COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics 2 [S1Lot2>Mat2]

Course

Field of study
Aviation

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
30

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Knowledge: The student has knowledge of mathematics at the high school level Skills: The student is able to solve problems and has the ability to use mathematical tools to solve high school tasks Social competences: The student understands the need for continuous improvement of competences (linguistic, 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 goal is to understand the basic concepts and methods of the theory in order to apply them to solve engineering and technical problems.

Course-related learning outcomes

Knowledge:
1. has extended and in-depth knowledge of mathematics including algebra, analysis, theory of differential equations, probability, analytical geometry as well as physics covering the basics of classical mechanics, optics, electricity and magnetism, solid state physics, thermodynamics, useful for formulating and solving complex technical tasks related to engineering aeronautical and modeling.

Skills:
1. can use the mathematics (differential and integral calculus) to describe simple engineering problems.

Social competences:
1. is aware of the importance of knowledge in solving engineering problems and knows examples and understands the causes of faulty engineering projects that have led to serious financial and social losses, or to a serious loss of health and even life.
2. is aware of the social role of a technical university graduate, in particular understands the need to formulate and provide the society, in an appropriate form, with information and opinions on engineering activities, technological achievements, as well as the achievements and traditions of the engineer profession.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: exam in the form of a pass in theory and tasks.
Classes: assessment of written tests in the semester and direct activity during classes.
Obtaining additional credits related to activity during classes (presentations of examples of mathematics applications, use of literature, discussion of problems, presentation of reports on the application of theory and thoroughness of elaboration).

Programme content

Overview of functions of one independent variable. Trigonometric and cyclometric functions. Trigonometric identities. Exponential and logarithmic equations and inequalities.
Complex numbers and their applications - definition and different forms (algebraic, trigonometric, exponential); geometric interpretation; operations in the set of complex numbers (Moivre's formula, complex root); polynomials (solving polynomial equations, fundamental theorem of algebra); sets on the complex plane.
Numerical sequences. e-number
Function limits (at a point, left-hand, right-hand, improper, at infinity). Continuity of function. Asymptotes.
The derivative of a function of one independent variable.
L'Hospital's rule.
Monotonicity and convexity of functions (using calculus). Investigation (course of variability) of functions.
Applications of the derivative (optimization tasks).
Indefinite integral - definition of indefinite integral and antiderivative, properties, basic formulas, integration by substitution and by parts, examples. Integrals from rational functions and selected integrals from irrational and trigonometric functions. Reduction formulas.
Definite integral - definition, geometric interpretation, Newton-Leibnitz formula, properties, basic formulas, integration by substitution and by parts. Examples and applications (planar area, lateral surface area and volume of a solid of revolution).
Matrix calculus - definition of matrices, their types and arithmetic; the determinant of a square matrix and its properties (Laplace's theorem, Sarrus' scheme, calculation of the determinant by elementary operations using Laplace's expansion); inverse matrix and methods of finding it; the rank of a matrix and its calculation.
Systems of linear equations (matrix notation, Cramer's theorem, Kronecker-Capelli theorem, Gaussian elimination matrix method).

Course topics

PART - 66 (THEORY -33.75 hours)
MODULE 1. MATHEMATICS
1.1. Arithmetic
Arithmetic terms and symbols, multiplication and division methods, fractions and decimals, coefficients and multiples, weights, measures and conversion factors, ratios and proportions, averages and percentages, areas and magnitudes, second powers, third powers, square and cube roots. [2]
1.2. Algebra

a) Calculation of simple algebraic expressions, addition, subtraction, multiplication and division, using parentheses, simple algebraic fractions; [2]
b) Linear equations and their solutions; Exponents and powers, negative and fractional powers; binary and other systems; Equivalent equations and equations of the second degree with one unknown; [1]

Teaching methods

1) Lectures:
- a lecture conducted in an interactive way with formulating questions to a group of students or to specific students indicated,
- partially using multimedia presentations (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 school,
- taking into account various aspects of the presented issues,
- the activity of students during classes is taken into account when issuing the final grade.
2) Exercises:
- solving exemplary tasks on the board,
- initiating discussions on solutions,
- homework / extra 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	75	3,00
Classes requiring direct contact with the teacher	47	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	28	1,00