

M116	Constructive and Analytical Geometry	L	P	S	ECTS 6
		2	3	0	

Course objective. The aim of the course is to examine geometry from the point of view of constructive methods. The most important methods of solving constructive tasks are systematized with the necessary theoretical foundation. Students will expand their knowledge of the basic concepts and application of analytic geometry in (three-dimensional) space. The concepts related to the surfaces and mappings will also be introduced from the analytical point of view. The lectures and exercises are presented by using dynamic geometry software.

Prerequisites. Undergraduate mathematics or computer science study programme.

Course content.

1. Euclidean constructions. Constructive task. The locus of points. Methods of auxiliary figures.
2. Methods of geometric transformations. Symmetry with respect to a line. Rotation. Symmetry with respect to a point. Translation. Glide symmetry. Similarity. Inversion.
3. Algebraic method.
4. Constructions by limited means.
5. The rectangular (Cartesian) coordinate system in space. Basic metrical relations of analytical geometry of space. The orientation of the coordinate system.
6. Transformation of the coordinates. Euler angles.
7. The equation of a plane. The distance of the point from a plane. The angle between two planes.
8. The equation of a line in three-dimensional space. The distance from a point to the line, the distance between two lines. The angle between two lines in space. The angle between a line and a plane.
9. Surfaces of the second order. Geometric mappings in R^3 .

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Describe the main properties of each method for solving constructive tasks.
2.	Choose an appropriate method for solving constructive tasks using geometry sets and interactive geometry software.
3.	Take steps to solve a constructive task.
4.	Analyse the mapping of Euclidean space and appropriate procedures in solving tasks from the point of view of constructive and analytical methods.
5.	Interpret and use analytical geometry definitions, theorems and equations for solving tasks.
6.	Develop spatial abilities.
7.	Implement mathematical proofs of the foundation of the procedures and formulas encountered in this course.

RELATING THE LEARNING OUTCOMES, ORGANIZATION OF THE EDUCATIONAL PROCESS AND ASSESSMENT OF THE LEARNING OUTCOMES.

TEACHING ACTIVITY	ECTS	LEARNING OUTCOME**	STUDENT ACTIVITY*	EVALUATION METHOD	POINTS	
					min	max

Attending lectures and exercises	2	1-7	Lecture attendance, discussion, team work and independent work on given tasks	Attendance lists, tracking activities	0	4
Written exam (Mid-terms)	2	1, 2, 3, 5, 6	Preparing for the written exam	Evaluation	25	48
Final exam	2	1, 2, 4, 5, 7	Revising	Oral exam	25	48
TOTAL	6				50	100

Teaching methods and knowledge assessment. Lectures and exercises are obligatory. The exam consists of a written and an oral part. Upon completion of the course, students can take the exam. Successful midterm exam scores replace the written exam.

Can the course be taught in English: Yes.

Basic literature:

1. D. Palman, Geometrijske konstrukcije, Element, Zagreb, 1996.
2. B. Pavković, D. Veljan, Elementarna matematika 2, Školska knjiga, Zagreb, 1995.

Recommended literature:

1. B. Pavković, D. Veljan, Elementarna matematika 1, Školska knjiga, Zagreb, 2004.
2. R. A. Sharipov, A course of analytical geometry, Bashkir State University, 2013.
3. A. V. Pogorelov, Analytical geometry, Mir Publishers, 1980.