# GDAŃSK UNIVERSITY OF TECHNOLOGY

## Subject card

| Subject name and code | Mathematics, PG_00053079 | | |
|---|---|---|---|
| Field of study | Chemistry | | |
| Date of commencement of studies | October 2020 | Academic year of realisation of subject | 2020/2021 |
| 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 | 2 | 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 Anita Dąbrowicz-Tlałka | |
| | Teachers | mgr Dorota Garbowska | |
| | | dr Anita Dąbrowicz-Tlałka | |

| 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 | | | | | | |
| | Adresy na platformie eNauczanie: <br> WCh - Ch - s2, gr.1,2: 2020/21 (D.Garbowska) - Moodle ID: 11677 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11677 <br> WCh - Ch - s2, gr.1,2: 2020/21 (D.Garbowska) - Moodle ID: 11677 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11677 <br> WCh - Ch - s2, gr.1,2: 2020/21 (D.Garbowska) - Moodle ID: 11677 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11677 <br> WCh - Ch - s2, gr.1,2: 2020/21 (D.Garbowska) - Moodle ID: 11677 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11677 | | | | | | |

| 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 | 10.0 | 110.0 | 225 |

| Subject objectives | The aim of this subject is to obtain the students competence in the range of using the basic methods of mathematical analysis and linear algebra.Furthermore, the student is able to use this knowledge to solve simple theoretical and practical problems that can be found in the field of engineering. |
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| Learning outcomes | | Course outcome | Subject outcome | Method of verification |
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| | | [K6_W01] has basic knowledge of selected areas of mathematics, including: algebra, differential calculus and integral calculus, functions of two variables, elements of analytical geometry, elements of vector analysis, differential equations and probability theory, and knowledge of physics: basic equations and concepts and physical laws, including the knowledge necessary to predict the course of physical phenomena and to solve various technical problems | Student examines the convergence of the number series. Student determines the convergence range of the power series and develops the function into a series. Student defines basic notions of matrix calculus. Student uses basic notions and formulas of matrix calculus in solving systems of linear equations. Student analisies properties of a given function of two variables using differencial calculus of several variables functions. Student uses double and triple integral in geometrical applications. Student determines gradient, divergence and rotation as well as field potential. Student demonstrates some chosen techniques of solving ordinary differential equations. Student gives the definition of basic notions of probability theory. Student describes the basic types of distributions of random variable. | [SW1] Assessment of factual knowledge |
| | | [K6_K01] understands the need for lifelong learning, can inspire and organize the process of teaching other people | Student is able to process the acquired information, analyze and interpret it, draw conclusions and reason opinions. | [SK2] Assessment of progress of work |
| | | [K6_U04] can use professional vocabulary, can prepare and communicate technical information in the form of text documents, spreadsheets, charts and technological schema | Student recognizes the importance of skillful use of basic mathematical apparatus in terms of technical study in future. | [SU2] Assessment of ability to analyse information |

| Subject contents | |
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| | Number series: Convergent and divergent series. Convergence tests of the number series. |
| | Power series: Radius and interval of convergence of series. Developing functions in series. |
| | Elements of linear algebra: Matrices, their properties and operations on matrices. Determinants. Inverse of a square non-singular matrix. Dot product, cross product, their properties and its applications. The triple scalar product and applications. |
| | Systems of linear equations. Cramer patterns. The rank of the main and completed matrix. Kronecker-Capelli theorem. Gaussian elimination method. |
| | 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. |
| | Multiple integrals: Normal and regular area. Double and triple integral. Change of variables - polar, cylindrical and spherical coordinates. Examples of applications. |
| | Elements of field theory: scalar and vector fields. Gradient, divergence, rotation. |
| | Ordinary differential equations: First order linear differential equations. Linear differential equations order n with constant coefficients. |
| | Calculus of probability - discrete and continuous random variable, distribution function, expected value and variance of a random variable. |

| Prerequisites and co-requisites | |
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| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|---|
| | Tests | 50.0% | 40.0% |
| | Quizzes | 50.0% | 10.0% |
| | Written exam | 50.0% | 50.0% |

| Recommended reading | Basic literature | - M. Gewert, Z. Skoczylas : Analiza matematyczna 2, Oficyna Wydawnicza GiS, Wrocław;<br><br>- K. Jankowska, T. Jankowski : Zadania z matematyki wyższej, Wydawnictwo PG, 2010;<br><br>- K. Jankowska, T. Jankowski : Funkcje wielu zmiennych - Całki wielokrotne - Geometria analityczna, Wydawnictwo PG, 2010;<br><br>- K. Jankowska, T. Jankowski : Zadania z matematyki wyższej. Wydawnictwo PG, 2010;<br><br>- E. Mieloszyk : Macierze, wyznaczniki i układy równań, Wydawnictwo PG, 2000;<br><br>- M. Bednarczyk, A. Dąbrowicz-Tlałka, Wdawnictwo PG, 2016<br><br>- A. Zeliaś : Metody statystyczne, Polskie Wydawnictwo Ekonomiczne, Warszawa 2000. |
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| | Supplementary literature | G.M. Fichtenholz : Rachunek różniczkowy i całkowy, t. 2, Wydawnictwo Naukowe PWN<br><br>W. Krysicki, L. Włodarski : Analiza matematyczna w zadaniach II, Wydawnictwo Naukowe PWN<br><br>R. Leitner, Zarys matematyki wyższej II, Wydawnictwo Naukowo-Techniczne<br><br>W. Stankiewicz : Zadania z matematyki dla wyższych uczelni technicznych, Wydawnictwo Naukowe PWN |
| | eResources addresses | WCh - Ch - s2, gr.1,2: 2020/21 (D.Garbowska) - Moodle ID: 11677 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11677<br>WCh - Ch - s2, gr.1,2: 2020/21 (D.Garbowska) - Moodle ID: 11677 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11677<br>WCh - Ch - s2, gr.1,2: 2020/21 (D.Garbowska) - Moodle ID: 11677 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11677<br>WCh - Ch - s2, gr.1,2: 2020/21 (D.Garbowska) - Moodle ID: 11677 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11677 |

| Example issues/ example questions/ tasks being completed | Examine the convergence of series ... using the appropriate convergence criterion. |
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| | Expand the given function ... in series and designate the radius at which this expansion is true. |
| | Discuss the solvability of the given system of equations ... . |
| | Find local extrema of the given function f (x, y) = .... |
| | Calculate the double integral ... over the indicated area D. |
| | Using cylindrical or spherical coordinates, calculate the given triple integral ... |
| | Determine the potential of the vector field ... |
| | Using the prediction method, solve the first and second order linear differential equations. |
| | Calculate cumulative distribution function of the given discrete random variable .... |
| Work placement | Not applicable |