SYLLABUS

Name: ***Discrete mathematics (Math 3) (AESAu-A>SI2DM24)***
Name in Polish:
Name in English: ***Discrete mathematics (Math 3)***

Information on course:

Course offered by department: Faculty of Automatic Control, Electronics and Computer Science
Course for department: Silesian University of Technology

Default type of course examination report:

ZAL

Language:

English

Course homepage:

https://platforma.polsl.pl/rms/course/view.php?id=1185

Short description:

The 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. The scope of this course includes: definitions and properties of the basic concepts in the set theory and set calculus, relations and mathematical logic, applications of methods of the discrete mathematics in description and analysis of the finite objects occurring in theoretical and technical problems, concepts of the higher mathematics within the range of functions and relations
Course prerequisites: Course attendants should be familiar with mathematical notation and basic concepts of algebra and calculus.

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Description:

Detailed programme's content of lectures:
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.
Exercises: Practical realization of the issues, presented during the lectures, on the way of discussing and solving the tasks illustrating the undertaken problems.

ECTS: 3
Total workload: 90 hours (35h contact hours, 55h students' own work hours)
Forms of contact hours:
Lecture 15h
Class 15h
Other (e.g. test and reports revision and discussion) 5h
Students' own work: preparation for classes, revision of lecture slides, solving quizes, preparation for tests

Bibliography:

1. Roman, S., An Introduction to Discrete Mathematics, CBS College Publishing, Philadelphia, 1986.
2. Matheson Jr., H.F., Discrete Mathematics with Applications, John Wiley & Sons Inc., New York, 1996.
3. Kulikowski, J.L. [et al.], Discrete mathematics, Warsaw, PWN, 1982.
4. Kelley, W.G., Peterson, A.C., Difference equations : an introduction with applications, Boston: Academic Press, Inc., 1991.
5. Dossey, J.A. [et al.], Discrete mathematics, HarperCollins College Pub, New York, 1993.
6. Srivastava, S.M., Course on mathematical logic, New York Springer, 2008.
7. Selby, S., Sweet, L., Sets, relations, functions: an introduction, New York: McGraw-Hill, 1963.
8. Harris, J.M., Hirst, J.L., Mossinghoff, M.J., Combinatorics and graph theory, New York Springer, 2008.
9. Goldberg, S., Introduction to difference equations: with illustrative examples from economics, psychology, and sociology, John Wiley & Sons, New York, 1963.
10. Aigner, M., Discrete mathematics, American Mathematical Society, Providence, Rhode Island, 2007.
11. Johnsonbaugh, R., Discrete mathematics, Upper Saddle River, Prentice Hall International, 1997.
12. Epp, S.S., Discrete mathematics with applications, Wadsworth Publ. Co, Belmont, 1990.

Learning outcomes:

The student knows and understands basics in the fields of mathematical logic, set theory, functions and relations, graph theory, difference equations, digital circuit arithmetic (K1A_W1)
The student is able to apply the methods of discrete mathematics for description and analysis of finite objects appearing in theoretical and technical problems (K1A_U1)

Assessment methods and assessment criteria:

Presence at the lecture is not obligatory, but recommended. Knowledge of issues presented at the lecture is required. Presence in class exercises is obligatory and monitored.
At the end of semester the final test will be organized (practical and theoretical tasks) for which one can get a maximum of 50 points. Additionally one can get 10 points for activity during classes and up to 10 bonus points for online homework quizzes. The final 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)
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. In the correction test the student can improve the grade for one rank at most.
The syllabus is valid from academic year 2024/25 and its content cannot be changed during the semester

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	3	2024/2025-Z	