GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Mathematics II, PG_00043527 | | |
| Field of study | Environmental Engineering | | |
| Date of commencement of studies | October 2021 | Academic year of realisation of subject | 2021/2022 |
| Education level | first-cycle studies | Subject group | Obligatory subject group in the field of study<br>Subject group related to scientific research 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 | 2 | ECTS credits | 5.0 |
| 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 | mgr Justyna Woroń<br>dr Cezary Mrozicki<br>mgr Małgorzata Kula | |

**Lesson types and methods of instruction**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 30.0 | 30.0 | 0.0 | 0.0 | 0.0 | 60 |

E-learning hours included: 0.0

Adresy na platformie eNauczanie:
WILiŚ - Inżynieria Środowiska - sem. 2 - Matematyka 2021/2022 (C. Mrozicki) - Moodle ID: 19972
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=19972

**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 | 60 | 10.0 | 60.0 | 130 |

**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_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 is able to interpret the use of the geometric integral calculus and distinguish improper integrals. The student knows how to solve equations and inequalities containing complex numbers. Student uses elements of linear algebra to solve systems of linear equations. The student knows how to analyze the convergence of a numerical aid of a different criteria. The student is able to use the array to determine the sum of a number and approximate calculations. The student knows how to use the methods of differential calculus of several variables in issues related to optimization, search for local and global extremes. | [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 |
| [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 geometrical applications of definite integrals. The student distinguishes between types of improper integrals. The student solves equations using complex numbers. The student defines the basic concepts of linear algebra. The student describes the methods of solving systems of linear equations. The student applies concepts of analytic geometry to solve tasks. The student calculates the radius of convergence and the interval of convergence of a power series. The student uses function series to determine the sum of a number series and in approximate calculation. The student applies the concept of functions of several variables to determine the extremes of the function. The student recognizes the importance of self-expanding knowledge and take the challenges of working with a group problem-solving. | [SW1] Assessment of factual knowledge<br>[SW2] Assessment of knowledge contained in presentation<br>[SW3] Assessment of knowledge contained in written work and projects |

## Subject contents

Definite integral in Riemanns sense: Newton-Leibnitz Theorem. Integration formulas, the substitution method of integration and integration by parts for definite integrals. Applications of integral calculus in computing areas of plane figures, lengths of arcs, volumes of solids of resolution. Improper integral. Definition. Types of integrals. Complex numbers: Algebraic form, equality, conjugation, operations, modulus, trigonometric form, operations in polar form, roots, solving equations. Elements of linear algebra: Matrices (definition, types of matrices, matrix operations), determinants (definition and properties), rank of a matrix, system of linear equations (Cramer"s rule, Kronecker-Capelli theorem, Gauss-Jordan elimination method). Analytic geometry in 3-space: Basic vectors definitions and properties. Eigenvectors and Eigenvalues. Dot product, cross product, triple scalar product - their properties and applications. Equations for lines and planes in 3-space. The distance from a point to a plan. Angles between planes and lines. Number series and function series: Number series. Convergent and divergent series. Convergence tests of number series. Power series. Radius and interval of convergence. Taylors and Maclaurins series. Integration and differentiation of power series. Examples of applications - approximate calculation of integrals. Information on Fourier series Functions of two variables: Limit and continuity of a function of several variables. Partial derivatives. Total differential. Taylors formula. Maxima and minima of a function of several variables. Implicit functions.

## Prerequisites and co-requisites

Knowledge of the subject: Mathematics I.

## Assessment methods and criteria

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Written exam | 50.0% | 35.0% |
| Midterm colloquium | 50.0% | 65.0% |

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| Recommended reading | Basic literature | W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach 1, Wydawnictwo Naukowe PWN, Warszawa 2008 W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach 2, Wydawnictwo Naukowe PWN, Warszawa 2008 M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Definicje. Twierdzenia. Wzory. Oficyna Wydawnicza GIS, Wrocław 2008 M. Gewert, Z. Skoczylas, Analiza matematyczna 2. Definicje. Twierdzenia. Wzory. Oficyna Wydawnicza GIS, Wrocław 2008 M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Przykłady i zadania. Oficyna Wydawnicza GIS, Wrocław 2008 M. Gewert, Z. Skoczylas, Analiza matematyczna 2. Przykłady i zadania. Oficyna Wydawnicza GIS, Wrocław 2008 T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1. Definicje. Twierdzenia. Wzory. Oficyna Wydawnicza GIS, Wrocław 2006 T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1. Przykłady i zadania. Oficyna Wydawnicza GIS, Wrocław 2006 T. Jurlewicz, Z. Skoczylas, Algebra liniowa 2. Definicje. Twierdzenia. Wzory. Oficyna Wydawnicza GIS, Wrocław 2006 T. Jurlewicz, Z. Skoczylas, Algebra liniowa 2. Przykłady i zadania. Oficyna Wydawnicza GIS, Wrocław 2006 K. Jankowska, T. Jankowski, Zbiór zadań z matematyki, Wydawnictwo PG, Gdańsk 2008 K. Jankowska, T. Jankowski, Zadania z matematyki wyższej, Wydawnictwo PG, Gdańsk 2008 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 | WILiŚ - Inżynieria Środowiska - sem. 2 - Matematyka 2021/2022 (C. Mrozicki) - Moodle ID: 19972<br>https://enauczanie.pg.edu.pl/moodle/course/view.php?id=19972 |
| Example issues/ example questions/ tasks being completed | 1. Give the definition of the sum of the series.<br><br>2. Check whether the given series is convergent using the ratio test, the root test.. the comparison test or the integral test.<br><br>3. Discuss the existence of the solution for the given system of linear equations.<br><br>4. Compute partial differentials of the second order for the given function f(x,y) .<br><br>5.. Find extreme values of the function f(x,y). | |
| Work placement | Not applicable | |