UNIVERSITY
OF WARMIA AND MAZURY
IN OLSZTYN

Faculty of Mathematics and Computer Science

Course title: ELEMENTS OF ALGEBRA AND ANALYTICAL GEOMETRY

ECTS credit allocation (and other scores): 6

Semester: autumn

Level of study: ISCED-6 - first-cycle programmes (EQF-6)

Branch of science: Natural sciences

Language: English

Number of hours per semester: 30 lectures + 45 classes = 75 hours

Course coordinator/ Department and e-mail: Erasmus coordinator Anna Szczepkowska/ WMiI, anna.szczepkowska@matman.uwm.edu.pl

Type of classes: classes and lectures

Substantive content

CLASSES:

Solving exercises illustrating concepts introduced during lectures.

LECTURES:
1. Groups and fields: definition of a group, examples; permutation groups of finite sets; the concept of a field, examples of fields. 2. Complex numbers: real and imaginary part of a complex number; sum and multiplication of complex numbers, their properties; conjugation, modulus and argument of a complex number; complex plane; the polar form of a complex number; the Moivre's theorem; the formula for roots of a complex numbers. 3. Matrices and determinants: definition of a matrix; arithmetic of matrices; definition of a determinant and methods of its computation; properties of a determinant; finding the inverse matrix; rank of a matrix and methods of its computation. 4. Solving linear equations. 5. Vector spaces: definition of a vector space, examples; basic properties of a vector space; subspaces; linear combination; linear span of a set; linear (in)dependence; basis and dimension; coefficients and basis; change of basis. 6. Linear transformations: definition and examples; the kernel and the image of a linear transformation; matrix of a linear transformation; izomorphic vector spaces; invariant subspaces; eigenvalues and eigenvectors of an endomorphism; applications of linear transformations. 7. Chosen aspects of analitycal geometry on the plane and in the three dimensional space.

Learning purpose:
The aim of the course is to make students familiar with chosen concepts of algebra (in particular linear algebra) and basis of analytical geometry in the plane and in the three dimensional space. Course should provide students with tools from algebra and in turn enable them to better understand subjects which follow in the program of studies (e.g. numerical methods, optimasing methods and coding theory). During the course students should get used to mathematical formality and to a certain level of abstraction.

On completion of the study programme the graduate will gain:

Knowledge:

one knows basic definitions, theorems and methods from chosen parts of algebra
one has general knowledge of analytical geometry method

one understands the civilizational meaning of mathematics and its applications (K1_W25) Skills

Skills:

one is able to obtain necessary information from literature connected with chosen parts of algebra, analytical geometry and also to integrate it, to make conclusions and justify methods which are used;
one has the ability of self-learning in chosen parts of algebra and analytical geometry

Social Competencies:

one understands their own limits and sees the need of additional learning

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Basic literature:

1) Andrzej Białynicki - Birula, Algebra, wyd. PWN Warszawa, 2009 ; 2) Jerzy Rutkowski, Algebra abstrakcyjna w zadaniach, wyd. PWN Warszawa, 2000 ; 3) Teresa Jurlewicz, Zbigniew Skoczylas, Algebra i geometria analityczna, Przykłady i zadania, wyd. Oficyna Wydawnicza GiS, 2008 ; 4) Jerzy Rutkowski, Algebra liniowa w zadaniach, wyd. PWN Warszawa, 2011

Supplementary literature:

1) Andrzej Białynicki – Birula, Algebra liniowa z geometrią, wyd. PWN Warszawa, 1979 ; 2) Ireneusz Nabiałek, Zadania z algebry liniowej, wyd. Wydawnictwa Naukowo-Techniczne Warszawa, 2006

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 3,20 ECTS points,

Student's independent work: 2.8 ECTS points,