - Signal processing and anti-aliasing - Materials and reflection models - Geometric modeling - Camera models <p>Ray Tracing</p> <ul style="list-style-type: none"> - Recursive ray tracing algorithm - Spatial index structures - Sampling approaches - Parallel and distributed algorithms <p>Rasterization and graphics hardware</p> <ul style="list-style-type: none"> - Homogeneous coordinates, transformations - Hardware architectures - Rendering pipeline - Shader programming and languages - OpenGL
Assessment/exams:	<ul style="list-style-type: none"> - Successful completion of at least 50% of the exercises - Successful participation in rendering competition - Final written exam <p>Final grade determined by result of the exam and the rendering competition.</p> <p>A re-exam takes place during the last two weeks before the start of the lectures in the following semester.</p>
Literature:	Will be announced on the course website