

<b>Program of Studies:</b>	<b>Master Program Bioinformatics</b>
<b>Name of the module:</b>	<b>Computer Graphics</b>
<b>Abbreviation:</b>	<b>I-M-2</b>
<b>Subtitle:</b>	Core Lecture
<b>Modules:</b>	Lecture: 4 h (weekly) Tutorial: 2 h (weekly)
<b>Semester:</b>	1 <sup>st</sup> -3 <sup>rd</sup> semester/at least every two years
<b>Responsible lecturer:</b>	Prof. Dr. Philipp Slusallek
<b>Lecturer:</b>	Prof. Dr. Philipp Slusallek
<b>Language:</b>	English
<b>Level of the unit/ Mandatory or not:</b>	Graduate course / mandatory elective
<b>Total workload:</b>	270 h = 90 h of classes and 180 h private study
<b>Credits:</b>	9
<b>Entrance requirements:</b>	Solid knowledge of linear algebra is recommended.
<b>Aims/Competences to be developed:</b>	<p>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.</p> <p>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 language, plus advanced techniques.</p> <p>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.</p>

<b>Content:</b>	<ul style="list-style-type: none"> <li>- Introduction</li> <li>- Overview of Ray Tracing and Intersection Methods</li> <li>- Spatial Index Structures</li> <li>- Vector Algebra, Homogeneous Coordinates, and Transformations</li> <li>- Light Transport Theory, Rendering Equation</li> <li>- BRDF, Materials Models, and Shading</li> <li>- Texturing Methods</li> <li>- Spectral Analysis, Sampling Theory</li> <li>- Filtering and Anti-Aliasing Methods</li> <li>- Recursive Ray Tracing &amp; Distribution Ray-Tracing</li> <li>- Human Visual System &amp; Color Models</li> <li>- Spline Curves and Surfaces</li> <li>- Camera Transformations &amp; Clipping</li> <li>- Rasterization Pipeline</li> <li>- OpenGL API &amp; GLSL Shading</li> <li>- Volume Rendering (opt.)</li> </ul>
<b>Assessment/Exams:</b>	<ul style="list-style-type: none"> <li>- Successful completion of weekly exercises (30% of final grade)</li> <li>- Successful participation in rendering competition (10%)</li> <li>- Mid-term written exam (20%, final exam prerequisite)</li> <li>- Final written exam (40%)</li> <li>- In each of the above a minimum of 50% is required to pass</li> </ul> <p>A re-exam typically takes place during the last two weeks before the start of lectures in the following semester.</p>
<b>Grade:</b>	The grade is derived from the above assessments. Possible changes will be announced at the beginning of each semester.
<b>Literature:</b>	Will be announced in the lecture.