

## Subject card

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                          |                                                                                                                                                                                                                                                               |                                     |                                                                                                                                        |            |     |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------|-----|
| Subject name and code                       | NoSQL Databases, PG_00209694                                                                                                                                                                                                                                                                                                                                                                       |                                                          |                                                                                                                                                                                                                                                               |                                     |                                                                                                                                        |            |     |
| Field of study                              | Mathematics                                                                                                                                                                                                                                                                                                                                                                                        |                                                          |                                                                                                                                                                                                                                                               |                                     |                                                                                                                                        |            |     |
| Date of commencement of studies             | October 2026                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | Academic year of realisation of subject                                                                                                                                                                                                                       |                                     | 2026/2027                                                                                                                              |            |     |
| Education level                             | Master's studies                                                                                                                                                                                                                                                                                                                                                                                   |                                                          | Subject group                                                                                                                                                                                                                                                 |                                     | Obligatory subject group in the field of study<br>Optional subject group                                                               |            |     |
| Mode of study                               | full-time studies                                                                                                                                                                                                                                                                                                                                                                                  |                                                          | Mode of delivery                                                                                                                                                                                                                                              |                                     | at the university                                                                                                                      |            |     |
| Year of study                               | 1                                                                                                                                                                                                                                                                                                                                                                                                  |                                                          | Language of instruction                                                                                                                                                                                                                                       |                                     | English                                                                                                                                |            |     |
| Semester of study                           | 2                                                                                                                                                                                                                                                                                                                                                                                                  |                                                          | ECTS credits                                                                                                                                                                                                                                                  |                                     | 5.0                                                                                                                                    |            |     |
| Learning profile                            | academic                                                                                                                                                                                                                                                                                                                                                                                           |                                                          | Assessment form                                                                                                                                                                                                                                               |                                     | credit                                                                                                                                 |            |     |
| Conducting unit                             |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                          |                                                                                                                                                                                                                                                               |                                     |                                                                                                                                        |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                                                                                                                                                                                                                                 |                                                          | dr hab. Rafał Lutowski                                                                                                                                                                                                                                        |                                     |                                                                                                                                        |            |     |
|                                             | Teachers                                                                                                                                                                                                                                                                                                                                                                                           |                                                          |                                                                                                                                                                                                                                                               |                                     |                                                                                                                                        |            |     |
| Lesson types                                | Lesson type                                                                                                                                                                                                                                                                                                                                                                                        | Lecture                                                  | Tutorial                                                                                                                                                                                                                                                      | Laboratory                          | Project                                                                                                                                | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                                                                                                                                                                              | 30.0                                                     | 30.0                                                                                                                                                                                                                                                          | 0.0                                 | 0.0                                                                                                                                    | 0.0        | 60  |
|                                             | 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                                                                                                                                                                                                                                                                                                                                                                              | 60                                                       |                                                                                                                                                                                                                                                               | 3.0                                 |                                                                                                                                        | 62.0       | 125 |
| Subject objectives                          | <p>Familiarizing students with the following topics:</p> <ul style="list-style-type: none"><li>• basic types of non-relational databases;</li><li>• application areas of different database models;</li><li>• sample NoSQL database products;</li><li>• differences between non-relational databases;</li><li>• differences between non-relational data models and the relational model.</li></ul> |                                                          |                                                                                                                                                                                                                                                               |                                     |                                                                                                                                        |            |     |
| Learning outcomes                           | Course outcome                                                                                                                                                                                                                                                                                                                                                                                     |                                                          | Subject outcome                                                                                                                                                                                                                                               |                                     | Method of verification                                                                                                                 |            |     |
|                                             | [MATMU2_U05] is able to apply new or adapt existing methods and tools from a selected field of mathematics and information and communication technologies in related fields                                                                                                                                                                                                                        |                                                          | The student is able to apply and communicate (orally and in writing) methods of selected non-relational database models at an advanced level, including their mathematical foundations.                                                                       |                                     | [SU2] presentation/project/paper/report                                                                                                |            |     |
|                                             | [MATMU2_U08] can use English at level B2+ of the Common European Framework of Reference for Languages, to a degree that allows for independent completion of education and communication with a diverse group of recipients, using specialist terminology                                                                                                                                          |                                                          | The student knows the English nomenclature used in the area of non-relational databases. The student uses product documentation and Internet resources to build a database.                                                                                   |                                     | [SU4] test/exam - oral or written<br>[SU5] implementation of a problem task<br>[SU8] observation of student's independent or team work |            |     |
|                                             | [MATMU2_W01] knows and understands in depth the theory of selected areas of mathematics or related fields, the complex relationships between them and their development trends                                                                                                                                                                                                                     |                                                          | The student has an in-depth understanding of the mathematical foundations of non-relational database models (in particular, graph structures, set theory, and data algebras) and can apply this knowledge in the analysis and design of data storage systems. |                                     | [SW4] test/exam - oral or written<br>[SW2] presentation/project/paper/report                                                           |            |     |

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| Subject contents                | <ol style="list-style-type: none"><li>1. Basic properties of the relational model and the origins of NoSQL.</li><li>2. Additional modules for working with text data in relational databases.</li><li>3. CAP theorem.</li><li>4. Basic types of non-relational databases and their application areas.</li><li>5. Discussion of selected non-relational databases.</li></ol> |                                                                                                                                                                                                                                                                                                                                                                                                              |                               |
| Prerequisites and co-requisites |                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                              |                               |
| Assessment methods and criteria | Subject passing criteria                                                                                                                                                                                                                                                                                                                                                    | Passing threshold                                                                                                                                                                                                                                                                                                                                                                                            | Percentage of the final grade |
|                                 | presentation                                                                                                                                                                                                                                                                                                                                                                | 50.0%                                                                                                                                                                                                                                                                                                                                                                                                        | 30.0%                         |
|                                 | test                                                                                                                                                                                                                                                                                                                                                                        | 50.0%                                                                                                                                                                                                                                                                                                                                                                                                        | 40.0%                         |
|                                 | homeworks                                                                                                                                                                                                                                                                                                                                                                   | 80.0%                                                                                                                                                                                                                                                                                                                                                                                                        | 30.0%                         |
| Recommended reading             | Basic literature                                                                                                                                                                                                                                                                                                                                                            | <ol style="list-style-type: none"><li>1. G. Harrison, Next generation databases, Apress Berkeley, CA, 2015</li><li>2. P. Lake, P. Crowther, Concise Guide to Databases, Springer London, 2013</li><li>3. A. Meier, M. Kaufmann, SQL &amp; NoSQL Databases, Springer Vieweg Wiesbaden, 2019</li><li>4. L. Perkins, E. Redmond, R. Wilson, Seven databases in seven weeks, Pragmatic Bookshelf, 2018</li></ol> |                               |
|                                 | Supplementary literature                                                                                                                                                                                                                                                                                                                                                    | n/a                                                                                                                                                                                                                                                                                                                                                                                                          |                               |
|                                 | eResources addresses                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                              |                               |
|                                 | Example issues/<br>example questions/<br>tasks being completed                                                                                                                                                                                                                                                                                                              | <ol style="list-style-type: none"><li>1. Explain NRW notation and its impact on consistency and availability.</li><li>2. List the nonrelational database models and point out the differences between them.</li><li>3. Explain the reasons for choosing a specific data model and present the steps for creating and working with a database.</li></ol>                                                      |                               |
| Work placement                  | Not applicable                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                              |                               |

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