University of Gdańsk

Subject card

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|---|---|---|---|
| Subject name and code | Equations of Mathematical Physics, PG_00209689 | | |
| 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 | Polish |
| Semester of study | 1 | ECTS credits | 5.0 |
| Learning profile | academic | Assessment form | credit |
| Conducting unit | Division of Mathematical Methods of Physics -> Institute of Theoretical Physics and Astrophysics -> Faculty of Mathematics, Physics and Informatics -> Rector | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. Marcin Marciniak | |
| | 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**

This course describes the fundamental types of second-order linear partial differential equations (often called the equations of mathematical physics), covering their properties and methods for solving them.

**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 determine approximate solutions of differential equations used in social sciences, medical sciences, biology and chemistry, among others. | [SU5] implementation of a problem task |
| [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 knows the applications and state of knowledge of the following equations: Laplace, Poisson, wave and heat, as well as selected integral equations. | [SW4] test/exam - oral or written |

<table>
<tr><td>Subject contents</td><td>Sturm-Liouville Systems<br><br>The classification of second-order linear partial differential equations.<br><br>Properties of hyperbolic equations using the wave equation as an example; Kirchhoff's formula, the d'Alembert method, and the Fourier method for solving the string equation; the method for solving the equation of a semi-infinite string.<br><br>Properties of elliptic equations using Laplace's equation as an example; the Green's function method for solving the Dirichlet problem.<br><br>Properties of parabolic equations using the heat equation as an example; the Fourier transform method.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Project</td><td>51.0%</td><td>30.0%</td></tr>
<tr><td>Written exam</td><td>51.0%</td><td>70.0%</td></tr>
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</td></tr>
<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>A. N. Tikhonov, A. A. Samarskii, Equations of Mathematical Physics, Dover Publications, 2011<br><br>V. P. Pikulin, S. I. Pohozaev, Equations of Mathematical Physics. A practical course. Springer Nature, 2001</td></tr>
<tr><td>Supplementary literature</td><td>not applicable</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>not applicable</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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