University of Gdańsk

Subject card

| | | | |
|---|---|---|---|
| Subject name and code | Optimization Theory II, PG_00206873 | | |
| Field of study | Mathematics | | |
| Date of commencement of studies | October 2026 | Academic year of realisation of subject | 2027/2028 |
| Education level | Master's studies | Subject group | Obligatory subject group in the field of study<br>Optional subject group<br>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 | 3 | ECTS credits | 5.0 |
| Learning profile | academic | Assessment form | exam |
| Conducting unit | Institute of Mathematics -> Faculty of Mathematics, Physics and Informatics -> Rector | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr Monika Wrzosek | |
| | 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**

To introduce students to the theoretical foundations and main applications of optimization theory.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [MATMU2_U04] is able to apply the scientific method in solving advanced problems in a selected branch of mathematics or its applications, and appropriately selects methods and tools - mathematical or computer - needed to solve such problems | The student is able to apply methods of optimization theory to solve advanced optimization problems, correctly selects mathematical tools, and carries out formal reasoning and proofs. | [SU4] test/exam - oral or written |
| [MATMU2_W03] knows and understands to a deep degree 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 between issues in this field and other areas of mathematics | The student knows and understands the proofs of theorems and understands the role of reasoning constructions in optimization problems and their applications. | [SW4] test/exam - oral or written<br>[SW1] oral statement/ conversation/discussion |

<table>
<tr><td>Subject contents</td><td>1. Uniform approximation of continuous functions on compact sets.<br>2. Characterization of the best approximation. Remez algorithm.<br>3. Splines and their applications in optimal approximation of linear functionals.<br>4. Global theory of conditional optimization. Duality theorems.<br>5. Generalized Lagrange multipliers. Iterative methods of optimization.<br>6. The method of steepest descent. Penalty function.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Optimization Theory I</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>tests</td><td>51.0%</td><td>50.0%</td></tr>
<tr><td>observation of the student's attitude</td><td>51.0%</td><td>0.0%</td></tr>
<tr><td>egzam</td><td>51.0%</td><td>50.0%</td></tr>
</table>
</td></tr>
<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>D. G. Luenberger, Teoria optymalizacji. BNI,1974.</td></tr>
<tr><td>Supplementary literature</td><td>• E. Pollak, Metody obliczeniowe optymalizacji. MIR, 1974.<br>• M. M. Syslo, N. Deo, J. S. Kowalik, Algorytmy optymalizacji dyskretnej. PWN, 1995.<br>• I. Nykowski, Z. Galas, Zbiór zadań z programowania matematycznego I II PWN 1986.<br>• M. Brdyś, A. Ruszczyński, Metody optymalizacji w zadaniach, WNT 1985.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table>
</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>not included</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
</table>

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