## Subject card

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| Subject name and code | Complex functions, PG_00023761 |
| Field of study | Mathematics |

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| Date of commencement of studies | October 2026 | Academic year of realisation of subject | 2027/2028 |
| Education level | first-cycle studies | Subject group | Obligatory subject group in the field of study |
| | | | Subject group related to scientific research in the field of study |
| 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 | 5.0 |
| Learning profile | general academic profile | Assessment form | exam |

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| Conducting unit | Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology |

| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. Piotr Bartłomiejczyk |
|---|---|---|
| | 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 | 5.0 | 60.0 | 125 |

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| Subject objectives | Gaining basic knowledge of complex functions and ability to apply known concepts. |

| Learning outcomes | Course outcome | Subject outcome | Method of verification |
|---|---|---|---|
| | K6_W04 | Student knows the Cauchy integral theorem. Student knows the fundamental theorems for sequences and series of complex numbers. | [SW1] Assessment of factual knowledge |
| | K6_U01 | Student knows the definition of the derivative of a function of a complex variable. Student knows the necessary and sufficient condition for the existence of the derivative. | [SU4] Assessment of ability to use methods and tools |
| | K6_U04 | Student is able to use criteria to test the convergence of the series. Student calculates the limits of sequences of complex numbers. | [SU4] Assessment of ability to use methods and tools |
| | K6_W07 | Student calculates the logarithm of a complex number, calculates the power of the complex number. Student determines the real and imaginary parts of a complex variable functions. | [SW1] Assessment of factual knowledge |

| Subject contents | Course content – lecture<br>1. Preliminaries<br>2. Complex plane<br>3. Complex functions<br>4. Power series<br>5. Derivative of a complex function<br>6. Cauchy-Riemann equations<br>7. Holomorfic functions<br>8. Analitic functions<br>9. The Cauchy integral theorem<br>10. The Cauchy integral formula<br>11. Holomorfic functions and power series<br>12. The Morera theorem<br>13. Cauchy inequalities<br>14. Entire functions and the Liouville theorem<br>15. Maximum principle and the Schwarz lemma | | |
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| Prerequisites and co-requisites | Mathematical Analysis, Linear Algebra, Analytical geometry, | | |

| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|---|
| | Written exam -theory | 50.0% | 50.0% |
| | Test 1,2 | 50.0% | 50.0% |

| Recommended reading | Basic literature | F. Leja, Analitic functions, PWN 1968 |
|---|---|---|
| | Supplementary literature | B. W. Shabat, Introduction to complex analysis, AMS.1992 |
| | eResources addresses | |

| Example issues/ example questions/ tasks being completed | Calculate the limit of a sequence .<br><br>Examine the convergence of the series,<br><br>Give a definition of limit of a sequence .<br><br>Determine the real and imaginary part of a function.<br><br><br>Calculate a complex integral<br><br><br>Formulate the Cauchy integral formula |
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| Practical activites within the subject | Not applicable |

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