

## Subject card

|                                             |                                                                                                                               |                                                          |                                         |                                     |         |                        |     |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|-------------------------------------|---------|------------------------|-----|
| Subject name and code                       | Seminar - solving maths problems for maths teachers, PG_00174492                                                              |                                                          |                                         |                                     |         |                        |     |
| Field of study                              | Mathematics                                                                                                                   |                                                          |                                         |                                     |         |                        |     |
| Date of commencement of studies             | October 2024                                                                                                                  |                                                          | Academic year of realisation of subject |                                     |         | 2025/2026              |     |
| Education level                             | Master's studies                                                                                                              |                                                          | Subject group                           |                                     |         | Optional subject group |     |
| Mode of study                               | full-time studies                                                                                                             |                                                          | Mode of delivery                        |                                     |         | at the university      |     |
| Year of study                               | 2                                                                                                                             |                                                          | Language of instruction                 |                                     |         | Polish                 |     |
| Semester of study                           | 4                                                                                                                             |                                                          | ECTS credits                            |                                     |         | 6.0                    |     |
| Learning profile                            | academic                                                                                                                      |                                                          | Assessment form                         |                                     |         | exam                   |     |
| Conducting unit                             | Division of Didactics of Mathematics -> Institute of Mathematics -> Faculty of Mathematics, Physics and Informatics -> Rector |                                                          |                                         |                                     |         |                        |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                            |                                                          | dr Elżbieta Mrożek                      |                                     |         |                        |     |
|                                             | 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                                                       |                                         | 10.0                                |         | 80.0                   | 150 |
| Subject objectives                          | Deepening and broadening students knowledge of school mathematics                                                             |                                                          |                                         |                                     |         |                        |     |

| Learning outcomes | Course outcome                                                                                                                                                                                                                                                                               | Subject outcome                                                                                                                         | Method of verification                                                                                                                  |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|                   | [MATMU2_K04] is ready to understand and appreciate the importance of intellectual honesty in one's own and other people's actions; ethical conduct                                                                                                                                           | Acts ethically, works independently on assigned tasks if required, especially on tests verifying the knowledge acquired.                | [SK1] oral statement/conversation/discussion<br>[SK8] observation of student's independent or team work                                 |
|                   | [MATMU2_U03] can understand mathematical texts of various types from selected fields of mathematics                                                                                                                                                                                          | Analyses proofs of mathematical theorems and is able to use them to solve tasks at the fourth stage of education.                       | [SU1] oral statement/conversation/discussion<br>[SU6] demonstration of practical skills                                                 |
|                   | [MATMU2_W02] knows and understands well the role and importance of the construction of mathematical reasoning                                                                                                                                                                                | Can use mathematical formalism to create simple mathematical models.                                                                    | [SW4] test/exam - oral or written<br>[SW1] oral statement/conversation/discussion                                                       |
|                   | [MATMU2_W01] knows and understands in-depth the theory of selected areas of mathematics                                                                                                                                                                                                      | Proves the truth of simple and moderately difficult theorems.                                                                           | [SW4] test/exam - oral or written                                                                                                       |
|                   | [MATMU2_W03] knows and understands in-depth a selected field of theoretical or applied mathematics and is able to understand the formulations of issues in this field that are still at the research stage and knows the connections of issues in this field with other areas of mathematics | Can use mathematical formalism to create simple mathematical models.                                                                    | [SW1] oral statement/conversation/discussion                                                                                            |
|                   | [MATMU2_K06] is ready to formulate opinions on basic mathematical issues                                                                                                                                                                                                                     | Is able to formulate opinions on basic mathematical issues                                                                              | [SK1] oral statement/conversation/discussion                                                                                            |
|                   | [MATMU2_K02] is ready to precisely formulate questions to deepen his/her understanding of a given topic or find missing elements of reasoning                                                                                                                                                | Is able to formulate questions that serve to deepen one's understanding of a given topic                                                | [SK4] test/exam - oral or written<br>[SK6] demonstration of practical skills<br>[SK8] observation of student's independent or team work |
|                   | [MATMU2_K05] is ready to independently search for information in literature, also in foreign languages                                                                                                                                                                                       | Analyzes the literature on reasoning in school teaching                                                                                 | [SK1] oral statement/conversation/discussion<br>[SK6] demonstration of practical skills                                                 |
|                   | [MATMU2_U04] is able, at an advanced level and including modern mathematics, to apply and present, orally and in writing, methods of at least one selected branch of mathematics                                                                                                             | Understands the importance of mathematics in other fields of science.                                                                   | [SU1] oral statement/conversation/discussion<br>[SU8] observation of student's independent or team work                                 |
|                   | [MATMU2_K01] is willing to acknowledge the limitations of his or her own knowledge and is willing to pursue further education                                                                                                                                                                | Understands the need for further education.                                                                                             | [SK8] observation of student's independent or team work                                                                                 |
|                   | [MATMU2_U01] can construct mathematical reasoning: prove theorems and refute hypotheses through construction and selection of counterexamples                                                                                                                                                | Solves problem-solving tasks and performs mathematical proofs                                                                           | [SU4] test/exam - oral or written<br>[SU6] demonstration of practical skills<br>[SU8] observation of student's independent or team work |
|                   | [MATMU2_U06] is able to apply methods and examples from a selected field of mathematics in related fields                                                                                                                                                                                    | Understands the importance of mathematics in other fields of science.                                                                   | [SU4] test/exam - oral or written<br>[SU6] demonstration of practical skills                                                            |
|                   | [MATMU2_U05] can perform proofs in a selected field and, if necessary, also use tools from other areas of mathematics                                                                                                                                                                        | Understands the importance of mathematics in other fields of science.                                                                   | [SU4] test/exam - oral or written<br>[SU8] observation of student's independent or team work                                            |
|                   | [MATMU2_U07] is able to define his/her interests and develop them; in particular, is able to establish contact with specialists in his/her field, e.g. understand their lectures intended for young mathematicians                                                                           | Analyzes mathematical proofs and applies them to solve tasks from the fourth stage of education (with an increased level of difficulty) | [SU4] test/exam - oral or written<br>[SU8] observation of student's independent or team work                                            |

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|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-------------------------------|
| Subject contents                                               | 1. Mathematics in the integral process of education.                                                                |                                                                                  |                               |
|                                                                | 2. Shaping elementary mathematical concepts and methods of introducing students to definitions.                     |                                                                                  |                               |
|                                                                | 3. Teaching mathematics: problem-based, realistic, text problems and their solution.                                |                                                                                  |                               |
|                                                                | 4. Types of reasoning: empirical, intuitive, formal.                                                                |                                                                                  |                               |
|                                                                | 5. Problematic, construction problems concerning issues implemented in upper secondary school at an advanced level. |                                                                                  |                               |
|                                                                | 6. Mathematical reasoning (proofs).                                                                                 |                                                                                  |                               |
|                                                                | 7. Solving and constructing examination tasks at an advanced level of the 4th stage of education.                   |                                                                                  |                               |
| Prerequisites and co-requisites                                |                                                                                                                     |                                                                                  |                               |
| Assessment methods and criteria                                | Subject passing criteria                                                                                            | Passing threshold                                                                | Percentage of the final grade |
|                                                                | observation of the student's attitude                                                                               | 51.0%                                                                            | 0.0%                          |
|                                                                | activity                                                                                                            | 51.0%                                                                            | 20.0%                         |
|                                                                | exam                                                                                                                | 51.0%                                                                            | 50.0%                         |
|                                                                | test                                                                                                                | 51.0%                                                                            | 30.0%                         |
| Recommended reading                                            | Basic literature                                                                                                    | [1] S. Kopański, In Search of Mathematical Talents, Wydawnictwo Dla Szkoly, 2003 |                               |
|                                                                |                                                                                                                     | [2] A. Birkholc, Mathematical Analysis for Teachers, PWN                         |                               |
|                                                                |                                                                                                                     | [3] W. Żakowski, Mathematics for Candidates for Higher Education                 |                               |
|                                                                |                                                                                                                     | [4] G. Polya, How to Solve?, PWN 1964                                            |                               |
|                                                                |                                                                                                                     | [5] Collections of Matura exam tasks at an advanced level                        |                               |
|                                                                |                                                                                                                     | [6] Collections of tasks and school textbooks                                    |                               |
|                                                                | Supplementary literature                                                                                            | [1] M. Szurek, On Teaching Mathematics, GWO 2005                                 |                               |
|                                                                | eResources addresses                                                                                                |                                                                                  |                               |
| Example issues/<br>example questions/<br>tasks being completed | not included                                                                                                        |                                                                                  |                               |
| Work placement                                                 | Not applicable                                                                                                      |                                                                                  |                               |

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