COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics 2

Course

Field of study
Automatic Control and Robotics

Year/Semester
1/1

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
30

Projects/seminars
0

Number of credit points

6

Lecturers

Responsible for the course/lecturer:
dr Tomasz Kiwerski

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dr Tomasz Kiwerski

Prerequisites

High school level mathematical knowledge and the ability to use it in some specific practical situations.

Course objective

To provide students with basic knowledge of algebra, in particular, about the field of complex numbers, linear algebra and some structures of abstract algebra. Developing abstract thinking skills, as well as the ability to apply the acquired knowledge in more practical issues.

Course-related learning outcomes

Knowledge

Student has a knowledge of the basisc of linear and abstract algebra.

Skills

Student should know the basic methods of linear algebra and be able to illustrate the most important theorems and definitions with appropriate examples.

Social competences

Student should know the limitations of his own knowledge and understand the need to expand his skills.

In addition, he should understand the need to be precise in expressing his thoughts and the value of theoretical thinking.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture - written theoretical knowledge exam (with some possible exercises included) at the end of the semester.

Tutorials - tests and assessment of activity in the classroom.

Programme content

Complex numbers via Hamilton's construction; de Moivre's formula; Euler's formula; roots of complex polynomials and the fundamental theorem of algebra; matrix calculus; Gauss' algorithm; Laplace expansion (cofactor expansion); Cramer's theorem; symmetries; group of permutations GL(n,R); cyclic group; group action; homomorphism; Cayley's theorem; subgroup; image and kernel of a homomorphism; modular arithmetic; rings and fields; vector (linear) spaces and linear operators acting on them; linear (in)dependence; basis; dimension; Kronecker-Capelli theorem; representation of a linear operator as a matrix; eigenvalues and eigenvectors of matrices; characteristic polynomial; eigenspaces; geometric and algebraic multiplicity; eigenbasis for matrices; diagonalization and eigendecomposition; Euclidean spaces.

Teaching methods

Lectures: theory presented in relation to the students' current knowledge; initiating discussions frequently during the lecture; introducing new topics preceded by numerous examples and motivations; recommending materials for self-study and supplementing knowledge.

Tutorials: tasks closely related to the theory presented during the lecture; solving example tasks on the blackboard; detailed reviewing of the solutions to the tasks by the teacher and discussion of the comments; taking into account the activity of students during classes when assigning the final grade.

Bibliography

Basic

1. J. B. Fraleigh, Calculus with analytic geometry, 1980.

2. G. Strang, Introduction to linear algebra, 2009.

3. A. I. Kostrykin, Wstęp do algebry. Podstawy algebry, 2012.

4. T. Jurlewicz i Z. Skoczylas, Algebra liniowa 1, 2003.

5. T. Jurlewicz i Z. Skoczylas, Algebra liniowa 2. 2005.

Additional

1. W. K. Nicholson, Elementary linear algebra with applications, 1986.

2. H. Anton, Calculus with analytic geometry, 1989.

3. M. Grzesiak, Liczby zespolone i algebra liniowa, 1999.

Breakdown of average student's workload

	Hours	ECTS
Total workload	140	6,0
Classes requiring direct contact with the teacher	70	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	70	3,0

[1] delete or add other activities as appropriate