

Algebraic and geometrical methods in physics - opis przedmiotu

Informacje ogólne	
Nazwa przedmiotu	Algebraic and geometrical methods in physics
Kod przedmiotu	13.2-WF-FizP-AGMP-I-S17
Wydział	Wydział Fizyki i Astronomii
Kierunek	Fizyka
Profil	ogólnoakademicki
Rodzaj studiów	pierwszego stopnia z tyt. licencjata
Semestr rozpoczęcia	semestr zimowy 2019/2020

Informacje o przedmiocie	
Semestr	1
Liczba punktów ECTS do zdobycia	6
Typ przedmiotu	obowiązkowy
Język nauczania	angielski
Sylabus opracował	- prof. dr hab. Wiesław Leoński - dr hab. Maria Przybylska, prof. UZ

Formy zajęć					
Forma zajęć	Liczba godzin w semestrze (stacjonarne)	Liczba godzin w tygodniu (stacjonarne)	Liczba godzin w semestrze (niestacjonarne)	Liczba godzin w tygodniu (niestacjonarne)	Forma zaliczenia
Wykład	30	2	-	-	Egzamin
Ćwiczenia	45	3	-	-	Zaliczenie na ocenę

Cel przedmiotu

The main aim of course is to give students mathematical tools of algebra and analytic geometry necessary for their further studies of physics. Developing the ability to use algebraic and geometric tools for setting and solving physical problems. Use of vector mathematical tools such as vector space, linear transformation or Euclidean space.

Wymagania wstępne

Knowledge of mathematics and physics at the level of post-gymnasium

Zakres tematyczny

Lecture:

I. Complex numbers: Cartesian and polar parametrization. Complex roots, roots of unity.

II. Polynomials of one variable: operations on polynomials, division of polynomials with rest, roots of polynomials, fundamental theorem of algebra.

III. Matrices: operations on matrices, matrix classification. Square matrices: determinant and its properties. Methods of calculation of determinants.

Cramer linear systems and methods for solving them.

IV. Euclidean vector spaces: vectors in $\mathbb{R}^2$, $\mathbb{R}^3$ and $\mathbb{R}^n$, vector components, vector operations, vector norms, scalar and vector product, orthogonal vectors, angle between vectors.

V. Geometry of linear systems: vectors of solutions of systems of homogeneous and non-homogeneous linear equations. Order of a matrix, Kronecker-Capelli theorem. Methods of solving for general systems of linear equations. Linear transformations and their basic properties. Matrix of linear transformation, eigenvectors and eigenvalues

VI. Elements of analytical geometry: parametric equations of straight lines in $\mathbb{R}^2$ and $\mathbb{R}^3$, equations of planes in space, equations of straight lines and planes with given various data, conics in Cartesian and polar systems,

Class:

Practical realization of the matter presented during lectures and enhancement of the calculus skills.

Metody kształcenia

Lecture: classical lecture

Class: solving of problems related to the subjects considered during lectures with applications in physics.

Efekty uczenia się i metody weryfikacji osiągnięcia efektów uczenia się

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
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Opis efektu	Symbol e efektów	Metody weryfikacji	Forma zajęć
Student knows and understands selected topics of complex number theory, linear algebra and analytical geometry. He/she knows the elementary terminology used in these sciences.	K1A_W02	- egzamin - ustny, opisowy, testowy i inne - kolokwium	- Wykład - Ćwiczenia
Student has the ability to use a mathematical apparatus to describe and model physical phenomena and processes.	K1A_W02	egzamin - ustny, opisowy, testowy i inne	- Wykład - Ćwiczenia
Student is aware of his/her knowledge and skills; understands the need and knows the possibilities of continuing education at higher education levels.	K1A_K01 K1A_K04	dyskusja	- Wykład - Ćwiczenia
Student can determine various forms of complex number, perform various algebraic operations on complex numbers and know the physical applications of complex numbers. He/shi knows the notion of matrix and determinant, performs operations on matrices, calculate determinants. He/she uses determinants to solve linear systems of equations. He/she knows the concept of linear space and its properties, knows various examples of linear spaces, especially those used in physics; performs various operations on vectors and knows their physical applications. He/she understands the concept of linear transformation between vector spaces, knows how to determie eigenvalues and eigenvectors. Student can write equations of straight lines in the plane and equations of planes in three-dimensional space based on various given data. He/she recognizes conics, writes equations of conics in coordinate systems with moved origin, apply these equations to describe physical problems. The student knows characeristic properties of Euclidean spaces and can orthogonalize the given vectors.	K1A_W02 K1A_U01 K1A_U07	- egzamin - ustny, opisowy, testowy i inne - kolokwium	- Wykład - Ćwiczenia
Student uses various materials written in Polish and English.	K1A_U07	- egzamin - ustny, opisowy, testowy i inne - kolokwium	- Wykład - Ćwiczenia

Warunki zaliczenia

Lecture: Positive passing of written exam

Class: Positive passing of all written tests.

Before taking the exam a student must gain positive grade during the class.

Total score: average rating of the exam and grade from the class.

Literatura podstawowa

[1] T. Jurliewicz, Z. Skoczylas, *Algebra liniowa 1*, Oficyna Wydawnicza GiS, Wrocław 2011

[2] T. Jurliewicz, Z. Skoczylas, *Algebra liniowa 2*, Oficyna Wydawnicza GiS, Wrocław 2011

[3] T. Jurliewicz, Z. Skoczylas, *Algebra i geometria analityczna*, Oficyna Wydawnicza GiS, Wrocław 2011.

[4] R. Larson, Elementary linear algebra, 8 edition, Cengage Learning, 2007

[5] S. Lipschutz, M. Lipson, Schaum's outlines. Linear algebra, 3 edition, 2001

[6] E. W. Swokowski, *Calculus with analytic geometry*, Prindle, Weber & Schmidt Publishers, Boston 1983.

Literatura uzupełniająca

Uwagi

Zmodyfikowane przez dr hab. Piotr Lubiński, prof. UZ (ostatnia modyfikacja: 13-01-2020 15:12)

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