## Subject card

| Subject name and code | Discrete Mathematics, PG_00036609 |  |  |  |  |  |  |
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| Field of study | Mathematics |  |  |  |  |  |  |
| Date of commencement of studies | October 2021 |  | Academic year of realisation of subject |  |  | 2021/2022 |  |
| Education level | first-cycle studies |  | Subject group |  |  | Obligatory subject group in the field of study <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 | 1 |  | Language of instruction |  |  | Polish |  |
| Semester of study | 2 |  | ECTS credits |  |  | 6.0 |  |
| Learning profile | general academic profile |  | Assessment form |  |  | exam |  |
| Conducting unit | Department of Probability Theory and Biomathematics -> Faculty of Applied Physics and Mathematics |  |  |  |  |  |  |
| Name and surname of lecturer (lecturers) | Subject supervisor |  | dr inż. Magdalena Lemańska |  |  |  |  |
|  | Teachers |  | dr inż. Magdalena Lemańska |  |  |  |  |
| 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: 0.0 |  |  |  |  |  |  |
|  | Adresy na platformie eNauczanie: |  |  |  |  |  |  |
| 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 |  | 85.0 | 150 |
| Subject objectives | Introduction to methods integrating various branches of mathematics. |  |  |  |  |  |  |
| Learning outcomes | Course outcome |  | Subject outcome |  |  | Method of verification |  |
|  | K6_W04 |  | The student knows the Chinese remainder theorem, the basic theorems of the graph theory, the theorem on the existence of a solution for some recursive equations. |  |  | [SW2] Assessment of knowledge contained in presentation |  |
|  | K6_U02 |  | He can carry out easy proofs by induction method, he can formulate and solve simple recursive equations. |  |  | [SU4] Assessment of ability to use methods and tools |  |
|  | K6_U01 |  | The student is able to formulate theorems and understands them. |  |  | [SU2] Assessment of ability to analyse information |  |
|  | K6_U10 |  | He can model and solve discrete problems. |  |  | [SU2] Assessment of ability to analyse information |  |
|  | K6_W06 |  | The student knows selected concepts and methods of mathematical logic, set theory and discrete mathematics contained in the foundations of other mathematical disciplines. |  |  | [SW2] Assessment of knowledge contained in presentation |  |


| Subject contents | Elements of combinatorics: <br> a) Pigeonhole principle, switching on and off principle - 2 hours <br> Recurrences: <br> a) Fibonacci sequence, Hanoi towers, simple recursive equations - 2 hours <br> b) recursive equations, prediction method - second and higher order equations - 4 hours <br> c) recursive equations, the forming function method - 2 hours <br> Number theory: <br> a) integer division, divisibility of numbers, congruence relation, abstraction class, Zm ring, the largest common divisor - 2 hours <br> b) Euclid's algorithm, extended Euclid's algorithm, prime numbers and relatively prime numbers, reversible elements - 2 hours <br> c) solving congruence equations, the Chinese remainder theorem, the Euler function, <br> - 2 hours <br> d) RSA agorithm - 2 hours <br> Graphs <br> basic definitions, types of graphs, graph complementation, graph isomorphism <br> - 1 hour <br> Eulerian and Hamiltonian graphs, Euler theorem, Ore theorem, finding the longest and shortest path, the problem of the Chinese postman, -2 hours <br> trees - 3 hours <br> different versions of Hall's theorem - 2 hours <br> planar graphics - 2 hours <br> coloring of vertices and edges of graphs - 2 hours |  |  |
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| Prerequisites and co-requisites |  |  |  |
| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
|  | Tests | 50.0\% | 60.0\% |
|  | Exam | 50.0\% | 40.0\% |
| Recommended reading | Basic literature | „Matematyka dyskretna" A <br> „Matematyka dyskretna" | zepietowski <br> A. Ross, Charles R.B. Wright |
|  | Supplementary literature | http://mediawiki.ilab.pl/inde <br> „Teoria grafów" Robin Wilso | atematyka dyskretna 1 |
|  | eResources addresses |  |  |
| Example issues/ example questions/ tasks being completed | Solve the Fibonacci equation. Provide and prove the Chinese claim about the rest. Provide and prove the Euler-Hierholtz theorem. Provide and prove the claim of five colors. Solve the recursive equation. Solve the congruence system. Inductively prove that the $\mathrm{n}-1$ edge is in the tree with n vertices. |  |  |
| Work placement | Not applicable |  |  |

