University of Gdańsk

Subject card

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|---|---|---|---|
| Subject name and code | Algebra and Logic, PG_00210431 | | |
| Field of study | Nuclear safety and radiological protection | | |
| Date of commencement of studies | October 2026 | Academic year of realisation of subject | 2026/2027 |
| Education level | Bachelor's studies | Subject group | Optional subject group |
| 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 | 3.0 |
| Learning profile | academic | Assessment form | credit |
| Conducting unit | Institute of Theoretical Physics and Astrophysics -> Faculty of Mathematics, Physics and Informatics -> Rector | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr Adrian Kołodziejski | |
| | Teachers | | |

**Lesson types**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 0.0 | 30.0 | 0.0 | 0.0 | 0.0 | 30 |

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 | 30 | 0.0 | 45.0 | 75 |

**Subject objectives**

The aim of the course is to introduce students to the fundamental concepts and methods of linear algebra and mathematical logic used in the description and analysis of problems in physics, nuclear safety, and radiation protection.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [BJORL3_W12] Has an advanced knowledge and understanding of the mathematical and statistical methods used in data analysis. | The student is familiar with the methods of linear algebra used in data analysis and understands their applications and limitations. | [SW4] test/exam - oral or written |
| [BJORL3_U04] Can use mathematical and computer apparatus to analyze and solve problems in radiological protection and nuclear safety. | The student is able to apply the methods of linear algebra and mathematical logic to analyse and solve problems that form the foundation of issues related to nuclear safety and radiation protection. | [SU4] test/exam - oral or written |
| [BJORL3_U10] Graduate applies mathematical and statistical methods to describe phenomena and analyze data. | The student is able to apply methods of linear algebra to solve systems of linear equations, analyse matrices, and describe selected physical problems and analyse data. | [SU4] test/exam - oral or written |
| [BJORL3_W04] Has an advanced knowledge and understanding of selected techniques in advanced mathematics to the extent necessary to describe phenomena at the subatomic level and to solve problems in nuclear physics and chemistry. | The student is familiar with the fundamental concepts and methods of linear algebra and mathematical logic used in the mathematical description of problems in physics. | [SW4] test/exam - oral or written |

<table>
<tr><td>Subject contents</td><td colspan="3">1.<br>Elements of mathematical logic: propositional calculus, logical connectives, truth tables, tautologies, implication, equivalence, quantifiers, and basic methods of logical reasoning.<br>2.<br>Elements of set theory: set operations, relations, and functions.<br>3.<br>Matrices and matrix operations. Matrix determinants and their basic properties.<br>4.<br>Systems of linear equations. Gaussian elimination and the Kronecker–Capelli theorem.<br>5.<br>Vector spaces. Basis, dimension, linear independence, and linear combinations.<br>6.<br>Linear transformations and their matrix representations.<br>7.<br>Eigenvalues and eigenvectors of matrices. Basic applications in the description of physical phenomena.<br>8.<br>Inner product and vector orthogonality.<br>9.<br>Basic applications of linear algebra and mathematical logic in physics, nuclear safety, radiation protection, and the analysis of measurement data.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td colspan="3"></td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>tests</td><td>51.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1.<br>G. Strang, Introduction to linear algebra, Wellesley : Wellesley-Cambridge 2003,<br>2.<br>W. Marek, J. Onyszkiewicz, Elementy logiki i teorii mnogości w zadaniach, PWN 2006</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1.<br>T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1. Definicje, twierdzenia, wzory, GIS 2005<br>2.<br>T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1. Przykłady i zadania, GIS 2005<br>3.<br>T. Jurlewicz, Z. Skoczylas, Algebra liniowa 2. Definicje, twierdzenia, wzory, GIS 2002<br>4.<br>T. Jurlewicz, Z. Skoczylas, Algebra liniowa 2. Przykłady i zadania, GIS 2002</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">not applicable</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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