

| <b>Course code</b>                          |   |           |            |           |            |         |   |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
|---|---|-----------|------------|-----------|------------|---------|---|-------|---|---------------|---|---|---|---|---|---|---|------------|----|----|----|----|----|----|----|---------------------------------|---|---|---|------|---|---|------|
| <b>Type and description</b>                 | EC - elective subjects from the discipline of Mathematics   |           |            |           |            |         |   |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
| <b>ECTS credit</b>                          | 1   |           |            |           |            |         |   |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
| <b>Course name</b>                          | Selected problems of descriptive set theory   |           |            |           |            |         |   |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
| <b>Course name in Polish</b>                | Wybrane zagadnienia deskryptywnej teorii mnogości   |           |            |           |            |         |   |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
| <b>Language of instruction</b>              | English   |           |            |           |            |         |   |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
| <b>Course level</b>                         | 8 PRK   |           |            |           |            |         |   |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
| <b>Course coordinator</b>                   | prof. dr hab. Marek Balcerzak   |           |            |           |            |         |   |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
| <b>Course instructors</b>                   | prof. dr hab. Marek Balcerzak   |           |            |           |            |         |   |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
| <b>Delivery methods and course duration</b> | <table border="1"> <thead> <tr> <th></th> <th>Lecture</th> <th>Tutorials</th> <th>Laboratory</th> <th>Project</th> <th>Seminar</th> <th>Other</th> <th>Total of teaching hours during semester</th> </tr> </thead> <tbody> <tr> <td>Contact hours</td> <td>0</td> <td>0</td> <td>0</td> <td>5</td> <td>0</td> <td>0</td> <td>5</td> </tr> <tr> <td>E-learning</td> <td>no</td> <td>no</td> <td>no</td> <td>no</td> <td>no</td> <td>no</td> <td>no</td> </tr> <tr> <td>Assessment criteria (weightage)</td> <td>0</td> <td>0</td> <td>0</td> <td>100%</td> <td>0</td> <td>0</td> <td>100%</td> </tr> </tbody> </table> |           | Lecture    | Tutorials | Laboratory | Project | Seminar                                 | Other | Total of teaching hours during semester | Contact hours | 0 | 0 | 0 | 5 | 0 | 0 | 5 | E-learning | no | no | no | no | no | no | no | Assessment criteria (weightage) | 0 | 0 | 0 | 100% | 0 | 0 | 100% |
|   | Lecture   | Tutorials | Laboratory | Project   | Seminar    | Other   | Total of teaching hours during semester |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
| Contact hours                               | 0   | 0         | 0          | 5         | 0          | 0       | 5                                       |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
| E-learning                                  | no  | no        | no         | no        | no         | no      | no                                      |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
| Assessment criteria (weightage)             | 0   | 0         | 0          | 100%      | 0          | 0       | 100%                                    |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
| <b>Course objective</b>                     | <p>Course objective:</p> <ol style="list-style-type: none"> <li>1.Acquirement of knowledge in main notions of classical descriptive set theory.</li> <li>2. Acquirement of knowledge in Borel hierarchy and in establishing Borel classes of sets</li> <li>3. Acquirement of knowledge in theory of analytic and coanalytic sets in Polish spaces.</li> </ol>   |           |            |           |            |         |   |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
| <b>Learning outcomes</b>                    | <p>After the course, a PhD student is able to:</p> <ol style="list-style-type: none"> <li>1. describe basic examples of Polish spaces and their properties - outcomes W1, W2, U1</li> <li>2. evaluate the Borel class of selected types of sets - outcomes W1, U1, U2, K1</li> <li>3. describe the notion of an analytic set and properties of analytic sets - outcomes W1, W2, K1</li> </ol>   |           |            |           |            |         |   |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
| <b>Assessment methods</b>                   | <p>Outcomes W1, U1, K3 - oral exam</p> <p>Outcomes U1, K1-K3 - presentation</p> <p>The final evaluation is based on:</p> <p>Oral exam - 50%</p> <p>Presentation - 50%</p>   |           |            |           |            |         |   |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
| <b>Prerequisites</b>                        | Foundations of set theory and topology  |           |            |           |            |         |   |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |
| <b>Course content with delivery methods</b> | <p>Course content divided into two forms:</p> <p>SELF-LEARNING</p>  |           |            |           |            |         |   |       |   |               |   |   |   |   |   |   |   |            |    |    |    |    |    |    |    |                                 |   |   |   |      |   |   |      |

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|   | <p>1. Polish spaces. The Alexandrov theorem.. The Cantor space and the space of sequences with natural terms.</p> <p>2. Transfer theorems on maps between Polish spaces. Borel isomorphism theorem.</p> <p>3. Borel hierarchy in Polish spaces. Examples of Borel sets in <math>C[0,1]</math>.</p> <p>4. Analytic and coanalytic sets. Basic properties and examples.</p> <p>PRESENTATION</p> <p>1. Examples of Borel sets in selected spaces.</p> <p>2. Examples of analytic and coanalytic sets.</p> |
| <b>Basic reference materials</b>                  | <p>1. A. S. Kechris, Classical descriptive set theory, Springer 1994.</p> <p>2. S. M. Srivastava, A course of Borel sets, Springer 1998.</p>   |
| <b>Other reference materials</b>                  |  |
| <b>Average student workload outside classroom</b> | 15 h   |
| <b>Comments</b>                                   |  |
| <b>Last update</b>                                | July 2020  |