(faculty stamp)

Course description

1. Course title: DISCRETE MATHEMATICS	**2. Course code: DM**
3. Validity of course description: since 2017/2018	
4. Mode of studies: intramural studies	
5. Level of studies: 1st cycle of higher education	
6. Field of study: MACROFACULTY (RAu)	
7. Profile of studies: general academic	
8. Programme:	
9. Semester: 2	
10. Faculty teaching the course: Institute of Mathematics, Faculty of Applied Mathematics	
11. Course instructor: dr hab. inż. Edyta Hetmaniok	
12. Course classification: joint courses	
13. Course status: compulsory	
14. Language of instruction: English	
15. Pre-requisite qualifications: Knowledge of mathematics at the secondary school level is required.	
16. Course objectives: : Aim of this course is to present the basic fields in mathematics concerning various discrete structures, mathematical logic, techniques of theorem proving, which makes an important supplement for mathematical analysis, algebra and analytical geometry.	
17. Description of learning outcomes:[1]	

No	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	Student has a systematic knowledge in the field of basic mathematical logic.	Final test	Lecture/class	K_W1, K_U6
2.	Student has a systematic knowledge in the field of basic discrete mathematics.	Final test	Lecture/class	K_W1, K_U6
3.	Student can apply mathematical logic for correct formulation of statements and for consideration of their correctness.	Final test	Lecture/class	K_W1, K_U6
4.	Student can apply the methods of discrete mathematics for description and analysis of finite objects appearing in theoretical and technical problems.	Final test	Lecture/class	K_W1, K_U6, K_U7
5.	Student can explain the concepts of higher mathematics in terms of functions and relations.	Final test	Lecture/class	K_W1, K_U6, K_U7

18. Teaching modes and hours: Lecture / BA /MA Seminar / Class / Project / Laboratory

Lecture	Class	Laboratory	Project	BA/MA Seminar
15 h	15 h			

Syllabus description:

Contents of lecture: ELEMENTS OF COMBINATORICS – permutations, function of n-factorial (n!), combinations, binomial coefficient, binomial formula. LOGIC – calculus of logic sentences, truth-tables, tautologies and contradictions, quantifiers. METHODS OF THEOREMS PROVING – direct proof, modus ponens, modus tollens, proof by contradiction and contrapositive, proof of equivalence, proof by mathematical induction. SETS – definition and notation, operations on sets, Venn diagrams, Cartesian product, size (cardinality) of a set, countable and uncountable sets. RELATIONS – definition and properties, graph of a relation, equivalence relation, relation of partial and total (linear) order. FUNCTION AS A RELATION – function in the sense of relation, surjective, injective, bijective function. INTRODUCTION TO GRAPH THEORY – definition and operation on graphs, graph isomorphism, walk, trail, path, trees. *Z* TRANSFORM AND DIFFERENCE EQUATIONS – recurrence relation and methods of its solving: iteration method, by characteristic equation, by using the generating functions, by using the *Z* transform.

Contents of exercises: Practical realization of the issues, presented during the lectures, on the way of discussing and solving the tasks illustrating the undertaken problems.

[1] należy wskazać ok. 5 – 8 efektów kształcenia

19. Examination: No

20. Primary sources:

Roman, S., An Introduction to Discrete Mathematics, CBS College Publishing, Philadelphia, 1986.
Matheson Jr., H.F., Discrete Mathematics with Applications, John Wiley & Sons Inc., New York, 1996.
Kulikowski, J.L. [et al.], Discrete mathematics, Warsaw, PWN, 1982.
Kelley, W.G., Peterson, A.C., Difference equations : an introduction with applications, Boston: Academic Press, Inc., 1991.
Dossey, J.A. [et al.], Discrete mathematics, HarperCollins College Pub, New York, 1993.

21. Secondary sources:

Srivastava, S.M., Course on mathematical logic, New York Springer, 2008.
Selby, S., Sweet, L., Sets, relations, functions: an introduction, New York: McGraw-Hill, 1963.
Harris, J.M., Hirst, J.L., Mossinghoff, M.J., Combinatorics and graph theory, New York Springer, 2008.
Goldberg, S., Introduction to difference equations: with illustrative examples from economics, psychology, and sociology, John Wiley & Sons, New York, 1963.
Aigner, M., Discrete mathematics, American Mathematical Society, Providence, Rhode Island, 2007.
Johnsonbaugh, R., Discrete mathematics, Upper Saddle River, Prentice Hall International, 1997.
Epp, S.S., Discrete mathematics with applications, Wadsworth Publ. Co, Belmont, 1990.

22. Total workload required to achieve learning outcomes

Lp.	Teaching mode :	Contact hours / Student workload hours
1.	**Lecture**	15/15
2.	**Classes**	15/30
3.	**Laboratory**	/
4.	**Project**	/
5.	**BA/ MA Seminar**	/
6.	**Other** (consultations, preparation for test)	2/13
	Total number of hours:	32/58

23. Total hours:	90
24. Number of ECTS credits:	3
25. Number of ECTS credits allocated for contact hours:	1
26. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects):	0

27. Comments: Assessment rules:

1. At the end of semester the final test will be organized (practical and theoretical tasks) for which one can get 50 points. Additionally one can get 5 points for activity during classes and 5 points for the short test.
2. The grade will be given according to the number of collected points, in the following way:
   0 – 20 p. insufficient
   21 – 35 p. sufficient (3.0)
   36 – 40 p. plus sufficient (3.5)
   41 – 44 p. good (4.0)
   45 – 49 p. plus good (4.5)
   50 – 60 p. very good (5.0)
3. Students who do not get the positive grade or want to improve the obtained grade can take the correction test. The correction test will take place during the summer exam session.
4. In the correction test the student can improve the grade for one rank at most.

The grade obtained after the test and correction test is the final grade.

Approved:

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(date, Instructor's signature) (*date, the Director of the Faculty Unit signature)*

[1] 1 ECTS – 25-30 hours of work