



COURSE DESCRIPTION CARD - SYLLABUS

Course name

MATHEMATICS

Course

Field of study

MECHANICAL ENGINEERING

Area of study (specialization)

Level of study

First-cycle studies

Form of study

part-time

Year/Semester

1/1

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

Other (e.g. online)

Tutorials

28

Projects/seminars

Number of credit points

8

Lecturers

Responsible for the course/lecturer:

Andrzej Drozdowicz, Ph.D.

Responsible for the course/lecturer:

Institute of Mathematics

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Prerequisites

1. Student has basic knowledge of elementary functions, algebraic operations, analytical geometry, trigonometry and mathematical analysis.
2. Students should be able to solve simple rational equations and inequalities, to give domains of elementary functions and to know their curves.
3. Students seriously treat the process of studying.

Course objective

The aim of subject is introduction to complex numbers and their some practical applications. Differential and integral calculus of one variable are presented together with their applications in mathematics and mechanics.



Course-related learning outcomes

Knowledge

After completing the first degree studies, the graduate has expanded and in-depth knowledge of various branches of higher mathematics and detailed knowledge on the application of mathematical methods and tools in engineering and mechanical sciences - K_W2.

Skills

After completing the first degree studies, the graduate:

- can use knowledge of higher mathematics; can build and analyse simple mathematical models; can use mathematical tools and methods, including numerical ones, to solve engineering problems - K_U13,
- is able to plan and implement self-education independently in order to raise and update their competences - K_U24.

Social competences

After completing the first degree studies, the graduate:

- is aware of the deepening and expansion of knowledge to solve newly created technical problems - K_K1,
- understands and appreciates the importance of intellectual honesty in own and other people's actions; is ready to demonstrate reliability, impartiality, professionalism and an ethical attitude - K_K1.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: written exam during session,

Tutorials: long test + short tests (10 minutes).

Programme content

1. Complex numbers – algebraic form (modulus, conjugate numbers, arithmetics, square roots), trigonometric form (de Moivre's formula, theorem about calculating roots), exponential form.
2. Elementary linear algebra. Matrix and determinants - definition and properties. The Laplace expansion. System of linear equations. Cramer formulas. Rank of a matrix. Kronecker-Capelli theorem.
3. Vectors calculus. Scalar and vector product of two vectors.
4. Definition of sequences. Monotonicity, boundedness and limits of sequences. Arithmetics of limits. The sandwich theorem (about three sequences). Definition of Euler's constant. Many examples.
5. Definition of a function. Domain and range of functions. Monotonicity of functions. Odd and even functions. Periodicity. Compound functions. Inverse functions.



- 6. Review of elementary functions – polynomials, power functions, exponential functions, logarithmic functions, trigonometric ones, the inverse trigonometric functions (arcus) – formulas, graphs, properties.
- 7. Definition of the derivative of the function. Geometric interpretation. Rules for differentiation (especially for compound functions). Mean value theorems and their applications. Extrema of functions - global and local. Criteria for existing such extrema. De l'Hospital's theorem.
- 8. Antiderivative of a function, definition of indefinite integrals and properties. Integrals of elementary functions. Integration by parts and integration by substitution. Integration of rational functions. Integration of trigonometric functions. Integration of some irrational functions.

Teaching methods

Lecture: multimedial presentation + blackboard,

Tutorials: solving of problems; discussion about obtained results.

Bibliography

Basic

- 1. W. Żakowski, Matematyka, T.1 i T.2, WNT, Warszawa 2003.
- 2. I. Fołtyńska, Z. Ratajczak, Z. Szafranski, Matematyka dla studentów uczelni technicznych, tom 1,2, Wydawnictwo PP, Poznań 2000.

Additional

- 1. W. Krywicki, L. Włodarski, Analiza matematyczna w zadaniach, T.1, T.2, PWN, Warszawa 2011.

Breakdown of average student's workload

	Hours	ECTS
Total workload	118	8,0
Classes requiring direct contact with the teacher	68	4,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	50	4,0

¹ delete or add other activities as appropriate