

REVIEW

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on the documentation submitted for participation in a competition
for the academic position of **"Professor"**
at Plovdiv University "Paisii Hilendarski"
in the field of higher education 5. Technical Sciences
professional direction 5.2. Electrical Engineering, Electronics, and Automation
(Theory of Electronic Circuits and Electronic Circuit Design)

In the competition for "Professor," announced in the Official Journal, issue 98 from November 19, 2024, and on the website of Plovdiv University "Paisii Hilendarski" for the needs of the Department of "Electronics, Communications, and Information Technology" within the Faculty of Physics and Technology, as a candidate participates Assoc. Prof. Dr. Eng. Nadezhda Miteva Kafadarova from Plovdiv University "Paisii Hilendarski."

1. General Presentation of the Received Documents

By Order No. PD-22-437 dated February 18, 2025, issued by the Rector of Plovdiv University "Paisii Hilendarski" (PU), I have been appointed as a member of the scientific jury for a competition for the academic position of **"Professor" at PU** in the field of higher education 5. Technical Sciences, professional area 5.2. Electrical Engineering, Electronics, and Automation (Theory of Electronic Circuits and Electronic Circuit Design), announced **for the needs of the Department** of "Electronics, Communications, and Information Technology" within the Faculty of Physics and Technology.

For participation in the announced competition, documents were submitted by only one candidate: Assoc. Prof. Dr. Eng. Nadezhda Miteva Kafadarova from Plovdiv University "Paisii Hilendarski."

The paper-based set of materials submitted by Assoc. Prof. Dr. Nadezhda Kafadarova is in compliance with the Regulations for the Development of the Academic Staff at PU and encompasses the following documents:

- Application form to the Rector for admission to participate in the competition;
- European format CV;
- Diploma for higher education with an acquired educational qualification degree "Master" with an annex (original and copy) or a notarized copy;
- Diploma for the educational and scientific degree "Doctor" (original and copy) or a notarized copy;
- Diploma (certificate) for the academic position "Associate Professor" (original and copy) or a notarized copy, or an order from the rector (director) of the higher education institution or scientific organization confirming the appointment to the academic position "Associate Professor".
- List of scientific works;
- Scientific works (copies of publications);
- Report on compliance with minimum national and additional faculty requirements (if any);
- Declaration of originality and authenticity of the attached documents;

- Abstracts of the materials under Article 76 of RDASPU (Regulations for the Development of the Academic Staff at Plovdiv University) (in Bulgarian and a foreign language);
- Self-assessment of contributions;
- List of citations;
- Document (certificate) of work experience;
- Documents related to teaching activities;
- Documents related to research activities;
- Certificates.

Candidate Assoc. Prof. Dr. Eng. Nadezhda Miteva Kafadarova has submitted a total of 112 scientific works, 5 textbooks and teaching resources, and a list of 11 research projects. For review, 70 scientific works are accepted that are beyond her dissertation for acquiring the educational qualification degree "Doctor," the competition for "Senior Assistant," and the competition for "Associate Professor," and they are taken into account in the final evaluation. Additionally, 5 teaching resources and 11 research projects related to the theme of the competition and not presented in other competitions are considered. A total of 42 scientific works will not be reviewed, including 7 from the dissertation, 6 for the academic position of Senior Assistant, and 29 for the academic position of Associate Professor. The breakdown of the scientific works across relevant categories, both nationally and internationally, is as follows: 47 have been presented abroad, and 23 have been presented within the country. Documents for a published patent application have also been submitted. A list of 183 observed citations, excluding those used for occupying the academic position of Associate Professor, has been provided, of which: 113 are citations in scientific journals indexed and referenced in globally recognized databases such as SCOPUS and Web of Science, and 70 are in non-indexed but peer-reviewed journals. In terms of volume and academic level, the materials presented for the competition outline a sufficiently high volume and, as further demonstrated, a level of presentation suitable for the desired academic position of "Professor." The competition is for a university lecturer at an established Bulgarian higher education institution - Plovdiv University "Paisii Hilendarski." As a reviewer, I evaluate the candidate's substantially high workload, stemming from their performance as a scientific researcher and as a university lecturer, which is notably more demanding than if it were solely for a professorship in one area. I recognize that the candidate has managed this dual responsibility exceptionally well, which I duly acknowledge. In my review, I will primarily concentrate on the scientific achievements presented by the candidate, considering that these are coupled with a considerable teaching load. I affirm that in fulfilling these two roles concurrently, the candidate has demonstrated, as previously stated, an undeniably excellent performance.

2. Brief Biographical Data (of the Candidate)

Assoc. Prof. Dr. Nadezhda Kafadarova was born in 1969. She completed her secondary education at a language school specializing in English in 1988. In 1993, she obtained a Master's degree in "Electronic Engineering and Microelectronics," specializing in "Optoelectronic and Laser Technology - Laser Technological Equipment," from the Technical University of Sofia - Plovdiv Branch. In 2010, she defended her doctoral thesis on a topic related to electronics and thermodynamics ("Research and Prediction of Heat Exchange in Electronic Components and Systems for Enhanced Reliability") and earned the scientific degree "Doctor" in the field of "Microelectronics" (scientific specialty code 02.20.02).

Since 1993, the candidate has been employed after successfully passing a competition for an assistant position at John Atanasov College, later transitioning to a senior assistant at the Technical University of Sofia - Plovdiv Branch following the merger of the two institutions.

From 2010 onwards, she held the academic position of "Assistant" at Plovdiv University "Paisii Hilendarski," and in 2012, she won a competition for the position of "Senior Assistant" in the field of higher education 5. Technical Sciences, professional area 5.3. Communication and

Computer Technology. From 2013 until now, she has held the academic position of "Associate Professor" at Plovdiv University "Paisii Hilendarski" in the field of higher education 5. Technical Sciences, Professional Area: 5.3 Communication and Computer Technology, scientific specialty: Communication Networks and Systems. Since 2019, Assoc. Prof. Kafadarova has held the administrative position of Head of the Department of "Electronics, Communications, and Information Technology" at the Faculty of Physics and Technology of PU.

The professional biography of Assoc. Prof. Dr. Nadezhda Kafadarova provides sufficient evidence to conclude that the candidate has successfully navigated a complex path in teaching and research, reflected in the scientific degrees and titles she has attained. This biography, along with the scientific achievements presented in the review and their assessment by the scientific community (including internationally), clearly outlines a fitting and well-deserved progression through the ranks of scientific degrees and titles.

3. General Characterization of the Candidate's Teaching and Research Activities

Assessment of the University Teaching Activities of the Candidate.

Over the past three years, from 2022 to 2025, Assoc. Prof. Nadezhda Kafadarova maintained an average annual teaching load of 528.3 hours. Currently, she teaches lecture courses on: Quality and Reliability of Electronic Equipment, Fundamentals of Communications, Telecommunication Technologies, Wireless Communication Systems, Mobile Information Systems, and Mobile Cellular Networks. It should be noted that for all lecture courses conducted by her, she has developed the respective curricula, as well as electronic resources in the e-learning environment DIPSEIL (<https://v4.dipseil.net>) in both Bulgarian and English languages. The courses in English were created for the purposes of distance learning in the bachelor's program "Telecommunication and Information Systems" at Plovdiv University. Assoc. Prof. Kafadarova has also developed courses with corresponding electronic resources for master's programs in Field 5.3, which are again available in the DIPSEIL environment.

Associate Professor Nadezhda Kafadarova has participated as a member of the authorial team in five books and university textbooks, including four in Bulgarian and one in English – "mRIDGE using mobile technology to improve policy reform for inclusion of disadvantaged groups in education," "Guide to the Basics of Communications," "Guide to Mobile Information Systems," "Using Augmented Reality Technology with Mobile Devices in the Learning Process," and "Guide to Self-Control Development," published by Koala Press BG.

Assoc. Prof. Kafadarova is currently supervising four doctoral students in the field of Technical Sciences, specifically in Communication and Computer Engineering (Professional Area 5.3). Two of these students have successfully defended their dissertations, achieving 80 points on indicator E17 of the requirements. Both are now faculty members at the Faculty of Physics and Technology at Plovdiv University, one as a full-time assistant professor and the other as an adjunct lecturer. One of the doctoral students supervised by Assoc. Prof. Kafadarova has been withdrawn with the right to defend, while the fourth was enrolled on August 1, 2023, and is currently an active doctoral student. Additionally, Assoc. Prof. Kafadarova has supervised 15 diploma theses. This underscores her significant commitment to the training and professional development of young scholars, as well as her active involvement in knowledge transfer in her areas of expertise. The above demonstrates a high level of teaching activity, which is a strong asset towards her professorship candidacy. I highly appreciate her teaching and academic activities (higher education personnel) of the candidate.

Evaluation of the Scientific and Applied Research Activities of the Candidate

The candidate, Associate Professor Dr. Nadezhda Kafadarova, has presented scientific publications equivalent to a monograph, thereby fulfilling the requirements of Article 29(3) of the Law on the Development of Academic Staff in the Republic of Bulgaria (LDASRB), Article 60(3) of the Regulations for the Implementation of LDASRB, and Article 76(5) of the Rules for

Academic Staff at Plovdiv University (RASPU). An extended habilitation report has been submitted, comprising a detailed description of the scientific research and achieved results, published in ten scientific articles indexed in internationally recognized databases (SCOPUS and WoS, confirmed in the competition materials). The habilitation report contains scientific information dedicated to the topical issue of predicting the functionality of energy conversion elements in the context of the European Green Deal and the ambitious goal of transforming Europe into the first climate-neutral continent by 2050. The submitted report spans 88 pages, including copies of the originals, and is presented both in Bulgarian and English.

The distribution of all presented scientific works from Group B and Group G indicators according to minimum requirements in respective categories, nationally and internationally, is as follows: 43 scientific publications in journals with corresponding xerographic copies. These include publications indexed in internationally recognized scientific databases such as Web of Science and Scopus, and non-indexed 27 scientific publications in non-refereed journals or edited collective volumes.

The presented scientific works of the candidate do not overlap with her participation in other procedures. Included here are three publications with the following quartiles (according to the SJR metric of scientific journals): Q1 – 1 article, Q2 – 1 article, Q3 – 1 article. The publications can be classified by type (articles – 9; conference papers – 61), articles in journals with impact factors – 3; by place of publication (articles in indexed international journals – 4, refereed journal articles in Bulgaria – 5, conference papers in proceedings of international scientific conferences abroad – 43, conference papers in proceedings of international scientific conferences in Bulgaria – 18); by language (English – 64, Bulgarian – 6); by number of co-authors (one co-author – 8, two co-authors – 25, three or more co-authors – 37). This gives me grounds to conclude that the candidate has made a substantial contribution to these publications. Considering that no separation protocols were applied, I recognize 129.14 points under Group B indicators (with a minimum requirement of 100 points) and a total of 544.51 points under Group G indicators (with a minimum requirement of 200 points), exceeding the minimum requirements. I consider the presentation to be of a sufficiently high level.

Based on the presented scientific publications by Associate Professor Dr. Nadezhda Kafadarova, it can be reasonably concluded that the candidate's contributions are substantial and reflect personal achievements. These contributions can be categorized as scientific and applied scientific and summarized as follows:

Scientific Contributions:

1. A comparative analysis of the capabilities of contemporary methods for predictive management of the performance of energy conversion elements—batteries and capacitor-based batteries - has been conducted. A concept and theoretical framework for a new approach to determining the operational state of batteries—State of Health, State of Charge, Remaining Useful Life (dependent on the number of charge and discharge cycles) - have been developed. Battery models have been synthesized based on monitoring data for battery resource assessment [candidate's articles: 1h, 2h, 3h, 4h, 6h, 7h, 8h, 10h, 48, 60];
2. A methodology for utilizing innovative technologies (remote learning and distance access learning in engineering specialties during the COVID-19 pandemic) has been proposed. Its effectiveness has been investigated through surveys and protocols during the transition from in-person to remote and distance learning [40, 41, 46, 51, 52, 53, 55, 56].

Applied Scientific Contributions:

3. Automated experimental apparatus with unique characteristics has been designed and developed for creating a database of informative parameters related to the number of charge and discharge cycles while preserving battery characteristics for predicting battery

performance. As an example, hybrid forecasting of the functionality of energy conversion elements has been performed [5h, 9h];

4. An intelligent sensor node for temperature measurement and wireless data transmission to a receiving server has been developed. Computational Fluid Dynamics (CFD) modeling of thermal processes in various electronic nodes and devices has been carried out. The developed CFD models and infrared thermography have been integrated into the training of engineering students [presented in publications 3, 6, 7, 17, 20, 23, 25, 29, 30, 33, 34, 35, 36, 37, 38, 42, 47];
5. Experiments (with pedagogical focus) have been conducted to investigate the effectiveness of introducing "added reality" and mobile technologies in the training of learners in both equitable and inequitable conditions. For this purpose, appropriate educational resources have been designed and developed [1, 2, 4, 8, 12, 13, 14, 15, 16, 19, 28, 32, 45].
6. Innovative exercise systems have been developed for enhancing self-control through the use of mobile technology [5, 9, 10] and QR codes to increase motivation [18, 24, 27, 31].
7. A methodology for using QR codes in dental practice has been developed, implemented, and tested. A deep learning model has been developed and tested, predicting positive effects of preventive analgesia in oral surgery during tooth extraction [26, 58].
8. An embedded system for measuring antenna radiation patterns has been designed and realized. Hardware modules for laboratory exercises in a remote telecommunications laboratory have been developed along with a methodology for conducting remote exercises. A model demonstrating significant practical value has been developed without twisting the connecting cable for the remote laboratory system. The cable is placed in a coaxial antenna holder [39, 43, 44, 49, 50].
9. A valuable practical development is a unique system for identifying the qualities of food liquid oils through thermovision. Heating of the oils is achieved through optical absorption of laser radiation at a specific wavelength. Laser heating in the developed system provides detailed visualization of spatial temperature gradients (through changes in the visualization of the oil column) within the sample volume, as well as their temporal variations. This system overcomes the limitations of other methods that only determine the thermal conductivity coefficients of the oils [59].

A list of 183 citations has been presented, excluding those used for the appointment to the position of Associate Professor, of which: 113 are citations in scientific publications that are indexed and referenced in world-renowned scientific databases such as Web of Science and Scopus, and 70 are in non-referenced journals with scientific peer review. There are 23 citations with an Impact Factor. I acknowledge the reported 1270 points under group D indicators, which significantly exceeds the minimum requirements for this group of indicators.

Assoc. Prof. Dr. Nadezhda Kafadarova is the head of a national scientific project funded by the "Scientific Research" Fund, a competition for funding fundamental scientific research. She has participated in the teams of two national scientific or educational projects, one financed by the National Recovery and Sustainability Plan under Component "Innovative Bulgaria," Investment 1 "Program for Accelerating Economic Recovery and Transformation through Science and Innovation," and Pillar 2 "Creating a Network of Research Universities in Bulgaria," and the other - from the Operational Program "Science and Education for Smart Growth," co-financed by the European Union through the European Structural and Investment Funds, 2021-2023. She has also participated in four international scientific or educational projects. Assoc. Prof. Kafadarova has submitted documents for a published patent application from the German Patent Office, as well as a certificate for being a reviewer of 19 articles for the following MDPI journals during the period 2023-2024: World Electric Vehicle Journal, Processes, Electronics, Photonics, Fluids, Batteries,

Applied Sciences, Energies, Materials. This gives me grounds to accept the declared 234 points under indicator E above the minimum requirements.

4. Evaluation of the Candidate's Personal Contribution

The presented report on meeting the minimum national requirements for the academic position of "Professor" demonstrates that the candidate fully meets the criteria across various groups of indicators. The verification of the authenticity and accuracy of the provided data confirms their validity and correctness. No instances of plagiarism have been detected.

5. Critical Remarks and Recommendations

The presentation of the candidate's contributions and their usefulness, accepted by the reviewer, is comprehensive and responsible. I have no critical remarks regarding this point.

6. Personal Impressions

From the materials submitted for the competition and detailed discussions with the candidate, I am convinced that she has developed a substantial and valuable body of work, supported by sufficient evidence, warranting the conferral of the professorial title.

CONCLUSION

The documents and materials submitted by Assoc. Prof. Dr. Eng. Nadezhda Miteva Kafadarova **meet all the requirements set** forth by the Law on the Development of Academic Staff in the Republic of Bulgaria (LDASRB), its Implementing Rules, and the respective regulations of Plovdiv University "Paisii Hilendarski."

The candidate has presented **a significant number** of scientific works published after the materials used for the defense of her doctoral degree and the attainment of the academic position of Associate Professor. Her works contain original scientific and applied contributions that have received international recognition, with a representative portion published in journals and scientific collections issued by international academic publishers. Her theoretical developments possess considerable practical applicability, with some directly oriented towards teaching activities. The scientific and pedagogical qualifications of Assoc. Prof. Kafadarova **are beyond doubt**.

The achievements of Assoc. Prof. Dr. Eng. Nadezhda Miteva Kafadarova in teaching and research activities **fully correspond** to the minimum national and additional requirements, particularly those of the Faculty of Physics and Technology, adopted in accordance with the Regulations of Plovdiv University for the Implementation of LDASRB.

After reviewing the materials and scientific works submitted for the competition, analyzing their significance and the contained scientific, applied, and practical contributions, I find it justified to provide my **positive evaluation** and recommend to the Scientific Jury to prepare a report-proposal to the Faculty Council of the Faculty of Physics and Technology for the election of Assoc. Prof. Dr. Eng. Nadezhda Miteva Kafadarova to the academic position of "Professor" at Plovdiv University "Paisii Hilendarski" in the field of higher education 5. Technical Sciences, Professional Area 5.2. Electrical Engineering, Electronics, and Automation (Theory of Electronic Circuits and Electronic Circuit Design).

14.04.2025 г.

Reviewer:

Prof. DSc.Phys and Prof. DSc.Eng. Marin Nenchev