



Subject card

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|---|--|--|---|-------------------------------------|--|------------|-----|
| Subject name and code | Linear algebra, PG_00045352 | | | | | | |
| Field of study | Data 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 | | |
| Mode of study | Full-time studies | Mode of delivery | | | at the university | | |
| Year of study | 1 | Language of instruction | | | English | | |
| Semester of study | 1 | ECTS credits | | | 3.0 | | |
| Learning profile | general academic profile | Assessment form | | | assessment | | |
| Conducting unit | Faculty of Electronics, Telecommunications and Informatics | | | | | | |
| 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 | 15.0 | 15.0 | 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 | | 5.0 | | 40.0 | 75 |
| Subject objectives | Students obtain competence in using methods of linear algebra and knowledge how to solve simple problems that are found in the field of engineering, in particular connected to data engineering. | | | | | | |
| Learning outcomes | Course outcome | | Subject outcome | | Method of verification | | |
| | [K6_W01] has basic knowledge in the field of mathematics, including mathematical analysis, algebra, geometry, probability calculus, statistics and numerical methods, necessary to formulate and solve simple tasks in the field of IT | | Student has basic knowledge of linear algebra, useful in formulating and solving simple problems in the field of data engineering. | | [SW1] Assessment of factual knowledge | | |
| | [K6_K01] is aware of quickly changing trends and the resulting need for further education and self-improvement in the area of the performed profession of an engineer with IT and economic-financial skills. | | Student recognizes the importance of skillful use of basic mathematical apparatus in the context of engineering studies. | | [SK2] Assessment of progress of work | | |
| | [K6_U05] Uses matrix calculus in the theory of systems of linear equations, uses differential, integer and vector calculus, performs operations on complex numbers and determines polynomial elements. | | Student names the basic algebraic structures, performs basic operations on complex numbers, finds the real and complex roots of polynomials, evaluates determinants and solves matrix equations, solves systems of equations, and analyzes problems in three dimensional analytic geometry. | | [SU4] Assessment of ability to use methods and tools | | |

| Subject contents | <ul style="list-style-type: none"> • Binary operations. Basic algebraic structures: group, ring, field, linear space. • Elements of modular arithmetic, tables of addition and multiplication modulo n. Inverse modulo n. Field \mathbb{Z}_p. • Field of complex numbers. Geometrical interpretation of complex numbers. Complex arithmetic. Complex roots. Simple equations in complex domain. • Ring of polynomials over field K. Roots of polynomials. Fundamental theorem of algebra. Polynomial factorization. Polynomial arithmetic with coefficients from field $K = \mathbb{Z}_p$. Synthetic division. • Matrices and determinants. Inverse matrix. Matrix equations. • Systems of linear equations. Cramer's theorem. Gaussian elimination. • Vectors in \mathbb{R}^3, dot, cross, and mixed products. Applications of vector products. • Line and plane in 3D space – vector, normal, parametric, canonical, intercept forms. | | | | | | | | | | | | |
|--|---|-------------------------------|---|-------------------------------|---|----------------------|------|-------|-------|-------|--------------------------|-------|-------|
| Prerequisites and co-requisites | No requirements | | | | | | | | | | | | |
| Assessment methods and criteria | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;">Subject passing criteria</th> <th style="width: 30%;">Passing threshold</th> <th style="width: 30%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>eCourse</td> <td>50.0%</td> <td>7.0%</td> </tr> <tr> <td>Tests</td> <td>50.0%</td> <td>23.0%</td> </tr> <tr> <td>Final comprehensive test</td> <td>40.0%</td> <td>70.0%</td> </tr> </tbody> </table> | Subject passing criteria | Passing threshold | Percentage of the final grade | eCourse | 50.0% | 7.0% | Tests | 50.0% | 23.0% | Final comprehensive test | 40.0% | 70.0% |
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| Example issues/ example questions/ tasks being completed | <ol style="list-style-type: none"> 1. Solve the matrix equation $AX=B$, where A and B are given. 2. Use Cramer formulas to find the y: $x+2y+2z+3t=3$, $3y+t=1$, $5x-2y+t=1$, $4x-5y+2t=1$. 3. Find all the roots of the equation $z^3 - 8i=0$. Express them in algebraic form. 4. Factor the polynomial $W(z)=z^3-iz^2-2iz-2$, knowing that one of its roots is $z_1=i$. 5. Find the normal equation of the plane passing through the point $P=(1,-1,3)$ and parallel to the vectors $a = [1, 1, 0]$ and $b=[0, 1, 1]$. 6. Determine the relative position of the lines $l_1 : x=1+t, y=-2-t, z=3+2t$ and $l_2: x=4+s, y=-2+2s, z=4-3s$. | | | | | | | | | | | | |
| Work placement | Not applicable | | | | | | | | | | | | |