

ABSTRACTS

**of the scientific works for participation in the contest
for the academic position of “professor”
(Annotations of the materials under Art. 76 (1) of PRASPU for
participation in the contest, including self-assessment of contributions)
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Twenty-four (24) scientific publications and one (1) textbook are presented for participation in this contest (see List of scientific papers for participation in the contest). All of them were published after the academic position of “Associate Professor” was acquired (2014).

I. Scientific Publications

1. **Kiskinov H.**, Zahariev A., Zlatev S., A new Monod type model accounting distributed delayed mortality in bacterial populations, *C. R. Acad. Bulg. Sci.*, Vol. 67 (2014), No. 9, 1211-1216, ISSN 1310-1331, [MR3308477](#), [Zbl 1324.92020](#), (**Web of Science, IF 2014 = 0.284 – Q4**), (SCOPUS, SJR 2014 = 0.210).

A new Monod type model of batch bioreactor is introduced. The model unites and develops the positive results from some previous models considered by many authors in particular by us too. The main advantage of the proposed model is the possibility by means of the distributed delay to account the impact of the mortality on the growth of the bacterial populations, during the whole interval of their average life time. Under these assumptions, the Cauchy problem for the considered model is formulated and existence of a unique globally absolutely continuous solution under non-negative initial conditions is proved. In addition the dynamics of the bacterial populations growth is investigated when the nutrient substrate vanishes on a finite or infinite period.

2. Zahariev A., **Kiskinov H.**, Angelov A., Zlatev S., Time lag model for bioreactor simulation accounting the effect of microorganism mortality, *Biotechnology & Biotechnological Equipment*, Vol. 29 (2015), No. 1, 195-199, ISSN 1310-2818, <https://doi.org/10.1080/13102818.2014.993111>, (**Web of Science, IF 2015 = 0.373 – Q4**), (**SCOPUS, SJR 2015 = 0.173**).

In the present paper a generalization of the classical model of Monod of batch bioreactor accounting the effects of delayed and instant mortality in bacterial populations is proposed. This model is analyzed in terms of adequacy and applicability for simulation of the process of periodic aerobic cultivation of microorganisms (bacteria, yeast). Existence of a unique global absolutely continuous solution of the Cauchy problem for the proposed model is proved. In addition the dynamics of the bacterial populations is investigated when the nutrient substrate diminishes on a finite or infinite period. Specific relationships have been obtained that allow for each specific taxonomic group of microorganisms to calculate the concentration of nutrient substrate needed to start population development, as well as to calculate the concentration of nutrient substrate that ensures that the concentration of biomass is maximum.

3. Angelov V., **Kiskinov H.**, Zahariev A., Georgiev L., On a fixed point theorem in uniform spaces and its application to nonlinear Volterra type operators, *Fixed Point Theory*, Vol. 18 (2017), No. 1, 47-56, ISSN 1583-5022, ISSN 2066-9208, [MR3675523](#), [Zbl 06696973](#), (**Web of Science, IF 2017 = 0.548 – Q3**), (**SCOPUS, SJR 2017 = 0.745**).

In the present work, we prove a fixed point theorem for nonlinear operators acting in Hausdorff sequentially complete uniform spaces whose uniformity is generated by a saturated family of pseudometrics. As an application we consider nonlinear abstract Volterra type integral equations of second kind in the case when the independent variable belongs to arbitrary completely regular Hausdorff space. Existence and uniqueness of the solutions of these equations in nonhomogeneous case are also proved.

4. **Kiskinov H.**, Kostadinov S., Zahariev A., Cholakov S., Weighted exponential dichotomy of the solutions of linear impulsive differential equations in a Banach space, *Rostocker Mathematisches Kolloquium*, Vol. 69 (2014/15), 3-17, ISSN 0138-3248, [MR3445662](#), [Zbl 1328.34052](#).

The goal of the present paper is to study a weighted Ψ -exponential dichotomy for linear differential equations with impulse effect in arbitrary Banach spaces. A dependence between the Ψ -exponential dichotomy of a homogeneous impulsive equation in a Banach space and the existence of a Ψ -bounded on the semi-axis solution of the corresponding nonhomogeneous impulsive equation is established.

5. **Kiskinov H.**, Zahariev A., Nonlinear impulsive differential equations with weighted exponential or ordinary dichotomous linear part in a Banach space, *International Journal of Differential Equations*, Volume 2015 (2015), Article ID 748607, 7 pages, ISSN 1687-9651, <http://dx.doi.org/10.1155/2015/748607>, [MR3407070](#), [Zbl 1339.34067](#), (**Web of Science**), (SCOPUS, SJR 2015 = 0.361).

This paper considers nonlinear perturbed impulsive differential equations with a weighted Ψ -dichotomous linear part in an arbitrary Banach space. We show that some properties of these equations are influenced by the corresponding Ψ -dichotomous impulsive homogeneous linear equation. By the help of Banach's fixed-point principle sufficient conditions for existence of Ψ -bounded solutions of these equations on \mathbb{R} and \mathbb{R}^+ in the cases of Ψ -exponential or Ψ -ordinary dichotomy are found.

6. Veselinova M., **Kiskinov H.**, Zahariev A., Stability analysis of neutral linear fractional system with distributed delays, *Filomat* 30:3 (2016), 841-851, ISSN 0354-5180, ISSN 2406-0933, doi:10.2298/FIL1603841V, [MR3498682](#), [Zbl 06749741](#), (**Web of Science, IF 2016 = 0.695 – Q2**), (SCOPUS, SJR 2016 = 0.748);

Veselinova M., **Kiskinov H.**, Zahariev A., Addendum to Stability analysis of neutral linear fractional system with distributed delays (Filomat 30:3 (2016), 841-851), *Filomat* 31:15 (2017), 5013-5017, ISSN 0354-5180, ISSN 2406-0933, doi:10.2298/FIL1715013V, [MR3725558](#), (**Web of Science, IF 2017 = 0.635 – Q3**), (SCOPUS, SJR 2017 = 0.384).

The aim of this work is to clear the existence and the uniqueness of the solution of an initial problem for neutral linear fractional differential system with distributed delays in the cases of incommensurate Riemann-Liouville and Caputo fractional derivatives. For the autonomous case we establish that if all roots of the introduced characteristic equation have negative real parts then the zero solution of the considered homogeneous linear fractional differential system with distributed delay is globally asymptotically stable. The proposed conditions coincide with the conditions which guaranty the same result in the particular case of system with constant delays.

7. Veselinova M., **Kiskinov H.**, Zahariev A., Stability analysis of linear fractional differential system with distributed delays, *AIP Conference Proceedings* **1690**, 040013 (2015), <https://doi.org/10.1063/1.4936720>, ISSN 1551-7616, ISSN 0094-243X, ISSN 0000-1984, ISSN 0000-2005, ISSN 0000-1983, (**Web of Science**), (SCOPUS, SJR 2015 = 0.179).

In the present work we study the Cauchy problem for linear incommensurate fractional differential system with distributed delays. For the autonomous case with distributed delays with derivatives in Riemann-Liouville or Caputo sense, we establish sufficient conditions under which the zero solution is globally asymptotic stable. The established conditions coincide with the conditions which guaranty the same result in the particular case of system with constant delays and for the case of system without delays in the commensurate case too.

8. Veselinova M., **Kiskinov H.**, Zahariev A., About stability conditions for retarded fractional differential systems with distributed delays, *Communications in Applied Analysis* **20** (2016), 325-334, ISSN 1083-2564, doi: [10.12732/caa.v20i3.5](https://doi.org/10.12732/caa.v20i3.5), [Zbl 1365.34136](https://zbmath.org/journal/Zbl1365.34136), (SJR 2016 = 0.332).

The aim of this paper is to introduce a new approach which allows to establish sufficient explicit conditions for global asymptotic stability of linear fractional differential system with distributed delays. The fractional derivatives in the system can be of Riemann-Liouville or Caputo type. The approach allows to replace the difficult for practical checking theoretical condition "if all roots of an analogue of the characteristic equation have negative real parts, then the considered system is asymptotically stable", with significantly simple task - to study the distribution of the roots of a polynomial or the distribution of the eigenvalues for a constant matrix, which are explicitly determined from the systems parameters. In the paper both cases of Riemann-Liouville and Caputo incommensurate type fractional derivatives are considered and some results for the commensurate case are given too.

9. Veselinova M., **Kiskinov H.**, Zahariev A., Explicit conditions for stability of neutral linear fractional system with distributed delays, *AIP Conference Proceedings* **1789**, 040005 (2016), <https://doi.org/10.1063/1.4968458>, ISSN 1551-7616, ISSN 0094-243X, ISSN 0000-1984, ISSN 0000-2005, ISSN 0000-1983, (**Web of Science**), (**SCOPUS**, **SJR 2016 = 0.163**).

The first purpose of the paper was to clear the existence and the uniqueness of the solution of the Cauchy problem for neutral linear incommensurate fractional differential system with distributed delays in the cases of Riemann-Liouville and Caputo derivatives. The obtained results generalize some results for the general case when the singular part in the Lebesgue decomposition of the kernels is not identically zero. Another purpose was to prove for the autonomous neutral system in the commensurate case some well known specific results for autonomous delayed systems. The obtained results are new even in the case, when in the Lebesgue decomposition of the both kernels the absolutely continuous and singular parts are identically zero. The main purpose was to replace the theoretical condition "if all roots of an analogue of the characteristic equation have negative real parts, then the considered system is asymptotically stable" with explicit type sufficient conditions for asymptotical stability. That means to replace this non constructive theoretical condition with a significantly simple task of two simple calculations - to study a function for nonexistence of roots in a compact interval and to find the maximum for a function in a rectangle, where all functions and compact sets are explicitly determined from the system parameters. We consider basically the incommensurate case but some results are given for the commensurate case too. The proposed conditions are based on the logarithmic norm technique and a part of the results are new even in the particular case of system with constant delays.

10. Boyadzhiev D., **Kiskinov H.**, Veselinova M., Zahariev A., Stability analysis of linear distributed order fractional systems with distributed delays, *Fractional Calculus and Applied Analysis* Vol. 20, No. 4 (2017), 914-935, doi: 10.1515/fca-2017-0048, ISSN 1311-0454, ISSN 1314-2224, [MR3684876](#), [Zbl 06770465](#), (**Web of Science, IF 2017 = 2.865 – Q1**), (**SCOPUS, SJR 2017 = 1.967**).

In the present work we study autonomous linear systems with distributed delays and distributed order fractional derivatives based on Caputo type single fractional derivatives, with respect to a nonnegative density function. For the initial problem of this kind of systems, existence, uniqueness and a priori estimate of the solution are proved. As an application of the obtained results, we establish sufficient conditions for global asymptotic stability of the zero solution of the investigated types of systems in the homogeneous case.

11. **Kiskinov H.**, Milev N., Zahariev A., A comparison type theorem for linear neutral fractional systems with distributed delays, *AIP Conference Proceedings* **1910**, 050009 (2017), <https://doi.org/10.1063/1.5013991>, ISSN 1551-7616, ISSN 0094-243X, ISSN 0000-1984, ISSN 0000-2005, ISSN 0000-1983, (**Web of Science**), (**SCOPUS, SJR 2017 = 0.165**).

The aim of the present work is using some new matrix measure results to establish explicit conditions for global asymptotic stability of the zero solution of incommensurate neutral linear fractional differential system with distributed delays. The derivatives in the system can be in Riemann-Liouville or Caputo type. The proposed conditions allow the studying for global asymptotic stability of the zero solution of the considered neutral system to be replaced with studying of the same problem for the corresponding (auxiliary) retarded linear fractional systems, which is a significantly simpler task.

12. **Kiskinov H.**, Zahariev A., On abstract integral equations with two nonlinear Volterra type operators in metric spaces, *Indian Journal of Mathematics* Vol. 60, No. 2 (2018), 207-234, ISSN 0019-5324, [MR3837762](#), [Zbl 06999736](#), (**SCOPUS, SJR 2018 = 0.142**).

In the present work a class of abstract integral equations of second kind with two nonlinear Volterra type operators in metric spaces is considered. Sufficient conditions for the existence and uniqueness of the solutions of this class integral equations are obtained. The corresponding integral inequalities are studied too and some applications of the obtained results to integral inequalities involving maxima are given.

13. **Kiskinov H.**, Zahariev A., On fractional systems with Riemann-Liouville derivatives and distributed delays - choice of initial conditions, existence and uniqueness of the solutions, *Eur. Phys. J. Special Topics*, Vol. 226, No. 16-18 (2017), 3473-3487, <https://doi.org/10.1140/epjst/e2018-00077-9>, ISSN 1951-6355, ISSN 1951-6401, (**Web of Science, IF 2017 = 1.947 – Q2**), (SCOPUS, SJR 2017 = 0.552).

A comparative analysis among the possible types of initial conditions including (or not) derivatives in the Riemann-Liouville sense for incommensurate fractional differential systems with distributed delays is proposed. The provided analysis is essentially based on the possibility to attribute physical meaning to the initial conditions expressed in terms of Riemann-Liouville fractional derivatives. This allows the values of the initial functions for the mentioned initial conditions to be obtained by appropriate measurements or observations. In addition, an initial problem with non-continuous initial conditions partially expressed in terms of Riemann-Liouville fractional derivatives is considered and existence and uniqueness of a special type continuous solution of this initial problem is proved.

14. Boyadzhiev D., **Kiskinov H.**, Zahariev A., Integral representation of solutions of fractional system with distributed delays, *Integral Transforms and Special Functions* Vol. 29, No. 9 (2018), 725-744, <https://doi.org/10.1080/10652469.2018.1497025>, ISSN 1065-2469, ISSN 1476-8291, [MR3830863](#), [Zbl 06916656](#), (**Web of Science, IF 2018 = 0.812 – Q2**), (SCOPUS, SJR 2018 = 0.676).

In the present work we consider a linear system with distributed delay and derivatives in Caputo sense of incommensurate type. For this system we study two important problems. First of them is to clear the problem with existence and the uniqueness of the solutions of initial problem in the case of discontinuous initial conditions. As far as we know, there are no results concerning initial problem for fractional differential equations with delay with discontinuous initial function. The other one is to prove the variation of constants formula for this initial problem. The obtained results extend the corresponding ones in the particular case of fractional system with constant delays. The proposed conditions coincide with the conditions which guaranty the same result in the case of integer order linear differential equations with distributed delay. In addition the integral representation of the solution of the initial problem is improved for the autonomous case. The obtained results are new even in the particular case of fractional system with constant delays.

15. Rahneva O., **Kiskinov H.**, Dimitrov I., Matanski V., Application of a Weibull cumulative distribution function based on m existing ones to population dynamics, *International Electronic Journal of Pure and Applied Mathematics*, Vol. 12, No. 1 (2018), 111-121, ISSN 1314-0744, [MR3872202](https://doi.org/10.12732/iejpm.v12i1.8), doi:10.12732/iejpm.v12i1.8.

In this paper is considered a modified Weibull cumulative distribution function based on m existing ones. It is studied the important "saturation" characteristic for this function in the Hausdorff sense. The results have independent significance in the study of issues related to life time analysis, insurance mathematics, biochemical kinetics, population dynamics and debugging theory. Numerical examples illustrating the obtained results using programming environment Mathematica are presented.

16. **Kiskinov H.**, Zahariev A., Asymptotic stability of delayed fractional systems with nonlinear perturbation, *AIP Conference Proceedings* **2048**, 050014, (2018), <https://doi.org/10.1063/1.5082113>, ISSN 1551-7616, ISSN 0094-243X, ISSN 0000-1984, ISSN 0000-2005, ISSN 0000-1983, (**Web of Science**), (**SCOPUS, SJR 2018 = 0.182**).

In the present work is considered a fractional nonlinear retarded system of incommensurate type with derivatives in Caputo sense. For this system is cleared the problem with existence and the uniqueness of the solutions of the initial problem in the case of discontinuous initial conditions. As partial case is studied a retarded nonlinear perturbed incommensurate fractional differential system with autonomous linear part. Sufficient conditions are found, which imply that if the zero solution of the linear part of the nonlinear perturbed system is globally asymptotically stable then the zero solution of the perturbed nonlinear system is globally asymptotically stable too.

17. Zahariev A., **Kiskinov H.**, Angelova E., Linear fractional system of incommensurate type with distributed delay and bounded Lebesgue measurable initial conditions. *Dynamic Systems and Applications*, Vol. 28, No.23 (2019), 491-506, ISSN 1056-2176, doi: [10.12732/dsa.v28i2.14](https://doi.org/10.12732/dsa.v28i2.14), (**Web of Science, IF 2019 = 0.522 – Q4**), (**SJR 2019 = 0.208**).

In the present work is considered a fractional linear system with distributed delay and derivatives in Caputo sense of incommensurate type. For this system is studied the important problem for existence and uniqueness of the solutions of an initial problem in the case of locally bounded Lebesgue measurable initial functions.

18. **Kiskinov H.**, Petkova M., Zahariev A., About the Cauchy problem for nonlinear system with conformable derivatives and variable delays, *AIP Conference Proceedings* **2172**, 050006, (2019), <https://doi.org/10.1063/1.5133525> , ISSN 1551-7616, ISSN 0094-243X, ISSN 0000-1984, ISSN 0000-2005, ISSN 0000-1983, (**Web of Science**), (**SCOPUS**, **SJR 2019 = 0.190**).

In the paper are made some notes to the newly introduced conformable derivative as a type local fractional derivative and it is presented a surprising result about the relation between the conformable derivatives and the usual integer order derivatives. As a consequence is considered an initial problem for system of nonlinear differential equations with conformable derivatives and delays. A scheme is shown how to transform it to equivalent well studied initial problem for system of integer first order equations with delays and as standard also to a system of Volterra integral equations, even in the case when the lower terminal of the conformable derivatives coincides with the right side of the initial interval. For convenience such transforms are made first for an initial value problem for nonlinear differential equation with conformable derivative without delay and with initial condition at the lower terminal of the derivative.

19. Zahariev A., **Kiskinov H.**, Asymptotic stability of the solutions of neutral linear fractional system with nonlinear perturbation, *Mathematics*, Vol. 8 (2020), No. 3, 390, <https://doi.org/10.3390/math8030390> , ISSN 2227-7390, (**Web of Science**, **IF 2020 = 2.258 – Q1**), (**SCOPUS**, **SJR 2020 = 0.495**).

In this article, first a general case of nonlinear delayed fractional system with linear neutral part and variable delays is considered. The fractional derivatives of the system are in Caputo sense with incommensurate orders. The incommensurate order of the fractional derivatives means that, unlike many fractional systems studied, the order of the fractional derivative is not the same for the whole system, and moreover, the different orders of the fractional derivatives are not rational numbers, which would allow a common denominator to be found (such approach has also been widely used in some studies). For this type systems we prove existence and uniqueness of the solutions of an initial problem with piecewise continuous initial conditions. Then we have two main goals. First of them is to obtain sufficient conditions which guarantee that the zero solution of a neutral linear system with nonlinear perturbation is globally asymptotically stable if the zero solution of the unperturbed neutral linear system is globally asymptotically stable. The second one is to study the influence of the memory on the asymptotic nature of the solutions of these systems, which is generated by the fractional derivatives and the time delays in the systems. Since the conditions and the obtained results are similar as these in the case of delayed systems with integer derivatives we can conclude that the influence from the memory generated by the time delays in the systems has more determining influence for the evolution of the process in compare with this generated by the fractional derivatives. It must be noted that for the study of the stability properties described above, a formula for integral representation of the general solution of a linear autonomous neutral system with several delays is proved.

20. **Kiskinov H.**, Madamlieva E., Veselinova M., Zahariev A., Existence of absolutely continuous fundamental matrix of linear fractional system with distributed delays, *Mathematics*, Vol. 9 (2021), No. 2, 150, <https://doi.org/10.3390/math9020150>, ISSN 2227-7390, (**Web of Science, IF 2020 = 2.258 – Q1**), (**SCOPUS, SJR 2020 = 0.495**).

Kiskinov H., Madamlieva E., Veselinova M., Zahariev A., Correction: Existence of absolutely continuous fundamental matrix of linear fractional system with distributed delays (*Mathematics*, (2021) 9, 150, 10.3390/math9020150), *Mathematics*, Vol. 9 (2021), No. 11, 1282, <https://doi.org/10.3390/math9111282>, ISSN 2227-7390, (**Web of Science, IF 2020 = 2.258 – Q1**), (**SCOPUS, SJR 2020 = 0.495**).

In the present work, we consider linear fractional systems with distributed delays and incommensurate order derivatives in the Caputo sense. The first goal of the work is to establish sufficient conditions for existence and uniqueness of a fundamental matrix $C(t,s)$, which is absolutely continuous in t on every compact subinterval of \mathbb{R} . The second one is to clarify the analytic properties in s , which are very similar to these in the integer case. Some applications of the obtained result concerning the integral representation of the solutions are given too.

21. **Kiskinov H.**, Petkova M., Zahariev A., Remarks on the coincidence of the left-side and right-side fractional derivatives on an interval and some consequences, *AIP Conference Proceedings* **2333**, 080003, (2021), <https://doi.org/10.1063/5.0041754>, ISSN 1551-7616, ISSN 0094-243X, ISSN 0000-1984, ISSN 0000-2005, ISSN 0000-1983, (**Web of Science**), (**SCOPUS, SJR 2020 = 0.177**).

The aim of the present paper is to analyze the possibility of coincidence of the left-side and right-side Caputo fractional derivatives on an interval. We prove, that a function whose left-side and right-side Caputo fractional derivatives coincide on an given interval, can be only a constant. As a consequence we point out why some "results" obtained by other authors under this assumption are wrong.

22. **Kiskinov H.**, Petkova M., Zahariev A., Veselinova M., Some results about conformable derivatives in Banach spaces and an application to the partial differential equations, *AIP Conference Proceedings* **2333**, 120002, (2021), <https://doi.org/10.1063/5.0041758>, ISSN 1551-7616, ISSN 0094-243X, ISSN 0000-1984, ISSN 0000-2005, ISSN 0000-1983, (**Web of Science**), (**SCOPUS, SJR 2020 = 0.177**).

In the paper we discuss conformable derivative behavior in arbitrary Banach spaces and clear the connection between two conformable derivatives of different order. As a consequence we obtain the important result that an abstract function has a conformable derivative at a point (which does not coincide with the lower terminal of the conformable derivative) if and only if it has a first order derivative at the same point. As an application of the obtained results we prove that the existence of a weak solution of a mixed (initial/boundary) problem for a parabolic partial differential equation with conformable derivative on time is equivalent to the existence of a weak solution of the same mixed problem for an appropriate considered parabolic equation with integer order derivative.

23. **Kiskinov, H.**; Veselinova, M.; Madamlieva, E.; Zahariev, A. A comparison of a priori estimates of the solutions of a linear fractional system with distributed delays and application to the stability analysis. *Axioms*, Vol. 10 (2021), No. 2, 75, ISSN 2075-1680, <https://doi.org/10.3390/axioms10020075>, (**Web of Science**), (**SCOPUS**, **SJR 2020 = 0.355**).

In this article, we consider a retarded linear fractional differential system with distributed delays and Caputo type derivatives of incommensurate orders. For this system, several a priori estimates for the solutions, applying the two traditional approaches by the use of the Gronwall's inequality and by the use of integral representations of the solutions are obtained. As application of the obtained estimates, different sufficient conditions which guaranty finite-time stability of the solutions are established. A comparison of the obtained different conditions in respect to the used estimates and norms is made.

24. **Kiskinov, H.**; Madamlieva, E.; Veselinova, M.; Zahariev, A.; Integral representation of the solutions for neutral linear fractional system with distributed delays. *Fractal Fract.*, Vol. 5 (2021), No. 4, 222, ISSN 2504-3110, <https://doi.org/10.3390/fractalfract5040222>, (**Web of Science**, **IF 2020 = 3.313 – Q1**), (**SJR 2020 = 0.600**).

In the present paper first we obtain sufficient conditions for existence and uniqueness of the solution of the Cauchy problem for an inhomogeneous neutral linear fractional differential system with distributed delays (even in the neutral part) and Caputo type derivatives, in the case of initial functions with first kind discontinuities. This result allows to prove that the corresponding homogeneous system possess a fundamental matrix $C(t,s)$ continuous in t , $t \in [a, \infty)$, $a \in \mathbb{R}$. As an application, integral representations of the solutions of the Cauchy problem for the considered inhomogeneous systems are obtained.

II. Textbooks

25. **Hristo Kiskinov**, *Introduction in the Discrete Mathematics*, Plovdiv University Press 2022, ISBN 978-619-7663-09-9 (in Bulgarian).

The textbook "Introduction to Discrete Mathematics" is written on the basis of the lectures given by the author on "Discrete Mathematics" for the Bachelor specialties Mathematics; Applied Mathematics; Business mathematics; Informatics; Mathematics and Informatics; Mathematics, Informatics and Information Technology, Information Technology, Mathematics and Educational Management; as well as on "Discrete Structures" for the specialty of Software Engineering at FMI at the University of Plovdiv "Paisii Hilendarski".

The content of the textbook, set out on 340 pages, consists of an introduction, 6 chapters and a bibliography of 74 titles. The presented curriculum is presented in six chapters and includes the following topics:

In the first chapter, which has an auxiliary character, the basic concepts of the theory of sets, graphs, relations and functions are considered.

The second chapter is devoted to Boolean functions and discusses both the necessary tools for representation as tables and formulas, and theoretical results such as the Post criterion for completeness and the presence of precomplete sets. Attention is paid to important practical aspects such as the construction of logical circuits and the minimization of Boolean functions.

The third chapter begins the research of formal languages and presents the different types of generating grammars according Chomsky's hierarchy. Regular expressions are also mentioned.

The fourth chapter presents finite state automata in their various varieties as the simplest type of abstract machines without external memory.

In the fifth chapter the abstract machines with one, two or more stacks are considered, as well as the Turing machines in their role as acceptors. A detailed recapitulation of the connections between the various abstract machines and the formal languages they accept has been made.

The sixth and final chapter is devoted to the role of Post and Turing machines as models of computing machines. Some important algorithmic problems are considered, confirming the limits of the capabilities of any modern computer.

The textbook includes those sections of discrete mathematics, which according to the author are most related to computer science. It is characteristic that there are many examples and exercises directly related to the presented material, as well as their good graphic presentation. Their solutions are presented for all exercises.

Signature:

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20.01.2022

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