GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|---|---|---|---|
| Subject name and code | Mathematics I, PG_00022416 | | | | | | |
| Field of study | Automation, Robotics and Control Systems | | | | | | |
| Date of commencement of studies | October 2024 | | Academic year of realisation of subject | 2024/2025 | | | |
| 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 | 6.0 | | | |
| 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 Magdalena Musielak | | | | |
| | Teachers | | dr Magdalena Musielak | | | | |
| 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 | | | | | | |
| 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 | 80.0 | | 150 |
| Subject objectives | Students obtain competence in the range of using methods of mathematical analysis and linear algebra and knowledge to solve simple problems that can be found in the field of engineering. | | | | | | |

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_K02] can work in a group taking on different roles in it | Student recognizes the importance of self-expanding knowledge and takes the challenge of working with a group to solve a problem. Student understands the need of lifelong learning. Student is able to inspire others and organize their learning process. | [SK2] Assessment of progress of work<br>[SK1] Assessment of group work skills |
| [K6_W01] has basic knowledge in the field of mathematics including algebra, geometry, mathematical analysis, probabilistics, numerical methods - necessary to describe and analyze automation and robotics systems | Student defines the basic concepts of differential calculus of one variable function. Student uses the first and second derivatives of a function to analyze its properties. Student determines intervals of monotonicity of a given function and its extrema. Student applies the basic rules and techniques of integration to calculate indefinite integrals. Student lists geometrical applications of definite integrals. Student uses definite integral to solve geometrical problems. Student distinguishes between the types of improper integrals. Student explains the definition of the cross product. Student uses the triple scalar product to give the volume of solids. | [SW3] Assessment of knowledge contained in written work and projects<br>[SW1] Assessment of factual knowledge |
| [K6_U01] can obtain information from literature, databases and other sources; integrate the information obtained, interpret it and draw conclusions, formulate and justify opinions | Student is able to process the acquired information, analyze and interpret it, draw conclusions and reason opinions. Student recognizes the importance of skillful use of basic mathematical apparatus in terms of study in the future. Student recognizes the importance of self-expanding knowledge. | [SU3] Assessment of ability to use knowledge gained from the subject<br>[SU2] Assessment of ability to analyse information<br>[SU1] Assessment of task fulfilment |

**Subject contents**

Definition of a first derivative. Derivatives of elementary functions. Applications of derivatives - Taylors theorem, de lHospitals theorem, monotonicity and local extrema, convexity, concavity and inflexion points of a function, asymptotes. Applications of differential calculus to studying the properties of one variable functions. The process of finding antiderivatives - integration formulas, integration by parts and the substitution method of integration. Integration of rational, trigonometric and irrational functions. Definite integrals in Riemanns sense - Newton-Leibniz theorem, improper integrals, applications to geometry. Vectors in 3-space. Dot product, cross product, triple scalar product.

**Prerequisites and co-requisites**

- active participation in tutorial - passing written tests and colloquiums

**Assessment methods and criteria**

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

**Recommended reading**

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| Basic literature | 1. Gewert M., Skoczylas Z.: Analiza matematyczna 1. GiS, Wrocław, 2004.<br>2. Jurewicz T., Skoczylas Z.: Algebra liniowa 1. GiS, Wrocław, 2004.<br>3. Krysicki W., Włodarski L.: Analiza matematyczna w zadaniach, cz.I. PWN, Warszawa 2006.<br>4. Leksiński W., Nabiałek I., Żakowski W.: Matematyka. Definicje, twierdzenia, przykłady, zadania. WNT, Warszawa, 2003. |
| Supplementary literature | 1. Jankowska K., Jankowski T.: Zbiór zadań z matematyki. Wyd. PG, Gdańsk, 1998.<br>2. Praca zbiorowa pod redakcją Wikieł B.: Matematyka. Podstawy z elementami matematyki wyższej. Wyd. PG, Gdańsk, 2009.<br>3. Żakowski W., Decewicz G.: Matematyka, cz.I. WNT, Warszawa, 1995. |
| eResources addresses | Adresy na platformie eNauczanie: |

**Example issues/ example questions/ tasks being completed**

1. Using the rules of differentiation find the derivative of the following function f(x)= .
2. Find local extremes and intervals of monotonicity of the following function f(x)= .
3. Determine indefinite integrals of the following functions using methods of integration by parts or by substitution.
4. Give three applications of the definite integral with appropriate rules.
5. Find the area between the two curves y= and y= from x= to x=

**Work placement**

Not applicable