### Field of study
Computer Science

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

### Study profile
academic

### Course code
FCS-00058

### Course type
obligatory

### Study profile
academic

### Course name
Logic and Set Theory

### Forms and number of hours of tuition
<table>
<thead>
<tr>
<th>Forms</th>
<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></td>
<td>30</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>

### Entry requirements

The aim of the lecture is to give the students a wide general view of the fundamental notions concerning algebra of sets, algebra of relations and basic deductive systems at the level of propositional and predicate logic. Students learn how to properly construct mathematical reasoning and develop the ability to provide mathematical proofs. Emphasis will be put on providing a context for the application of the presented notions within the computer science.

### Course objectives

Lecture:
1. Algebra of sets.
2. Propositional calculus and methods of proving.
3. First-order predicate calculus.
4. Relations and their properties.
5. Equivalence relations. Abstraction classes.
6. Ordering relations and their types.
7. Functions as unambiguous relations.

Classes:
1. Determining the properties of sets. Performing operations on sets.
2. Examining of tautology and satisfiability of propositional calculus formulas. Verification of the correctness of selected reasoning.
3. Examining of tautology and satisfiability of predicate calculus formulas in selected models.
4. Determining the properties of relations. Performing operations on relations.
5. Determining classes of abstraction and division of a set for selected equivalence relations.
6. Finding special elements of posets (upper and lower bound, the largest, the smallest, a maximal, a minimal element).
7. Determining the properties of functions. Performing operations on functions.

### Course content

**Lecture:**

1. Algebra of sets.
2. Propositional calculus and methods of proving.
3. First-order predicate calculus.
4. Relations and their properties.
5. Equivalence relations. Abstraction classes.
6. Ordering relations and their types.
7. Functions as unambiguous relations.

**Classes:**

1. Determining the properties of sets. Performing operations on sets.
2. Examining of tautology and satisfiability of propositional calculus formulas. Verification of the correctness of selected reasoning.
3. Examining of tautology and satisfiability of predicate calculus formulas in selected models.
4. Determining the properties of relations. Performing operations on relations.
5. Determining classes of abstraction and division of a set for selected equivalence relations.
6. Finding special elements of posets (upper and lower bound, the largest, the smallest, a maximal, a minimal element).
7. Determining the properties of functions. Performing operations on functions.

### Teaching methods
informative lecture, lecture problem, subject exercises,

### Assessment method

### Symbol of learning outcome
<table>
<thead>
<tr>
<th>Learning outcomes</th>
<th>Reference to the learning outcomes for the field of study</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO1</td>
<td>defines the notions of mathematical logic and set theory in range useful for information technology, in particular for analysis computational complexity and correctness of programs.</td>
</tr>
<tr>
<td>LO2</td>
<td>examines propositional calculus formulas and simple formulas of the predicate calculus; tests their satisfiability and tautology; justifies the correctness of simple reasoning</td>
</tr>
<tr>
<td>LO3</td>
<td>performs operations on sets, functions and relations; recognizes types of relations and discusses their properties; distinguishes classes of abstraction for equivalence relations</td>
</tr>
<tr>
<td>LO4</td>
<td>verifies basic properties of functions and relations, including equivalence relations and order relations</td>
</tr>
</tbody>
</table>

### Methods of assessing the learning outcomes
<table>
<thead>
<tr>
<th>Type of tuition during which the outcome is assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO1</td>
</tr>
<tr>
<td>LO2</td>
</tr>
<tr>
<td>LO3</td>
</tr>
<tr>
<td>LO4</td>
</tr>
</tbody>
</table>

### 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 - Participation in student-teacher sessions</td>
<td>20</td>
</tr>
<tr>
<td>6 - Preparation for exam</td>
<td>23</td>
</tr>
<tr>
<td>7 - Participation in exam</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL:</td>
<td>150</td>
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</tbody>
</table>

### Quantitative indicators

<table>
<thead>
<tr>
<th>Items</th>
<th>HOURS</th>
<th>No. of ECTS credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student workload - activities that require direct teacher participation</td>
<td>82</td>
<td>3.3</td>
</tr>
<tr>
<td>Student workload - practical activities</td>
<td>75</td>
<td>3.0</td>
</tr>
</tbody>
</table>

### Basic references

### Supplementary references

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

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

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