COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mathematics

Course

Field of study

Aerospace Engineering

Year/Semester

1 / 1

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

Other (e.g. online)

Tutorials

60

Projects/seminars

Number of credit points

6

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

Prerequisites

Knowledge: Student has knowledge of mathematics at the secondary school level -

Skills: Student is able to solve problems and has the ability to use mathematical tools to solve tasks in the field of secondary school -

Social competencies: The student understands the need for continuous improvement of competences (language, professional and social) and knows the importance of higher mathematics methods in the description of engineering and technical issues. Can independently search for information in the literature.

Course objective

The main aim is the understanding of basic notions and methods theory in order to apply them to solving engineering and technical problems.

Course-related learning outcomes

Knowledge

1. The student has knowledge of mathematics necessary to understand and describe the basic issues related to aerospace engineering (containing: elements of linear algebra and analytic geometry, mathematical analysis) -

2. The student has extended knowledge necessary to understand profile subjects in the field of aerospace engineering for selected specialties -

Skills

1. The student has the ability to self-education using modern teaching tools, such as: remote lectures, websites, didactic programs, e-books -

2. The student is able to obtain information from literature, the Internet and other sources. It is able to integrate obtained information, interpret and draw conclusions from them -

3. The student knows how to use formulas and tables, technical and economic calculations -

Social competences

1. The student is aware of the importance of compliance with the principles of professional ethics -

2. The student understands the need for critical knowledge assessment and continuous education. It is able to think and act in a creative and enterprising way -

3. Student is aware of the social role of a technical university graduate (understands the need to formulate and provide the public with information and opinions on technical achievements and other aspects of engineering activities) -

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: exam in the form of passing theory and tasks.

Classes: evaluation of written tests during the semester and the direct activity during the classes.

Getting extra points related with activity (presentations of examples of applications of mathematics, use of literature, discussion of problems, presenting reports concerning applications of the theory and diligence of the study).

Programme content

Issues:

An overview of the functions of one independent variable. Trigonometric and cyclometric functions. Trigonometric identities. Exponential and logarithmic equations and inequalities.

Complex numbers and their applications - description and different forms (algebraic, trigonometric, exponential); geometric interpretation; activities in a set of complex numbers (Moivre's formula, complex element); polynomials (solving polynomial equations, the basic theorem of algebra); collections on the complex plane.

Numerical sequences. The number of Euler.

Limits of functions (at point, left-sided, right-handed, incorrect, in infinite). Continuity of functions. Asymptote.

Derivative of the function of one independent variable.

The de L'Hospital rule.

Monotonicity and convexity of functions (using the differential calculus). Testing (course of variation) of the function.

Derivative applications (optimization tasks).

Indefinite integral - definition of indefinite integral and primary function, properties, basic formulas, integration by substitution and by parts, examples. Integrals of rational functions and selected integrals of irrational functions and trigonometric functions. Reduction formulas.

Definite integral - definition, geometrical interpretation, Newton-Leibnitz formula, properties, basic formulas, integration by substitution and parts. Examples and applications (flat area, lateral area and volume of a solid of revolution).

Matrix calculus - definition of matrices, their types and arithmetic; determinant of the square matrix and its properties (Laplace theorem, Sarrus scheme, calculating the determinant by the elementary operations method using the Laplace development); inverse matrix and methods of finding it; row of the matrix and its calculation.

Systems of linear equations (matrix notation, Cramer's theorem, Kronecker-Capelli theorem, matrix method of Gauss elimination).

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MODULE 1. MATHEMATIC

1.1 Arithmetic

Arithmetic terms and symbols, multiplication and division methods, fractions and decimal fractions, recommended and multiples, weight, measures and available conversion factors, ratios and proportions, averages and percentages, areas and volumes, second powers, third powers, roots square and cubic. [2]

1.2 Algebra

a) Calculation of simple algebraic expressions, addition, subtraction, multiplication and division, parentheses used, simple algebraic fractions; [2]

b) Linear equations and their solutions; Exponents and powers, negative and fractional powers; Binary system and other systems; Equivalent and second degree equations with one unknown; Logarithms; [1]

1.3 Geometry

a) Simple geometric constructions; [1]

b) Graphic projection; nature and use of graphs, equation / function graphs; [2]

c) Simple trigonometry; trigonometric relationships, use of tables and coordinates polar and rectangular.[2]

Teaching methods

1) Lectures:

- interactive lecture with questions to students or specific students,

- using partially a multimedia presentation (e.g. examples, animations),

- theory presented in connection with the current knowledge of students,

- presenting a new topic preceded by a reminder of related content known to students from other subjects,

- taking into account various aspects of the issues presented (economic, ecological, social),

- student activity is taken into account during the course of the assessment.

2) Classes:

- solving sample tasks on the blackboard,

- initiate discussion on solutions,

- homework / additional tasks.

Bibliography

Basic

1. M. Gewert, Z. Skoczylas, Analiza matematyczna 1, Oficyna Wydawnicza GiS, Wrocław 2005.

2. T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1, Oficyna Wydawnicza GiS, Wrocław 2007.

3. I. Foltyńska, Z. Ratajczak, Z. Szafrański: Matematyka dla studentów uczelni technicznych, cz.1, cz.2, Wydawnictwo Politechniki Poznańskiej, Poznań 2004.

Additional

1. J. Banaś, S. Wędrychowicz, Zbiór zadań z analizy matematycznej, Wydawnictwo WNT, Warszawa 1996.

2. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, cz.1, cz.2, Wydawnictwo naukowe PWN, Warszawa 2010.

Breakdown of average student's workload

	Hours	ECTS
Total workload	174	6,0
Classes requiring direct contact with the teacher	94	3,0
Student's own work (literature studies, preparation for tutorials, preparation for tests) [1]	80	3,0

[1] delete or add other activities as appropriate