### Field of study
- **Computer Science**

### Degree level and programme type
- **Engineer's degree full-time programme**

### Study profile
- **Academic**

### Course name
- **Linear Algebra**

### Course code
- **FCS-00030**

### Forms and number of hours of tuition

<table>
<thead>
<tr>
<th>L</th>
<th>C</th>
<th>LC</th>
<th>P</th>
<th>SW</th>
<th>FW</th>
<th>S</th>
<th>Semester</th>
<th>No. of ECTS credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>30</td>
<td></td>
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<td></td>
<td></td>
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<td>3</td>
<td>6</td>
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</tbody>
</table>

### Entry requirements
- The aim of the course is to familiarize students with basic notions, examples, theorems and methods of Linear Algebra. Teaching how to perform operations on matrices, calculate determinants, solve systems of linear equations, perform operations on permutations, perform operations on complex numbers, linear spaces and linear transformations.

### Course objectives
- **Lecture:**
  - The concept of a group, a group of permutations.
  - Field of complex numbers.
  - Matrices, rank of matrices.
  - Systems of linear equations and the Gaussian elimination method.
  - Determinants and their applications.
  - Linear spaces, subspace of a linear space.
  - Base and dimension of a linear space.
  - Linear transformations, Kernel and image of a linear transformation.
  - Eigenvalues and eigenvectors of a linear transformation.
- **Classes:**
  - Operations in the group of permutation.
  - Operations in the field of complex numbers.
  - Operations in the set of matrices, inverse of matrix, rank of matrix.
  - Solving systems of equations by Gaussian elimination method.
  - Calculation of determinants.
  - Applications of determinants.
  - Base and dimension of a linear space.
  - Linear transformations.
  - Kernel and range of a linear transformation.
  - Eigenvalues and eigenvectors of a linear transformation.

### Course content
- Lecture:
  - The concept of a group, a group of permutations.
  - Field of complex numbers.
  - Matrices, rank of matrices.
  - Systems of linear equations and the Gaussian elimination method.
  - Determinants and their applications.
- Classes:
  - Operations in the group of permutation.
  - Operations in the field of complex numbers.
  - Operations in the set of matrices, inverse of matrix, rank of matrix.
  - Solving systems of equations by Gaussian elimination method.
  - Calculation of determinants.
  - Applications of determinants.
  - Base and dimension of a linear space.
  - Linear transformations.
  - Kernel and range of a linear transformation.
  - Eigenvalues and eigenvectors of a linear transformation.

### Teaching methods
- Informative lecture, lecture problem, classic problem method, subject exercises.

### Assessment method
- Written exam, two written in-class tests.

### Symbol of learning outcome

<table>
<thead>
<tr>
<th>Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO1</td>
</tr>
<tr>
<td>LO2</td>
</tr>
<tr>
<td>LO3</td>
</tr>
<tr>
<td>LO4</td>
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<tr>
<td>LO5</td>
</tr>
</tbody>
</table>

### Methods of assessing the learning outcomes

| LO1 | Written exam |
| LO2 | Written exam, written in-class tests |
| LO3 | Written exam, written in-class tests |
| LO4 | Written exam, written in-class tests |
| LO5 | Written exam, written in-class tests |

### Student workload (in hours)

<table>
<thead>
<tr>
<th>Calculation</th>
<th>No. of hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Attendance at lectures</td>
<td>30</td>
</tr>
<tr>
<td>2 - Attendance at classes</td>
<td>30</td>
</tr>
<tr>
<td>3 - Preparation for classes</td>
<td>45</td>
</tr>
<tr>
<td>4 - Preparation for exam</td>
<td>16</td>
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<tr>
<td>5 - Presence during exam</td>
<td>2</td>
</tr>
<tr>
<td>6 - Preparation for tests</td>
<td>25</td>
</tr>
<tr>
<td>7 - Participation in student-teacher sessions</td>
<td>2</td>
</tr>
</tbody>
</table>

**TOTAL:** 150

### Basic references
- D. C. Lay, Linear algebra and its applications, Pearson/Addison-Wesley, 2006

### Supplementary references
- T. Jankowski, Linear algebra, Politechnika Gdańska, Gdańsk, 2001

### Organisational unit conducting the course
- Department of Theoretical Computer Science

### Date of issuing the programme
- Feb. 17, 2022

### Author of the programme
- dr Marzena Filipowicz-Chomko
L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW – field work, S – seminar