GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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| Subject name and code | Mathematics I, PG_00058736 | | |
| Field of study | Environmental Engineering | | |
| Date of commencement of studies | October 2025 | Academic year of realisation of subject | 2025/2026 |
| Education level | first-cycle studies | Subject group | Obligatory subject group in the field of study |
| Mode of study | Full-time studies | Mode of delivery | at the university |
| Year of study | 1 | Language of instruction | Polish |
| Semester of study | 1 | ECTS credits | 9.0 |
| Learning profile | general academic profile | Assessment form | exam |
| Conducting unit | Mathematics Center -> Vice-Rector For Education | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr Cezary Mrozicki | |
| | Teachers | | |

**Lesson types and methods of instruction**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 45.0 | 60.0 | 0.0 | 0.0 | 0.0 | 105 |

E-learning hours included: 0.0

**Learning activity and number of study hours**

| Learning activity | Participation in didactic classes included in study plan | Participation in consultation hours | Self-study | SUM |
|---|---|---|---|---|
| Number of study hours | 105 | 8.0 | 112.0 | 225 |

**Subject objectives**

Students obtain competence in the range of using methods of mathematical analisis and knowledge how to solve simple problems that can be found in the field of engineering.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_W01] has knowledge in the field of mathematics, including: linear algebra, mathematical analysis and elements of mathematical statistics, probability theory, applications of mathematics, including mathematical methods and numerical methods, necessary for: 1) description and analysis of hydrological phenomena; 2) description and analysis of meteorological phenomena; 3) solving project tasks of the sanitary industry; | The student lists the basic properties of elementary functions.<br>The student solves equations and inequalities containing elementary functions.<br>The student interprets geometrically the study of graphs of functions using the concept of limit and continuity of functions.<br>The student defines the basic concepts of differential calculus of one variable.<br>The student analyses the properties of functions on the basis of an examination of its first and second derivative.<br>The student applies the basic rules and techniques of integration to calculate indefinite integrals.<br>The student lists geometrical applications of definite integrals.<br>The student distinguishes between types of improper integrals.<br>The student solves equations using complex numbers. | [SW1] Assessment of factual knowledge<br>[SW2] Assessment of knowledge contained in presentation<br>[SW3] Assessment of knowledge contained in written work and projects |
| [K6_U01] has the ability to self-education, can obtain information from literature, databases and other sources, uses information technology, Internet resources; can integrate the obtained information, make their interpretation, as well as draw conclusions and formulate and justify opinions | The student combines knowledge of mathematics with knowledge from other fields. | [SU1] Assessment of task fulfilment<br>[SU2] Assessment of ability to analyse information<br>[SU3] Assessment of ability to use knowledge gained from the subject<br>[SU4] Assessment of ability to use methods and tools<br>[SU5] Assessment of ability to present the results of task |

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| Subject contents | Functions of one variable and their properties:<br>The absolute value function definition, solving equations and inequalities with absolute value, graphs of functions with absolute value.<br>Power, exponential, logarithmic, trigonometric and cyclometric functions properties and graphs, solving equations and inequalities.<br><br>Limits and continuity:<br>Infinite sequences.<br>Fundamental definitions of limit of sequence, convergence and divergence, limit theorems.<br>Applications to solving equation.<br><br>Differential calculus of functions with one variable and applications of differential calculus of functions with one variable:<br>Definition of first derivative and differential.<br>Rolls and Lagranges theorems.<br>Higher derivatives and differentials.<br>Monotonicity and local extrema.<br>Convexity, concavity and inflexion points of a function.<br>De lHospitals Theorem. Taylors Theorem.<br>Asymptotes.<br>Applying differential calculus to study the properties of one variable functions.<br><br>Integral calculus of functions with one variable indefinite integral:<br>Basic methods and ways of integration - integration by parts and substitution.<br>Integration of rational functions, trigonometric and irrational.<br><br>Definite integrals in Riemanns sense:<br>Newton-Leibnitz Theorem.<br>Integration formulas, the substitution method of integration and integration by parts for definite integrals.<br>Applications of integral calculus in computing areas of plane figures, lengths of arcs, volumes of solids of resolution.<br><br>Improper integral:<br>Definition. Types of integrals.<br><br>Analytic geometry in 3-space:<br>Basic vectors definitions and properties. Eigenvectors and Eigenvalues.<br>Dot product, cross product, triple scalar product - their properties and applications.<br>Equations for lines and planes in 3-space.<br>The distance from a point to a plan.<br>Angles between planes and lines.<br><br>Complex numbers:<br>Algebraic form, equality, conjugation, operations, modulus, trigonometric form, operations in polar form, roots, solving equations. |
| Prerequisites and co-requisites | There are no preliminary or additional requirements. |
| Assessment methods and criteria | |

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Written exam | 50.0% | 50.0% |
| Midterm colloquium | 50.0% | 50.0% |

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| Recommended reading | Basic literature | Pod redakcją B. Wikieł, Matematyka. Podstawy z elementami matematyki wyższej. Wydawnictwo PG, Gdańsk 2009<br>W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach 1, Wydawnictwo Naukowe PWN, Warszawa 2008<br>M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Definicje. Twierdzenia. Wzory. Oficyna Wydawnicza GIS, Wrocław 2008<br>M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Przykłady i zadania. Oficyna Wydawnicza GIS, Wrocław 2008<br>T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1. Definicje. Twierdzenia. Wzory. Oficyna Wydawnicza GIS, Wrocław 2006<br>T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1. Przykłady i zadania. Oficyna Wydawnicza GIS, Wrocław 2006<br>K. Jankowska, T. Jankowski, Zbiór zadań z matematyki, Wydawnictwo PG, Gdańsk 2008<br>K. Jankowska, T. Jankowski, Zadania z matematyki wyższej, Wydawnictwo PG, Gdańsk 2008<br>K. Jankowska, T. Jankowski, Funkcje wielu zmiennych. Całki wielokrotne. Geometria analityczna, Wydawnictwo PG, Gdańsk 2008 |
| | Supplementary literature | W. Leksiński, I. Nabiałek, W. Żakowski, Matematyka. Definicje, twierdzenia, przykłady, zadania. WNT, Warszawa 2006 |
| | eResources addresses | Adresy na platformie eNauczanie: |
| Example issues/ example questions/ tasks being completed | 1. Investigate the monotonicity of the sequence (an).<br><br>2. Enter the properties of the function f (x) = ....<br><br>3. Calculate the derivative of the function f (x) = ....<br><br>4. Determine the indefinite integral of the function f (x) = ... . | |
| Work placement | Not applicable | |

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