

<b>Name of the course: Computer Graphics</b>	Total credits: 2+2+1=5
Lecture: IPM-18AUTCGE Practice: IPM-18AUTCGG	
Type: Obligatory	
Total hours of per semester: lecture: 26 practice: 26 consultation: 13	
Type of testing: exam and practice grade Other: tests, project	
Semester: 1st	
<b>Description</b>	
<p>The basic principles and techniques for computer graphics on modern hardware, with special focus on real time applications.</p> <p><u>General principles.</u> The nature of light, electromagnetic spectrum. Reflection and refraction.  <u>Optics.</u> Image formation, first-order optics. The perspective camera. Simplified cameras: weak-perspective and orthographic ones. Omni-directional cameras. Non-perspective distortion of pin-hole cameras.  <u>Elementary geometry and geometric modelling:</u> Coordinate systems, transformations, basic curve, surface, and volume representations.  <u>Image synthesis techniques:</u> Raycasting/raytracing (algebraic and numerical techniques), incremental image synthesis, volume rendering, geometric queries and algorithms, spatial data structures.  <u>Modern GPU architectures.</u> CPU versus GPU. Stream processing. Evolution of CPU and GPU architectures. Introduction to GPGPU (General Purpose Computing on GPU).  <u>Modern OpenGL.</u> Incremental image synthesis, real time raycasting and raytracing for various visualization tasks. Design patterns for real-time software.</p>	
<b>Literature</b>	
<ul style="list-style-type: none"> <li>• Tomas Akenine-Moller, Eric Haines, Eric Haines: Real-Time Rendering, A.K. Peters., 3rd edition, 2008, ISBN-10: 1568814240</li> <li>• László Szirmay-Kalos: Computer Graphics (in Algorithms of Informatics II edited by Antal Iványi, Monda Kiadó, available electronically)</li> </ul>	
<b>Competencies</b>	
<b>Knowledge</b>	
<ul style="list-style-type: none"> <li>• Possession of complex and up-to-date knowledge in software technology, regarding the design, implementation, operation and maintenance of software, in the following areas: scientific computations, digital image and signal processing, computer graphics, multimedia, modern programming languages and paradigms..</li> <li>• Detailed and expert-level knowledge of the technical terms and expressions of computer science in English.</li> </ul>	
<b>Competencies</b>	
<ul style="list-style-type: none"> <li>• Ability to develop applications with real-time requirements.</li> <li>• Ability to formalize complex technical problems, to analyze theoretical and practical background, and to provide adequate solutions.</li> <li>• Skills for evaluating and applying new solutions and methods in the field of Computer Science.</li> <li>• Ability for written and oral communication in English, using the technical terms and expressions</li> </ul>	

of computer science. Ability to reason, to prepare reports, to read, understand, and exploit scientific and technical material (e.g. books and papers).

- Expertise in utilizing sources of technical information, their critical interpretation and evaluation, and the extraction of information relevant to the solution of a specific problem.

**Attitude**

- Attends professional, technological development related to their qualification.
- Commitment to critical feedback and self-assessment.
- Commitment to lifelong learning and receptivity to new IT competencies.
- Shares professional knowledge, mediates professional results.

**Autonomy and responsibility**

- Takes responsibility for his professional decisions taken during his professional activities.
- Takes responsibility for observing and enforcing deadlines.