



## COURSE CARD

### 1. Basic information

|  |   |                                     |
|--|---|-------------------------------------|
| Course name in English:  | Descriptive set theory  |                                     |
| Course name in Polish:   | Deskryptywna teoria mnogości  |                                     |
| Number of hours:   | 30  |                                     |
| Type of course:  | Elective course   |                                     |
| Form of course:  | lecture   |                                     |
| Code of course:  |   |                                     |
| Course leader:   | Dr hab. Szymon Żeberski   |                                     |
| Faculty of the course leader:  | W13 Faculty of Pure and Applied Mathematics                           |                                     |
| Email address of the course leader:  | Szymon.zeberski@pwr.edu.pl  |                                     |
| Scientific discipline(s) assigned to the course (doctoral students representing the marked disciplines can participate in the course): | Architecture and urban planning                                       | <input type="checkbox"/>            |
|  | Automation, electronic, electrical engineering and space technologies | <input type="checkbox"/>            |
|  | Information and communication technology                              | <input type="checkbox"/>            |
|  | Biomedical engineering  | <input type="checkbox"/>            |
|  | Chemical engineering  | <input type="checkbox"/>            |
|  | Civil engineering, geodesy and transport                              | <input type="checkbox"/>            |
|  | Materials engineering   | <input type="checkbox"/>            |
|  | Mechanical engineering  | <input type="checkbox"/>            |
|  | Environmental engineering, mining, and energy                         | <input type="checkbox"/>            |
|  | Mathematics   | <input checked="" type="checkbox"/> |
|  | Chemical sciences   | <input type="checkbox"/>            |
|  | Physical sciences   | <input type="checkbox"/>            |
| Management and quality studies   | <input type="checkbox"/>  |                                     |

### 2. Objectives

### 3. Content

*Detailed information about the course content, including topics and form of classes.*

| No. | Topic                         | Number of hours | Form of classes |
|-----|-------------------------------|-----------------|-----------------|
| 1   | Metric spaces, compact spaces | 2               | lecture         |
| 2   | Polish spaces                 | 3               | lecture         |
| 3   | Borel sets                    | 2               | lecture         |
| 4   | Borel classes                 | 2               | lecture         |
| 5   | Universal sets                | 3               | lecture         |
| 6   | Analytic and coanalytic sets  | 3               | lecture         |



|    |                                       |   |         |
|----|---------------------------------------|---|---------|
| 7  | Analytic complete sets                | 3 | lecture |
| 8  | Regularity properties                 | 3 | lecture |
| 9  | Separation theorem                    | 2 | lecture |
| 10 | Reduction theorem                     | 2 | lecture |
| 11 | Selection and uniformization theorems | 5 | lecture |

#### 4. Prerequisites

List of prerequisites relating to knowledge, skills and other competences for course participants.

Introduction to set theory and logic

#### 5. Learning outcomes

List of learning outcomes at level 8 of the Polish Qualifications Framework assigned to the course (mark the learning outcomes in the last column).

| Symbol | Learning outcome   |                                     |
|--------|--|-------------------------------------|
|        | <i>KNOWLEDGE. Doctoral student knows and understands:</i>  |                                     |
| SzD_W3 | the main trends in the development of the scientific or artistic disciplines covered in the curricula;   | <input checked="" type="checkbox"/> |
| SzD_W4 | research methodology;  | <input checked="" type="checkbox"/> |
| SzD_W5 | the rules for the dissemination of scientific results, including in open access mode;  | <input type="checkbox"/>            |
| SzD_W6 | the fundamental dilemmas of modern civilization;   | <input type="checkbox"/>            |
| SzD_W7 | the legal and ethical conditions of scientific activity;   | <input type="checkbox"/>            |
| SzD_W8 | the economic and other relevant conditions of scientific activity;   | <input type="checkbox"/>            |
| SzD_W9 | basic principles of knowledge transfer to the economic and social spheres and commercialisation of results of scientific activity and know-how related to these results.   | <input type="checkbox"/>            |
|        | <i>SKILLS. Doctoral student is able to:</i>  |                                     |
| SzD_U2 | use knowledge from different fields of science or art to creatively identify, formulate and innovatively solve complex problems or perform research tasks, in particular:<br>- define the purpose and subject of scientific research, formulate a research hypothesis,<br>- develop research methods, techniques and tools, and use them creatively,<br>- draw conclusions on the basis of scientific research;<br>critically analyse and evaluate the results of scientific research, expertise and other creative work and their contribution to knowledge development;<br>transfer the results of scientific activities to the economic and social spheres; | <input checked="" type="checkbox"/> |
| SzD_U3 | communicate on specialised topics to the extent that they enable an active participation in the international scientific community;  | <input checked="" type="checkbox"/> |
| SzD_U4 | disseminate research results, including in popular forms;  | <input checked="" type="checkbox"/> |
| SzD_U5 | initiate debates and participate in a scientific discourse;  | <input type="checkbox"/>            |



|  |   |                          |
|--|---|--------------------------|
| SzD_U6   | be able to speak a foreign language at B2 level of the Common European Framework of Reference for Languages to a level that enables them to participate in the international scientific and professional environment;   | <input type="checkbox"/> |
| SzD_U7   | plan and implement an individual or collective research or creative activity, including in an international environment;  | <input type="checkbox"/> |
| SzD_U8   | independently plan and act for one's own development and inspire and organize the development of others;  | <input type="checkbox"/> |
| SzD_U9   | plan classes or groups of classes and implement them using modern methods and tools.  | <input type="checkbox"/> |
| <i>SOCIAL COMPETENCES. Doctoral student is ready to:</i> |   |                          |
| SzD_K3   | fulfilling the social obligations of researchers and creators, initiate public interest activities, thinking and acting in an entrepreneurial way;  | <input type="checkbox"/> |
| SzD_K4   | maintaining and developing the ethos of research and creative environments, including:<br>- carrying out scientific activities in an independent manner,<br>- respecting the principle of public ownership of research results, taking into account the principles of intellectual property protection. | <input type="checkbox"/> |

## 6. Evaluation

*Short description of the method(s) used to evaluate the learning outcomes assigned to the course, e.g., exam, test, report, presentation, etc.*

Short reports and exam

## 7. Teaching methods

*Short description of the teaching methods used during the course, e.g., multimedia presentation, discussion, literature studies, developing written documents, own work, etc.*

Traditional chalk and board lecture, literature studies and own work

## 8. Literature

*List of primary and secondary literature used to prepare the course and including additional knowledge for participants, e.g., books, textbooks, research papers, standards, web pages, etc.*

A. Kechris, Classical descriptive set theory, Springer 1994

S.M. Srivastava, A course on Borel sets, Springer 1998

Additional:

T. Jech, Set theory, Springer, 2002

## 9. Other remarks

*Additional remarks, comments, (e.g., language of the course)*