

STANDPOINT

by

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gest-professor in the Faculty of Mathematics and Informatics at University of Plovdiv "Paisii Hilendarski"

on participation in a competition for occupation of an academic position Associate Professor at University of Plovdiv "Paisii Hilendarski" in the area of higher education: 4. Natural Sciences, Mathematics and Informatics, Vocational Direction: 4.5. Mathematics (Computational Mathematics), announced in State Newspaper, Issue 31, from 12 April 2019
with an applicant: **Chief Assistant Professor Pavlina Hristova Atanasova, PhD**

I. Brief CV of the applicant and evaluation of the materials submitted under the procedure

Chief Assist. Prof. Pavlina Hristova Atanasova, PhD was born on October 17, 1978. She graduated with a bachelor's and master's degrees in 2001 from the University of Plovdiv Paisii Hilendarski (PU), major stream in mathematics - specialization in computer science, with a professional classification of mathematician and programmer as well as a teacher in mathematics, informatics and information technology. In 2012, she successfully defended her doctoral (PhD) dissertation on the subject "Numerical Methods and Algorithms for the Study of Nonlinear Parametric Problems in Physics" at the PU "Paisii Hilendarski. She has a professional experience in the field of over 18 years in various positions - as a programmer (2001-2002), full-time doctoral student at PU (2002-2004), research associate at the JINR - Dubna (2004-2010) and a lecturer at the PU Paisii Hilendarski since 2010. From 2010 to 2012 she is Assistant Professor, and from 2012 she is Ch. Assist. Prof. Dr. at the Department of Applied Mathematics and Modeling at the Faculty of Mathematics and Informatics (FMI) at PU.

The applicant Pavlina Atanasova participates in this competition with 22 works, of which 19 scientific publications and 3 study aids. The complete list of her scientific works includes a total of 61 papers (51 publications and 10 study aids). Of the 19 papers presented in the current competition, 3 publications were used in the procedure for a Ch. Assist. Prof. From the applied list for the academic rank of Associate Professor, 3 publications are published in referred journals with Impact Factor (IF) and 10 have been published in proceedings of international conferences referenced in Scopus and Web of Science (WoS) databases and in editions at a level of scientific journal rank (SJR). A list of 12 independent citations (selected from a complete list of more than 25 citations), a list of 21 participations in research projects and other documents in accordance with the procedure are also submitted for participation in this competition. The list of citations contains one duplicate of which I recognize 11 citations. Of these, 6 are in referred journals with IF (with a total IF of over 6,300) and the other 5 are citations in editions seen in Scopus and WoS.

Based on the submitted documents, I can conclude that **the applicant Dr. Atanasova fully meets the conditions for occupying the academic rank of "Associate Professor"**, in accordance with the ZRASRB, the Rules for the implementation of the ZRASRB and the Rules for the Development of the Academic Council of PU: holds the educational and scientific degree "Doctor"; has more than 14 years of teaching experience, of which more than 7 years as a teaching assistant; has submitted a sufficient number of scientific papers under this competition, subject to the condition that the papers do not repeat the ones submitted for the acquisition of the educational and scientific degree "doctor".

The specific requirements of the FMI at PU for the occupation of the academic rank of Associate Professor in the vocational direction 4.5 Mathematics were also fulfilled: (a) A total of 22 papers were submitted, of which 16 were publications that had not been completed by previous academic procedures, of which 3 were in refereed journals with impact factor (requiring a total of at least 8 publications, at least 3 of which published in referred journals with IF); (b) 6 journal publications (at least 5 required); c) 3 study aids, if required at least 1; d) 11 citations, 6 of which with IF and the rest - referenced in Scopus and WoS (at least 5 citations are required).

II. Review of the applicant's scientific and applied contributions

The scientific studies of Dr. Pavlina Atanasova in their major part refer to the field of computational mathematics with the development and application of algorithms, and their implementation for conducting computer experiments and simulations for numerical solving of some classes of physics problems. The results presented in the present procedure are grouped by the applicant in 4 fields according to the type of the tasks to be solved.

The broadest **first field A)** includes 13 publications [3-8, 10-11, 13-14, 16, 18-19] that relate to the numerical modeling of Josephson nanostructures (or Josephson junctions (JJ)), which finds a number of applications in nano- and quantum physics. The corresponding mathematical problems are reduced to solving a different type of nonlinear multiparameter boundary or initial differential problems for the so-called sine-Gordon equation with the use of experimental data. In the case of long Josephson junctions (LJJ), the problem is one-dimensional with Neumann's boundary conditions. This problem is solved numerically in [3, 5] by studying the influence of different boundary conditions using the least squares method, the continuous analog of the Newton's method and other numerical methods. When adding additional layers to the JJ, the model is described by some second harmonic in the current-phase relationship and a double sine-Gordon - a partial differential equation (PDE) for the magnetic flux distribution under Neumann's boundary conditions. The stability analysis of the static solutions of the equation is reduced to the corresponding Sturm-Liouville problem, which after some parameter transformations is reduced to a nonlinear boundary-value problem for a system of ordinary differential equations (ODE). The latter is linearized using the continuous analog of the Newton's method and is numerically solved. In [4] the problem is solved by applying a new self-developed program complex to study the influence of boundary conditions by analogy with [5]. Software programs are used in [7] and [8] for numerical experiments and graphs to analyze the solutions of the double sine-Gordon equation depending on the second harmonic. Numerical results on finding bifurcation solutions for models of the same problem for LJJ are presented in publications [6, 10]. Numerical solutions are in a good agreement with known analytical results. In [11, 13, 14, 16], the problem of multilayer LJJ modeled by a system of nonlinear PDEs at nonlinear boundary conditions and a set of parameters is solved. Numerical solving of this type of problems requires a large number of calculations, using the selected numerical methods, specially developed algorithms and author's programming codes implemented with the help of parallel machines. In particular, in [11] and [13], the initial problem for a system of nonlinear PDEs is discretized by a standard three-point difference scheme using the finite difference method with respect to the spatial coordinate and then the Cauchy resultant problem is solved by the Runge-Kuta method. Papers [14, 16] present many specific applications of this approach for analyzing and physically interpreting numerical solutions obtained. Articles [18, 19] use models in the field of spintronic for magnetic pulse JJ. The models are described by a system of stiff ODE, subject to initial conditions. The work presents Wolfram Mathematica's author's program codes for solving the problems with Runge-Kuta-type methods with specific applications.

The **second field B)** includes papers [9, 17]. A dynamic model of a polaron - a quasiparticle in a crystal, was constructed and investigated in the formation of hydrated electronic states based on the nonlinear system of PDEs and corresponding initial and boundary conditions. This problem is solved numerically by the finite difference method using a parallel algorithm. Numerical experiments and simulations of the formation of polaron states in water under the influence of ultraviolet laser irradiation have been performed.

The next **field B)** combines articles [12, 15], which present some analytical results on the existence of continuous solutions of perturbed linear volterra integral equations on a compact interval and the existence of solutions of a special type of linear DEs with impulses in Banach spaces.

The last **field (D)** includes some results on the representation of interpolation polynomials based on trigonometric, exponential, and Chebyshev basis functions and their generalizations.

In terms of quantity and quality, **the submitted publication activity of the applicant Ch. Assist. Prof. Pavlina Atanasova, PhD, can be assessed as very good and in full accordance with the**

subject of the competition. I believe that in all the scientific works co-authored, the applicant's participation is equal, and I will note that in 11 out of 19 publications she is the first co-author.

III. Applicant's teaching and teaching activities

Dr. Atanasova is a lecturer with not very long but rich enough and varied experience. As an Assist. Prof. and Ch. Assist. Prof. she has taught at FMI of PU courses in many disciplines: lectures and exercises in Numerical Methods for the specialty Business Mathematics, lectures and exercises in Computational Mathematics 2 for the specialty Business Mathematics, labs in Computer Numerical Methods for students in specialty of Informatics, labs in Software Systems in Mathematics for the specialty Software Technologies and Design, labs in Applied Mathematics for the specialty Business Information Technology and more. She has developed and conducted 8 elective courses, including: Analogies and Summaries in Mathematics, Computer Methods in Astrophysics, Graphic Data Presentation, Numerical Modeling in Nanophysics, Ways to Visualize with Wolfram Mathematica, Introduction to Web Programming with Python and Django and more. In her teaching activities Dr. Atanasova uses state-of-the-art methods and approaches, specialized programming environments and specialized mathematical software, self-prepared video materials, etc.

She is a successful co-supervisor of a doctoral student in the Department of Applied Mathematics and Modeling of the FMI - Stephani Panayotova, who is actively involved in her research and projects. She has been the tutor of successfully defended diploma thesis of 7 graduates.

All of this is a testament to the great commitment and up-to-date level of her teaching activity.

IV. Personal impressions, critical notes and recommendations

I know Pavlina Atanasova as a student when she appeared among her fellow students with active participation in my lessons on computer programming, operational systems and numerical methods. I am also very impressed with her overall research and teaching activities at the FMI of PU.

I have no significant comments on the submitted materials.

V. Conclusion

Based on the above, I believe that the scientific and scientific contributions of Ch. Assist. Prof. Pavlina Hristova Atanasova, PhD, in the subject area of the competition: Mathematics - Computational Mathematics are original and their quality is at a high scientific level. I highly appreciate the citation of the results, the participation in many scientific projects and the collaboration in a large creative team of scientists in Dubna, Russian Federation. All requirements of the ZRASRB, the Rules for its implementation, the Rules for the ZRASR of the university of Plovdiv Paisii Hilendarski and the specific requirements of the FMI at PU are fully satisfied.

On this basis, and in connection with the current competition for the occupation of the academic position of "Associate Professor" of Ch. Assist. Prof. Pavlina Hristova Atanasova, PhD, by: higher education area 4. Natural Sciences, Mathematics and Informatics, Vocational Direction 4.5 Mathematics (Computational Mathematics) for the needs of the University of Plovdiv University Paisii Hilendarski, Faculty of Mathematics and Informatics, **my standpoint is POSITIVE.**

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Plovdiv

Member of the scientific jury:
/Prof. DSs Snezhana Gocheva-Ilieva/