**Nazwa przedmiotu:**

Algebra

**Koordynator przedmiotu:**

Piotr Figurny, M.Sc.

**Status przedmiotu:**

Obowiązkowy

**Poziom kształcenia:**

Studia I stopnia

**Program:**

Electric and Hybrid Vehicles Engineering

**Grupa przedmiotów:**

Matematyka

**Kod przedmiotu:**

1120-00000-ISA-0102

**Semestr nominalny:**

1 / rok ak. 2022/2023

**Liczba punktów ECTS:**

4

**Liczba godzin pracy studenta związanych z osiągnięciem efektów uczenia się:**

1) Number of contact hours- 50, including:
a) lecture - 30 h.;
b) practicals – 15 h
c) consultations - 2 h
d) exam -– 3 h

2) Student’s individual work 60 hours, including:
a)40 h – student’s current preparation for practicals and lectures, literature study,
b) 10 h – student’s current preparation for tests,
c) 10 h - student’s current preparation for exam

3) TOTAL – sum of individual work and contact hours- 110 h.

**Liczba punktów ECTS na zajęciach wymagających bezpośredniego udziału nauczycieli akademickich:**

2 ECTS points – number of contact hours - 50, including:
a) lecture - 30 h.;
b) practicals – 15 h
c) consultations - 2 h
d) exam -– 3 h

**Język prowadzenia zajęć:**

angielski

**Liczba punktów ECTS, którą student uzyskuje w ramach zajęć o charakterze praktycznym:**

**Formy zajęć i ich wymiar w semestrze:**

|  |  |
| --- | --- |
| Wykład:  | 30h |
| Ćwiczenia:  | 15h |
| Laboratorium:  | 0h |
| Projekt:  | 0h |
| Lekcje komputerowe:  | 0h |

**Wymagania wstępne:**

Knowledge of mathematics at the second school level

**Limit liczby studentów:**

**Cel przedmiotu:**

Knowledge of selected departments of linear algebra and analytic geometry, necessary for studying major subjects.

**Treści kształcenia:**

Lecture:
1. The body of complex numbers, the algebraic form of a complex number.
2. Module and argument of a complex number, geometrical interpretation.
3. Trigonometric form of a complex number, exponentiation and elementary roots of complex numbers, de Moivre formula.
4. Polynomials in the complex domain, Bezout's theorem, the basic theorem of algebra.
5. Definition of matrices, operations on matrices.
6. Definition of determinant, properties of determinants, Sarrus pattern.
7. Inverse matrix.
8. Matrix form of a system of linear equations, Cramer systems.
9. Row of matrices, the Kronecker-Capelli theorem.
10. Gauss elimination method.
11. Conical curves.
12. Vectors in space, scalar and vector product, mixed product.
13. Equations of the plane and the straight line, the mutual positions of simple points and planes in space.14. Second degree surfaces.
15. Rotating surfaces.
16. Cylindrical and conical surfaces.

Practicals:
1. Calculation of the values of expressions in the complex domain.
2. Determination of the module and argument of a complex number, geometric interpretation of sets of numbers on a complex plane.
3. Determination of the trigonometric form of a complex number, exponentiation and the roots of complex numbers.
4. Determination of polynomial elements in the complex domain,
5. Distribution of polynomials into factors, solving algebraic equations.
6. Performing actions on matrices.
7. Calculation of matrix determinants by Laplace method.
8. The use of matrix elemental transformations in the process of calculating determinants.
9. Use of the Sarrus formula.
10. Determining the inverse matrix.
11. Solving systems of Cramer equations with the determinative method and the inverse matrix.
12. Determining the order of the matrix.
13. The use of the Kronecker - Capelli theorem to solve systems of linear equations.
14. Solving systems of equations using the Gaussian elimination method.
15. Study of the properties of conical curves.
16. Calculation of the scalar, vector and mixed product of vectors.
17. Determination of the plane equation in general, sectional and parametric form.
18. Determining the equation of a straight line in parametric, directional and edge form.
19. Solving tasks regarding the mutual position of simple points and planes in space.
20. Determination of equations of rotating, cylindrical and conical surfaces.
21. Identification of areas described by the second degree equations.

**Metody oceny:**

Lecture: Exam, Credit is granted based on sum of points obtained from practicals and an exam.
Practicals: tests and work during classes.

**Egzamin:**

tak

**Literatura:**

1. Nawrocki J. Matematyka 30 wykładów z ćwiczeniami, Oficyna Wydawnicza Politechniki Warszawskiej, Wyd. 2, 2007.
2. Gdowski B., Pluciński E., Zadania z rachunku wektorowego i geometrii analitycznej, PWN, 1974.
3. Jurlewicz T., Skoczylas Z., Algebra i geometria analityczna, Definicje, twierdzenia, wzory, GIS, 2014.
4. Jurlewicz T., Skoczylas Z., Algebra i geometria analityczna, Przykłady i zadania, GIS, 2015.
 5. Otto E. (red.), Matematyka dla wydziałów budowlanych i mechanicznych, Tom 1, PWN, 1978.
6. Otto E. (red.), Matematyka dla wydziałów budowlanych i mechanicznych, Tom 2, PWN, 1980.
7. Stankiewicz W., Zadania z matematyki dla wyższych uczelni technicznych. Część A i B, PWN 2006.

**Witryna www przedmiotu:**

**Uwagi:**

## Efekty przedmiotowe

### Profil ogólnoakademicki - wiedza

**Efekt 1120-PE000-ISA-0102\_W1:**

The student knows the definitions and theorems in the field of linear algebra.

Weryfikacja:

Obtaining the required by the regulations to pass the subject the number of points for activity in the class, test 1 and the exam.

**Powiązane efekty kierunkowe:** K\_W01

**Powiązane efekty obszarowe:** T1A\_W01, T1A\_W07

**Efekt 1120-PE000-ISA-0102\_W02:**

The student has knowledge of analytic geometry including descriptions of straight lines, planes, conic curves and the surface of the second degree in three-dimensional space.

Weryfikacja:

Obtaining the required by the regulations to pass the subject the number of points for activity in the class, test 2 and the exam.

**Powiązane efekty kierunkowe:** K\_W01

**Powiązane efekty obszarowe:** T1A\_W01, T1A\_W07

### Profil ogólnoakademicki - umiejętności

**Efekt 1120-PE000-ISA-0102\_U01:**

The student is able to perform actions in the body of complex numbers, perform operations on matrices and solve systems of linear equations.

Weryfikacja:

Obtaining the required by the regulations to pass the subject the number of points for activity in the class, test 1 and the exam.

**Powiązane efekty kierunkowe:** K\_U01

**Powiązane efekty obszarowe:** T1A\_U01

**Efekt 1120-PE000-ISA-0102\_U02:**

The student is able to perform actions on vectors, solve tasks regarding the mutual placement of planes, straight lines and surfaces of the second degree in three-dimensional space.

Weryfikacja:

Obtaining the required by the regulations to pass the subject the number of points for activity in the class, test 2 and the exam.

**Powiązane efekty kierunkowe:** K\_U01

**Powiązane efekty obszarowe:** T1A\_U01