MODULE DESCRIPTION CARD – SYLLABUS

Module name:	Number of hours:	Lecturer:
Module ICT05 Computer Graphics	10	Witold Andrzejewski, PhD

Module Descriptions:

The modules aim is to teach the students the basics of 3D computer graphics. This includes basic knowledge about 3D positions representation and transformation, basic knowledge about 3D object shape manipulation via skeletal animation and inverse kinematics, basics of light-surface interaction modeling and basics of raytracing algorithms.

Purpose of the support under Module:

The overall objective of the Innovative International Education Program in ICT within the IMPACT project is to raise the competencies of international students in key digital technologies and to support personalized, flexible, and modern education aligned with current global needs in the area of ICT.

The specific objective of the module is to provide competencies and promote activities carried out at the Poznań University of Technology in the area of computer graphics, including:
- o basic knowledge about 3D positions representation and transformation,
- o basic knowledge about 3D object shape manipulation via skeletal animation and inverse kinematics,
- o basics of light-surface interaction modeling,
- o basics of raytracing algorithms.

Method of support under Module:

Support within the module is provided with the participation of the instructor and divided into the following elements:
- 6-week self-study program using teaching materials provided by the instructor on the e-learning platform;
- 6 weeks of support from the instructor in the form of online consultations using tools that enable meetings to be held;
- a test to verify the acquisition of competences.

Module-related learning outcomes:

Descriptions of the new competences:

The main objective of the module is to develop students' understanding of the problems related to 3D computer graphics and skills related to solving such problems. Upon completion of the course, the student will acquire the following specific competences:

Knowledge:
1. the student understands the basics of mathematical representation of 3D positions in multiple coordinate systems and their transformations
2. the student knows the algorithms related to skeletal animation, including bone definition, skeletal structure, skeletal transformations, rigging and applying skeletal transformations to 3D models
3. the student knows the underlying theory of modelling of light interaction with surfaces, basic lighting models as well as physically based lighting models used in physically based rendering
4. the student knows the basics of raytracing algorithms for 3D scene visualization including: ray-object intersection algorithms, ray reflection and refraction and Whitted style raytracing
5. the student knows the basics of mathematics of Monte Carlo integration, its applications to solving lighting equation as well as path-tracing algorithm.

Skills:
1. the student is able to solve the problems related to 3D model representation, transformation (both based geometrical transformations and skeletal animation) and visualization
2. the student is able to suggest lighting model as well as required assets necessary to visualize 3D objects given the performance and quality requirements of the output renders
3. the student is able to implement basic raytracing algorithms

Social competences:
1. the student understands that some aspects of knowledge and skills related to computer graphics can quickly become absolete

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Criteria for verifying learning outcomes
Learning outcomes of the course are verified via an assessment test.

Method of verification/validation of learning outcomes
The verification of the learning outcomes is based on answers to the questions in the test. The test is passed if the student answers correctly at least 50% of the questions.

Workload
25 h (including work with teaching materials provided by the lecturer, consultation, and the student's own work) – 1 ECTS point

Level of the European Qualifications Framework