COURSE DESCRIPTION CARD- SYLLABUS

Course name

Linear algebra with analytic geometry I

Course

Field of study

Mathematics in Technology

Area of study (specialization)

—

Level of study

first-cycle studies

Form of study

full-time

Year/Semester

1/1

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

Number of hours

Lectures

30

Laboratory classes

—

Other (e.g. online)

—

Tutorials

30

Projects/seminars

—

Number of credit points

5

Lecturers

Responsible for the course/lecturer::

dr hab. inż. Paweł Kolwicz prof. PP

Responsible for the course/lecturer::

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Prerequisites

Basic knowledge with range of secondary school. The skill of efficient executing of algebraic operations, acquaintance of number sets as well as fundamental operations. He has consciousness of need of broadening his competences, readiness to undertaking of co-operation

Course objective

The know basic notions of calculus of complex numbers. To be acquainted with a matrix calculus and its applications to solving systems of linear equations. To know basic notions of the theory of linear spaces and linear operators, to be able to solve the eigenvalue problem. To use vector calculus to analysis of straight line and the plane in the space.

Course-related learning outcomes

Knowledge

- has the knowledge of the basic notions of matrix calculus, theory of linear spaces and linear operators, has the knowledge of complex numbers in different forms, can explain operations on complex numbers understand proofs (or their ideas) of more important selected theorems;
- has the knowledge of basic notions of vector algebra, distinguish equations of straight line and plane in the space.

Skills

- calculate determinants and rank of matrix, apply matrix calculus to solving systems of linear equations, distinguish linear subspaces and the dimension of linear space, solve of an eigenvalue problem of linear operator given by a matrix;
- determine of the straight line equation and plane equation in the space by applying vector algebra, can use basic calculus of complex numbers.

Social competences

- can think and behave in good mathematical manner in the area of linear algebra and analitical geometry;
- knows the limitation of own knowledge and understand the need of more far education and the necessity of systematic work .

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures:

- assessment of knowledge and skills at the written exam checking knowledge of concepts and the ability to prove theorems and illustrate the theory with examples (short practical tasks are also possible);
- passing threshold: 50% of points. Exam issues on the basis of which questions are prepared will be sent to students by e-mail using the university e-mail system.

Tutorials:

- continuous evaluation – rewarding the activity (additional points) manifested in the discussion and in cooperation in solving practical tasks;
- continuous assessment – rewarding the increase of skills in using the techniques learned;
- obtaining additional points for activity during classes, including the presentation of papers discussing additional aspects of issues, in particular the application of the theory in other sciences or a reference to the place in the history of mathematics;
- active participation in consultations deepening knowledge and directing further work;
- knowledge acquired as part of the exercises is verified by two tests carried out on about 7 and 15 exercises. Passing threshold: 50% of points.

Programme content

Update: 31.01.2020r.

Lectures: theoretical issues (definitions, lemmas, theorems, corollaries, algorithms) and relevant examples for the issues:

- complex numbers (algebraic, trigonometric and exponential forms, algebraic equations);
- number fields, abstract fields;
- linear spaces, base, dimension;
- linear operators, eigenvalues ??and eigenvectors of a linear operators;
- matrices, determinants, systems of linear equations, matrix equations;
- vector calculus (scalar and vector product of vectors), line and plane in space.

Tutorials:

- solving practical problems illustrating the concepts discussed and examples of problems using the theoretical machinery of the lecture, e.g.: using algebraic, trigonometric or exponential forms to solve algebraic equations, determining sets on the complex plane;
- determining the dimension of the linear space, finding the coordinates of an element after changing the base, studing linear subspaces;
- examining the linearity of the operator and determining the operator matrix in the determined base, solving the eigenvalue problem of the operator;
- solving matrix equations, calculating determinants;
- solving systems of linear equations using the Gauss method;
- determining the inverse matrix, rank of the matrix, using the vector calculus in geometry.

Teaching methods

Lectures:

- a lecture on an interactive board with questions for a group of students;
- students' activity (preparation of historical reports on the subject of mathematicians related to the presented material, reports about the applications of algebra in engineering sciences, presentation of proofs left to be done independently) during classes can increase the final assessment;
- initiating discussions during the lecture;
- theory presented in connection with the current knowledge of students from previous lectures.

Tutorials:

- solving sample tasks on the board;
- detailed reviewing the solutions of tasks by the teacher and discussions on comments.

Bibliography

Basic

- A. I. Kostrykin, Wstęp do algebry, cz.1 Podstawy algebry, PWN, Warszawa 2004.
- A. I. Kostrykin, Wstęp do algebry, cz.2 Algebra liniowa, PWN, Warszawa 2004.
- A. I. Kostrykin, Zbiór zadań z algebry, PWN, Warszawa 2005.
- M. Grzesiak, Liczby zespolone i algebra liniowa, Poznań 1999.
- T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1, Wrocław 2003.
- T. Jurlewicz, Z. Skoczylas, Algebra liniowa 2, Wrocław 2005.

Additional

- H. Arodź, K. Rościszewski, Zbiór zadań z algebry i geometrii analitycznej dla fizyków, PWN, 1990.
- J. Rutkowski, Algebra liniowa w zadaniach, PWN.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5
Classes requiring direct contact with the teacher	70	3
Student's own work (literature studies, preparation for tutorials, preparation for tests/exam)	55	2