Course Syllabus

Course from study programme for the cycle: 2022/2023

I. General Information

Course name	Mathematical basics for computer graphics
Programme	Informatics
Level of studies (BA, BSc, MA, MSc, long-cycle MA)	BA
Form of studies (full-time, part-time)	full-time
Discipline	Informatics, Mathematics
Language of instruction	english

Course coordinator	dr Armen Grigoryan

Type of class *(use only the types mentioned below)*	Number of teaching hours	Semester	ECTS Points
lecture	30	III	5
tutorial			
classes			
laboratory classes	30	III	
workshops			
seminar			
introductory seminar			
foreign language classes			
practical placement			
field work			
diploma laboratory			
translation classes			
study visit			

Course pre-requisites	Linear algebra Analytic geometry Introduction to differential and integral calculus

II. Course Objectives

Presentation of basic concepts and facts of mathematics, which are used in three-dimensional computer graphics.
Acquainting with the use of a mathematical apparatus in three-dimensional computer graphics with the use of appropriate software.

III. Course learning outcomes with reference to programme learning outcomes

Symbol	Description of course learning outcome	Reference to programme learning outcome
KNOWLEDGE		
W_01	The student is able to formulate the basic concepts and of mathematics, which are used in three-dimensional computer graphics	K_W02, K_W11
W_02	The student is able to identify the role of mathematics in particular problems of three-dimensional computer graphics	K_W02, K_W11
SKILLS		
U_01	The student is able to use the basic mathematical tools in three-dimensional computer graphics	K_U02
U_02	The student is able to apply the mathematical apparatus in three-dimensional computer graphics using the appropriate software	K_U02
SOCIAL COMPETENCIES		
K_01	The student is able to assess his knowledge and skills in mathematics necessary to understand computer graphics and understands the need for continuous training and improvement of professional and personal competences	K_K01

IV. Course Content

Affine n-dimensional Euclidean space. Affine transformations. Homogeneous coordinates. Matrix representation of affine transformations in homogeneous coordinates. Parallel and perspective projections. The matrix form of parallel and perspective projections in homogeneous coordinates. Quaternions and their application in three-dimensional graphics. The concept of a rectifiable curve. Curvature and torsion. Frenet's formulas. Regular surfaces. B-spline curves and surfaces. Mathematical model of lighting.

V. Didactic methods used and forms of assessment of learning outcomes

Symbol	Didactic methods *(choose from the list)*	Forms of assessment *(choose from the list)*	Documentation type *(choose from the list)*
KNOWLEDGE			
W_01	Conventional lecture	Test	Protocol
W_02	Conventional lecture	Test	Protocol
SKILLS			
U_01	Laboratory classes design thinking	Test	Protocol
U_02	Laboratory classes design thinking	Test	Protocol
SOCIAL COMPETENCIES			
K_01	Laboratory classes design thinking	Test	Protocol

VI. Grading criteria, weighting factors.....

Classes: graded pass based on a test result:
91 – 100% - 5,
81 – 90% - 4.5,
71 – 80% - 4.0,
61 – 70% - 3.5,
50 – 60% - 3.0,
0 - 49% -2.0

Lecture: graded pass based on a test result (only for those who have completed the classes):
91 – 100% - 5,
81 – 90% - 4.5,
71 – 80% - 4.0,
61 – 70% - 3.5,
50 – 60% - 3.0,
0 - 49% -2.0

Detailed assessment rules are given to students with each subject edition.

VII. Student workload

Form of activity	Number of hours
Number of contact hours (with the teacher)	Lecture 30 Laboratory 30 Consultations 30
Number of hours of individual student work	60

VIII. Literature

Basic literature
1. Foley, J., Van Dam, A., et al, “Computer graphics : principles and practice”, Addison-Wesley; 2014. 2. Vince, J., “Mathematics for Computer Graphics”, London : Springer London : Imprint: Springer; 2014 3. Hoggar, S. G.., “Mathematics for Computer Graphics”, Cambridge : Cambridge University Press; 1994
Additional literature
1. OpenGL Architecture Rewiew Board: M. Woo, J. Neider, T. Davis, "OpenGL Programming Guide", Second Edition, Addison-Wesley Developer Press, Sydney, Bonn, Amsterdam, Tokyo, 1997. 2. Jones, H. , “Computer graphics through key mathematics”, London : Springer; 2001.