# GDAŃSK UNIVERSITY OF TECHNOLOGY

## Subject card

| Subject name and code | Algebra II, PG_00021036 | | | | | |
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| Field of study | Mathematics | | | | | |
| Date of commencement of studies | October 2022 | | Academic year of realisation of subject | | 2023/2024 | |
| Education level | second-cycle studies | | Subject group | | Obligatory subject group in the field of study<br><br>Subject group related to scientific research in the field of study | |
| Mode of study | Full-time studies | | Mode of delivery | | blended-learning | |
| Year of study | 2 | | Language of instruction | | Polish | |
| Semester of study | 3 | | ECTS credits | | 4.0 | |
| Learning profile | general academic profile | | Assessment form | | assessment | |
| Conducting unit | Department of Differential Equations and Mathematical Applications -> Faculty of Applied Physics and Mathematics | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | | dr hab. Piotr Bartłomiejczyk | | | |
| | Teachers | | dr hab. Piotr Bartłomiejczyk | | | |

| Lesson types and methods of instruction | 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: 30.0 | | | | | | |

| 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 | 5.0 | 35.0 | 100 |

| Subject objectives | The aim of the subject is to introduce main facts and theorems in higher algebra, especially in Galois' theory and its algebraic and geometric applications. |
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| Learning outcomes | Course outcome | Subject outcome | Method of verification |
|---|---|---|---|
| | K7_U01 | Student can find normal subgroup, algebric extension and solve algebraic equation. | [SU3] Assessment of ability to use knowledge gained from the subject<br>[SU1] Assessment of task fulfilment<br>[SU4] Assessment of ability to use methods and tools |
| | K7_W02 | Student knows main facts and theorems of group, ring and fields theory and of Galois theory. | [SW3] Assessment of knowledge contained in written work and projects<br>[SW1] Assessment of factual knowledge |
| | K7_U02 | Student can find normal subgroup, algebric extension and solve algebraic equation. | [SU4] Assessment of ability to use methods and tools<br>[SU3] Assessment of ability to use knowledge gained from the subject<br>[SU1] Assessment of task fulfilment |
| | K7_W01 | Student knows main facts and theorems of group, ring and fields theory and of Galois theory. | [SW3] Assessment of knowledge contained in written work and projects<br>[SW1] Assessment of factual knowledge |
| | K7_U09 | Student can find normal subgroup, algebric extension and solve algebraic equation. | [SU4] Assessment of ability to use methods and tools<br>[SU1] Assessment of task fulfilment<br>[SU3] Assessment of ability to use knowledge gained from the subject |

| Subject contents | 1. Groups, , cosets, normal subgroups.<br>2. Permutation group and its properties.<br>3. Rings and fields.<br>4. Field of complex numbers. Algebraic elements and their degrees.<br>5. Factorisation of polynomials, indecomposable polynomials, Eisenstein's criterion.<br>6. Algebraic extension of field. Base and degree of extension.<br>7. Algebraic and transcendental numbers.<br>8. Field of algebraic numbers. Field of polynomial's factorisation.<br>9. Primitive element of extension. Automorphism of fields.<br>10. Galois group of extension. Galois extension.<br>11. Galois theorems.<br>12. Solvable, cyclic and abelian extension.<br>13. Solving algebraic equations, solvable groups.<br>14. Equations unsolvable by roots.<br>15. Constructible extensions. Unfeasibility of some classic constructions. |
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| Prerequisites and co-requisites | Linear algebra.<br><br><br>Algebra I. |

| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|---|
| | Lecture | 50.0% | 40.0% |
| | Exercises | 50.0% | 60.0% |

| Recommended reading | Basic literature | J. Rotman, Galois theory, Springer, 1998<br><br><br>J. Bewersdorff, Galois theory for beginners, AMS, 2006 |
|---|---|---|
| | Supplementary literature | J. S. Milne, Fields and Galois Theory, http://www.jmilne.org/math/CourseNotes/FT.pdf. |
| | eResources addresses | Adresy na platformie eNauczanie:<br>Algebra II 2023/2024 - Moodle ID: 32756<br>https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32756 |

| Example issues/ example questions/ tasks being completed | Find classes of conjugacy for permutation group.<br><br><br>Find factorisation of polynomial in complex numbers field.<br><br><br>Find algebraic extension of some field. |
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| Work placement | Not applicable |