

## REVIEW

from prof. Eugenia Assenova Stoimenova, IMI-BAS

Professional direction 4.5 Mathematics for competition of academic position of 'Professor' for the needs of Dept Informatics at NBU

in Professional direction 4.5 Mathematics announced in SG No. 35/18.04.2023 г.,

with candidates **Associate Professor Dr. Danail Brezov and Associate Professor Dr. Dimitar Atanasov**

### A. Evaluation of the scientific works of Assoc. Prof. Dr. Danail Brezov

Associate Professor Dr. Danail Stefanov Brezov graduated in Physics (bachelor degree in physics) in 2004 from the Faculty of Physics at Sofia University "St. Kliment Ohridski". In 2007 he completed the master program "Mathematics and Mathematical Physics" of the FMI of SU. In 2015 Danail Brezov has obtained a Doctor degree defending a thesis "Vector parametrizations and factorizations in Euclidean and hyperbolic models in mechanics" at the Institute of Mechanics of the Bulgarian Academy of Sciences. He was awarded the educational and scientific degree "doctor" in scientific specialty 01.02.01 "Theoretical Mechanics". He worked as a physicist at the Institute of Mechanics of the BAS in 2006. He was an assistant at the European Polytechnic University, Pernik in the period 2010 - 2012. From 2007 to the present, he worked at the University of Architecture, Civil Engineering and Geodesy as a chief assistant (2007-2019), and since 2019 he is an associate professor.

### I. Assessment of compliance with the minimum national requirements and the requirements of the New Bulgarian University

For participation in the competition for the academic position of "Professor" the candidate Assoc. Prof. Dr. Danail Brezov submitted documents that comply with the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria and the corresponding specific requirements of the NBU for this position. A report on the fulfillment of the minimum national requirements for scientific and teaching activities for obtaining a scientific degree and for occupying the academic position of "professor" for the field of higher education 4.5. Mathematics is presented.

The table shows the exact number of points according to the minimum requirements of ZRASRB and NRAS of NBU and the respective performance of the candidate.

Group of indicators		minimum requirements	Declared by Dr Brezov	According documents
A	Indicator 1	50	<b>50</b>	<b>50</b>
B	Indicator 2	0	<b>0</b>	<b>0</b>
C	Indicators 3 and 4	100	<b>276</b>	<b>111</b>

D	Sum of indicators 5 to 10	200	<b>441</b>	<b>315</b>
E	Indicator 11	100	<b>216</b>	
F	Sum of indicators from 12 to 20	150	<b>190</b>	<b>50</b>
G	Sum of indicators from 21 to 33	70	<b>95</b>	<b>No evidence</b>
H	Sum of indicators from 34 to 40	70	<b>110</b>	<b>No evidence</b>
I	Sum of indicators from 41 to the end	70	<b>75</b>	<b>No evidence</b>

It can be seen that the points of some indicators exceed the minimum number of points, for others there is no evidence in the attached documents, and the points of indicators of group E are below the minimum in the opinion of the reviewer.

Notes on adjusting scores by indicators.

**Group C.** Articles No. 14, No. 15, No. 16 and No. 17 of the NACID reference are not on the list for the competition and have not been submitted. We have to subtract  $30+60+30+45=165$  points from C4. The remaining 3 articles from the NACID reference were published before the 2019 Associate professor competition, but did not participate in this procedure, we will accept them for evaluation with this note. Thus, we will accept 111 points out of the claimed 276.

**Group D.** Articles No. 26, No. 27, No. 28 and No. 29 of the NACID reference are not on the list for the competition and have not been submitted. From D7 we have to subtract  $18+30+30+18=96$  points. Articles No. 32 and No. 33 from the NACID reference are not on the list for the competition and have not been submitted. From D8 we must take off  $15+15=30$  points. We accept 315 points out of the claimed 441.

**Group F.** In Indicator F14, there is no evidence for the 5 projects in the reference, "Organization of schools and international scientific exchange" I do not accept for participation in projects. In Indicator F19, 3 textbooks are described, and only one textbook is presented for participation in the contest. We accept 10 points for a consultant to a successfully defended doctoral student in F13 and 40 points for a textbook in F19.

**Group H.** No evidence presented for Indicators 34-40.

**Group I.** No evidence was presented for the declared participations.

There are articles (No. 1 and No. 12) in the list of articles for the competition, that are not included in the NACID reference.

## II. Research (creative) activity and results

The scientific interests of Assoc. Dr. Danail Brezov are stated in the CV as: geometry and symmetry groups in mathematical physics; applied and computational mathematics; statistical methods and Monte Carlo algorithms in data analysis and simulations.

For participation in the competition, he submitted 12 papers and 1 textbook. Paper #2 is a preprint and I will not evaluate it. Publications submitted for this competition have not been used in other professional development procedures. All the proposed papers have been published in reputable journals, with 2 of them (#4 and #7) being in the SJR Q1 category, one with #3 being in the SJR Q2 category, 6 being in the SJR Q3 category, and 2 being in category Q4 of SJR.

The scientific results of Associate Professor Danail Brezov, PhD, published in the papers submitted for participation in the competition, are in the areas of algebraic geometric models in mathematical physics, geometric algebras and topological groups. The author reference contains summaries of the articles for the competition.

**1. Evaluation of the monographic work, creative performances or other publications, corresponding in volume and integrity of the monographic work, including evaluation of the scientific and scientific-applied contributions of the author.**

There are three papers presented in the competition, which are classified in group C of the NACID reference, and all three were published before the appointment of the candidate for associate professor in 2019, although they did not participate in this procedure.

I will briefly comment on these papers. Two of the papers, #9 and #10, are devoted to the projective quaternion technique and its applications in the description of low-dimensional motion groups. The focus is on the projective description of kinematics. Using the quaternion technique, solutions to a wide range of kinematic problems have been obtained. In paper #11, an alternative parametrization of three-dimensional Euclidean rotations based on decomposition with respect to two axes is considered. Publications are in Scopus category Q3 and Q4 issues. In the reviewer's opinion, the quantity and quality of these 3 publications definitely do not correspond in volume and completeness to a monographic work.

**2. Evaluation of the contributions in the other attached publications (creative performances) made after the appointment of the academic position "Chief Assistant. It also includes an assessment of the peer review requirement.**

This group includes 6 papers from the list for the competition, namely #3-#8. Papers #3 and #4 have an applied character. They explore traffic patterns in the context of smart cities and urban planning, as well as environmental and health research. Models are based on scarce reliable data. Techniques from machine learning and artificial intelligence are applied. The impact of urban noise and pollution on human health has been studied through surveys.

In paper #5, some Coriolis-type effects in special relativity and electromagnetism are investigated in close analogy with a kinematic treatment of the group of spatial rotations. At the author's discretion, the article is retrospective in nature, reviewing and contextualizing his previous results.

Paper #6 addresses a practical problem of analyzing information from multiple views of calibrated cameras. A method for obtaining the positional orientation structure of such camera ensembles is proposed. The solution is reduced to the intersection of quadratics, with the conditions for compatibility of the system depending on the viewing angle of the cameras and their initial orientation

Paper #7 provides a study of commutative algebras generated by iteration of vector products in  $C^3$ . Focusing on specific real forms, the analytic properties of the corresponding rings of functions are discussed and related to various physical problems.

In paper #8, a method for obtaining powers and roots of dual complex  $2 \times 2$  matrices based on a broad generalization of De Moivre's formula is proposed. The compact exact expressions obtained for rational powers are formally extended to real or complex ones. A complex-dual analogue of the Rodrigues rotation formula for orthogonal operators in  $C^3$  is introduced.

Of the 6 papers presented, articles #4 and #7 are published in Scopus category Q1 issues, paper #3 is in category Q2, and the rest are in Scopus category Q3. In the reviewer's opinion, the quantity and quality of these 6 publications do not correspond in volume and completeness to the requirements for the academic position "professor" in professional direction 4.5. Mathematics.

### **3. Citation from other authors.**

The applicant presented list of 50 citations is in accordance with the minimum requirements of ZRASRB and NRAS of NBU.

### **4. Evaluation of the results of participation in research and creative projects and application of the obtained results in practice.**

Assoc. Prof. Dr. Danail Brezov declared participation in 5 research projects for which he did not provide evidence.

### **III. Teaching and learning activities**

Currently, candidate Danail Brezov is an associate professor at the University of Architecture, Civil Engineering and Geodesy, Sofia. His main commitments include: Conducting lectures and seminar exercises, evaluating students, scientific work. The syllabi of two courses "Mathematics" and "Programming and Algorithms by Python" which were compiled by the applicant are attached, but for the first of them no evidence is attached. Attached is a certificate of accepted mathematical analysis textbook and a link to the electronic version of the textbook. There is no information about the participation of Associate Professor Dr. Brezov in examination committees, etc.

### **IV. Administrative and public activities.**

There is no information about the participation of Assoc. Dr. Brezov in administrative activities at the university where he currently works or for other public activities.

## **B. Evaluation of the scientific works of Assoc. Prof. Dr Dimitar Atanasov**

The candidate Assoc. Prof. Dr. Dimitar Vladislavov Atanasov obtained a master's degree in "mathematics" from the FMI of SU "St. Cl. Ohridski" in 1999. In 2007, he defended his thesis on the topic "Robust methods for scaling and point estimation" in the scientific specialty "Probability Theory and Mathematical Statistics" with a diploma from VAK.

He worked as an assistant and senior assistant in FMI of SU in the period 1999-2008. From 2008 to the present, Dr. Dimitar Atanasov is a lecturer at NBU, having successively held the position of "senior assistant", "chief assistant", since 2010, and in 2013 he was elected as an associate professor at the Department of Informatics. He has a short-term specialization at the Max Plank Institute For Demographic Research in 2001.

## **I. Assessment of compliance with the minimum national requirements and the requirements of the New Bulgarian University**

For participation in the competition for the academic position of "Professor" the candidate Assoc. Prof. Dr. Dimitar Atanasov submitted documents that comply with the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria and the corresponding specific requirements of the NBU for this position. It is clear from the presented reference that Associate Professor Dr. Dimitar Atanasov has fulfilled the minimum national requirements for scientific and teaching activities for the field of higher education 4.5. Mathematics defined by the Statutes for application of LADAS, as well as the requirements of the Ordinance on Academic Staff Development of NBU (NRAS) and Annex 2. Minimum National and NBU Requirements, which must be met by candidates for obtaining a scientific degree and for holding the academic position of "Professor".

The table shows the exact number of points according to the minimum requirements of the National Bank of Ukraine's National Bank of Ukraine and the NBU and the corresponding performance of the candidate.

The table shows the exact number of points according to the minimum requirements of ZRASRB and NRAS of NBU and the respective performance of the candidate.

<b>Group of indicators</b>		<b>minimum requirements</b>	<b>Declared by Dr Atanasov</b>
A	Indicator 1	50	<b>50</b>
B	Indicator 2	0	<b>0</b>
C	Indicators 3 and 4	100	<b>120</b>
D	Sum of indicators 5 to 10	200	<b>267</b>
E	Indicator 11	100	<b>616</b>

F	Sum of indicators from 12 to 20	150	<b>270</b>
G	Sum of indicators from 21 to 33	70	<b>85</b>
H	Sum of indicators from 34 to 40	70	<b>100</b>
I	Sum of indicators from 41 to the end	70	<b>110</b>

It can be seen that the points on all indicators exceed the minimum number of points, and on some groups of indicators they significantly exceed them. I don't have notes to adjust the metric points.

## **II. Research (creative) activity and results**

### **1. Evaluation of the monographic work, creative performances or other publications, corresponding in volume and integrity of the monographic work, including evaluation of the scientific and scientific-applied contributions of the author.**

There are two papers (#1 and #2) presented in the competition, which are classified in group B of the NACID reference. The papers are devoted to psychometric methods of ability assessment, one published in 2020 and the other in 2021 (both after the 2013 docent competition).

Paper #1 studies the assessment of latent characteristics of test items and individuals' abilities. An approach for estimating the parameters based on the maximization of the marginal likelihood functions for the individual parameters is proposed. Paper #2 explored tests in which test items have different properties to measure characteristics on different subsets of the population. The estimation of the parameters is based on a sequence of statistical criteria comparing the characteristics of the test tasks obtained on the target group and rescaled to the corresponding characteristics obtained on the reference group. The papers are co-authored with D. Dimitrov and were published in a Scopus category Q2 journal. Points from these papers exceed the minimum requirements for group C.

### **2. Evaluation of the contributions in the other attached publications (creative performances) made after the appointment of the academic position "Chief Assistant. It also includes an assessment of the peer review requirement.**

This group includes 8 papers from the competition list numbered 3-10. Four of the papers (#3, #5, #7 and #8) are devoted to statistical methods for estimating parameters of branching stochastic processes. This topic is fundamental in the scientific research of Assoc. Professor Atanasov. Scientific interests in it, in a global aspect, have been intensified in recent years in connection with the COVID-19 pandemic. The candidate, together with his co-authors, has developed an approach for modeling the number of observed infected individuals, provided that some of the carriers of the infection are not registered.

The main idea of this approach is presented in paper #3. A model of a branching process with two types of particles is proposed, with their population sizes set respectively by the number of carriers and the number of registered infected individuals. The model is summarized in papers #5 and #7 with the immigration component added. Models including a vaccination process limiting the development of infection have also been studied. The generalized form of the model is discussed in paper no. 8. A significant advantage of the considered models is the possibility of their parameters being estimated on the basis of publicly available information on the spread of the infection provided by the health authorities. The software tools used for the evaluation are available and open source. All these papers were published in 2020 and 2021.

Papers No. 4 and No. 9 of this group are from the other main topic of Prof. Atanasov, namely "Psychometric methods for ability assessment". An approach called D-scoring was applied and various classical statistics were investigated to evaluate the behavior and strategy of the individuals in the execution of the test (guessing, copying, etc.). Paper #9 explores the possibility of equating and comparing test results between individuals who have taken different tests. The research is based on the scores of latent test characteristics obtained in paper #1. These papers were published in the last two years. The last attached paper, #10, is applied. It draws some quantitative and qualitative conclusions about the results of a particular exam in order to improve the test part of the exam.

All presented scientific papers in this group D are in full compliance with the announced competition. Dimitar Atanasov has indisputably significant scientific results and, no less valuable, indisputable applicability of his research. Moreover, all scientific results have been published in the last 3-4 years.

### **3. Citation from other authors.**

The applicant has attached a "List of citations" including 77 citations, 35 of which were not used in a previous procedure. The presented list is in accordance with the minimum requirements of ZRASRB and NRAS of NBU.

### **4. Evaluation of the results of participation in research and creative projects and application of the obtained results in practice.**

Assoc. Prof. Dr. Dimitar Atanasov has described his participation in 16 national and 4 foreign projects. They can be divided into three main directions:

- Projects in the field of branching stochastic processes and their applications. These projects are financed by the National Research Fund of the Ministry of Education and Science.
- Projects in the field of cognitive modeling. Funding for these projects is from the National Assessment Center of the Kingdom of Saudi Arabia.
- Applied projects. Various institutional projects are included here.

Prof. Atanasov's participation in all the described projects is essential and significant.

### **III. Teaching and learning activities**

The candidate, Dimitar Atanasov, is an associate professor in the "Informatics" department of the NBU. Over the years, he has participated in the improvement and development of several courses for the "Informatics" and "Information Technologies" programs. He has developed courses on Data Warehouse and Game Theory. He has updated a large part of the courses in the field of probability theory and statistics for various programs at the Dept. "Informatics" and Dept. "Cognitive Science and Psychology" of NBU. Dr. Atanasov has authored study materials for 6 courses at NBU, the materials for which are available at e-edu.nbu.bg. In recent years, Dimitar Atanasov has been the supervisor of at least four students from bachelor's and master's programs and is currently supervising one of them in a doctoral program at NBU. He has written numerous reviews and regularly participated in examination committees for both the bachelor's and master's programs at the Dept. "Informatics". He has taught several courses in English in NBU curricula.

#### **IV. Administrative and public activities.**

##### **1. Participation in collective governing bodies of NBU.**

In fulfillment of his academic duties, Associate Professor Atanasov conducts classes according to the schedule and regularly participates in the meetings of the departmental council. He participates in the Commission for evaluation of full-time teachers at the Bachelor's Faculty. He also participates in the Program Council of the Dept. "Informatics", Faculty Council of the Ministry of Education and Academic Council. Since 2019, he is the head of the Dept. "Informatics".

All the evidence presented by the candidate confirms my personal impressions that Associate Professor Dr. Dimitar Atanasov has a serious managerial and organizational activity in the NBU.

##### **Conclusion**

The analysis of the submitted materials of the two participants in the competition for a professor in the professional field: 4.5 Mathematics, I believe that of the two candidates Assoc. Professor Dr. Dimitar Atanasov satisfies the set of criteria and indicators for the acquisition of the title "professor" according to LADAS, as well as the requirements of the Ordinance on the development of the academic staff of the NBU and Appendix 2. Minimum national requirements and requirements of the NBU. There are significant omissions and lack of evidences in the documents of Associate Professor Dr. Danail Brezov, and this does not allow me to recommend him for the award of the scientific title "Professor".

I propose that the Scientific Jury vote in positive and recommend to the academic bodies of the NBU to award Associate Professor Dr. Dimitar Atanasov the academic title of "Professor" in the professional field: 4.5 Mathematics.

27.08.2023.

Signed:.....