SYLLABUS

Name: ***Algebra and analytic geometry (MakAu>SI2AAG19)***
Name in Polish:
Name in English: ***Algebra and analytical geometry***

Information on course:

Course offered by department: Faculty of Automatic Control, Electronics and Computer Science
Course for department: Silesian University of Technology

Default type of course examination report:

EGZ

Language:

English

Course homepage:

https://platforma2.polsl.pl/rau1/course/view.php?id=119

Short description:

The aim of the education is to use of the basic mathematical apparatus (vector spaces and linear transformations) necessary for further study, and to formulate problems and describe them in the language of algebra, and how to interpret results.
Knowledge of the concepts and methods covered in the first semester of the AaAG course is required.

Description:

ECTS: 5
Total workload: 125 hours (65 contact hours, 60 students' own work hours)
Forms of contact hours:
Lecture: 15h
Classes: 15h
Other (e.g. test revision and discussion, homework evaluation) 35h
Students' own work: 60h preparation for lectures and classes, own work with educational materials available on PZE platform, preparation for tests and exam)

Lecture:
a) Vector Spaces (def.+examples, subspaces of vector space, spanning sets, linear dependence and independence, basis and dimension); Inner Product Spaces (def., length and distance in inner product spaces, complex vector space, complex inner product space, angle and orthogonality, orthogonal basis, the Gram Schmith orthonormalization process);
b) Linear Transformations (transformation defined by matrix, kernel and range, standard matrix, composition of transformations, inverse transformation, matrix of nonstandard basis, transition matrix and similarity); Eigenvalues and Eigenvectors (def., eigenspaces, diagonalization, orthogonal diagonalization, Jordan canonical form)

Clases:
solving tasks and problems corresponding to the content introduced and discussed during the lecture

The teaching methods used are:
- Lectures, illustrated with slides, are conducted by the traditional method. During lectures, the necessary definitions and theorems (always illustrated by examples) are presented and discussed. Slides are available on the platform.
- Classes, during which practical problems related to currently discussed chapters are solved and discussed with students; materials useful in classes (e.g. sample sets of tasks) are placed on PZE platform.
Both during the lectures, and especially during the classes, students are expected to be active.

Bibliography:

1) Cheney, Koncaid: Linear Algebra. Theory and Applications, Jones and Bartlett Publishers, 2009.
2) Kolman, Hill: Elementary Linear Algebra with Applications, Pearson International Edition, 2008.
3) Larson, Edwards: Elementary Linear Algebra, D.C. Heath and Company, 1991.
4) Fraleigh, Beauregard: Linear Algebra, Addison-Wesley Publishing Company,1999
5) Grzymkowski: Matematyka dla studentów wyższych uczelni technicznych, Wyd. Pracowni Komputerowej Jacka Skalmierskiego, 1999 (in Polish)
6) Jurlewicz, Skoczylas: Algebra liniowa 1 i 2. Definicje, twierdzenia, wzory. Oficyna Wydawnicza GiS. Wrocław 2001. (in Polish)
7) Krysicki, Włodarski, Analiza matematyczna w zadaniach, cz.I (in Polish)
8) Grzymkowski, Zbiór zadań z matematyki (wybrane działy) (in Polish)
9) Adrianowicz, Nowak, Po co nam ta Matematyka, Zastosowania algebry liniowej nie tylko dla studentów pierwszych lat studiów technicznych (in Polish)

Learning outcomes:

Course-specific learning outcomes: Student who complete the course
knows and understands
the concept of linear space and its basis, the representation of a vector in the basis, the concept of scalar product and orthogonality, linear transformation and its properties, eigenvalues and eigenvectors, Jordan matrix and Jordan basis (test, exam) K1A_W02;
able to:
determine the coordinates of a vector in a basis; find and use orthogonal bases;
determine the kernel and image of a linear transformation, as well as its properties; determine eigenvalues and eigenvectors; determine a Jordan matrix and Jordan basis. (test) K1A U09

Assessment methods and assessment criteria:

Each educational effect (subpoints a,b above) will be examined on the short test, organized during the lecture.
Information about the term of the test will be given not later than 2 weeks before. For each effect, the student can get 15 points. The effect is passed after obtaining min. 40% of the points (i.e., not less than 6).

Pass of all the learning effects is a necessary condition for completion of the semester. The mark Z for passing the classes (the first component of the final grade) is determined in percentages.

The absence on the test without excuse (sickness, etc.) results in an unsatisfactory mark for effect exanimated in the term.

In class, the student can get an additional 5 points for the activity (these points we do not associate with the effects, but they can raise the final grade).

Students who haven't passed some of the education effects may try to give it during the correction colloquium organized on the last lecture in the semester (or possibly on an additional term in session). The maximum number of points that can be obtained in the correction term is half of all possible points in the test (ie. 8 points).

Persons wishing to improve already passed effects will be able to do this during the correction test. Only one-time attempt is permitted. The grade Z will include the number of points obtained on the improvement (even if it is less than the one obtained earlier).

Only students who have passed at least one effect may take the final exam in session.

After the second semester, there is an exam in the form of a multiple-choice test. The exam is passed after obtaining a minimum of 40% points. The grade E obtained on the exam is the second component on the basis of which the final grade is determined after the second semester.

There is an opportunity to pass the exam if the student obtains at least 40% of the points from each theoretical quiz organized during the semester (after each chapter).

After passing all practical effects (a), (b) and passing the theoretical exam, the final grade (calculated as 0.7 * Z + 0.3 * E) is determined on the basis of the following scale:

(< 39%) unsatisfactory,
(40% – 60%) satisfactory (3,0),
(60% – 65%) satisfactory plus (3,5),
(65% – 80%) good (4,0),
(80% – 85%) good plus (4,5),
(> 85%) very good (5,0).

The syllabus is effective from the 2nd semester / academic year 2025/26, and its content is not subject to change during the semester

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	5	2020/2021-L	