

REVIEW

by **prof. Anatoly Trifonov Aleksandrov,**
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of the materials submitted for participation in the competition for the academic position of "associate professor" in the field of higher education: 5. Technical Sciences, professional direction: 5.2. Electrical Engineering, Electronics and Automation, specialty " Electric Power Supply and Equipment " (Electrical machines I).

In the competition for the position of “associate professor”, which has been announced in The State Gazette, issue 55 from 27.06.2023 and also on the website of the Technical University of Gabrovo, as a candidate for the needs of the department of Electronics at the faculty of Electrical Engineering and Electronics participates Chief Assist. Prof. Eng. Dimitrina Yordanova Koeva, PhD.

1. Brief biography

Dimitrina Yordanova Koeva completed her secondary education at the "Marie Curie" Technical School of Electrical Engineering, Sliven, majoring in "Industry Automation" from 1984 to 1988. In the period 1985 - 1990, Dimitrina Koeva was a student at the Technical University - Gabrovo (TU-Gabrovo) and acquired the educational and qualification degree "Master of Science" in the specialty "Electric Power Supply and Equipment" with professional qualification "Electrical Engineering". From 1989 - 1990, she has worked as a designer for automobile generators and starters in the factory "Dinamo" JSC, Sliven, and from 1990 - 1991 – she has worked as a technologist in the division for "Generators and Starters" in the same factory. From 1991 to 2015, Dimitrina Koeva was the Ch. Assistant at TU – Sofia in the Faculty of Engineering and Pedagogy - Sliven. From 2012 to 2014, she was a part-time doctoral student at TU-Sofia, Faculty of Engineering and Pedagogy - Sliven. In 2014, she has obtained the educational and scientific degree "PhD" in the specialty of "Electrical machines". From 2015 until now, Dimitrina Koeva is the Ch. Assistant in the department of "Electric Power Supply and Equipment" at the Faculty of Electrical Engineering and Electronics (FEE) of TU-Gabrovo.

Dimitrina Koeva is the only candidate in the competition for the academic position of "associate professor" in professional field - 5.2 Electrical Engineering, Electronics and Automation, specialty " Electric Power Supply and Equipment” (Electrical machines I). The competition was announced in the State Gazette, issue 55 from 27.06.2023 and also on the TU-Gabrovo website and has been agreed upon the Academic Council of TU-Gabrovo (protocol No. 10/01.06.2023) and the Faculty Council of FEE (protocol No. 5/18.05.2023) with the proposal from the Department Council of the Department of Electric Power Supply and Equipment (protocol No. 10/10.05.2023).

2. General overview of the submitted materials

In this competition, Ch. Assist. Prof. Eng. Dimitrina Koeva is participating with 44 scientific publications of which: 11 works - equivalent to habilitation works and publications in journals, that have been referenced and indexed in globally recognized database with scientific information (indicator B.4), [B.4.1 – B.4.11]; 1 work - scientific publication printed in journals, that have been referenced and indexed in globally recognized database with scientific information (indicator G.7), [G.7.1]; 32 works - scientific publications printed in previously reviewed scientific proceedings and journals (indicator G.8), [G.8.1 – G.8.32]. Also 3 textbooks whose author is Ch. Assist. Prof. Eng. Koeva.

All publications and textbooks have been previously reviewed before publishing.

All publications can be classified as follows:

- By type: articles - 12; reports - 32.

- By importance: articles in Impact-ranked editions - 3 articles [B.4.7 – SJR:0.210, Q4; B.4.8 - SJR:0.210, Q4; B.4.11 - SJR:0.180]; awarded publications - 9 publications [B.4.4; B.4.11; G.8.10; G.8.16; G.8.18; G.8.21; G.8.27; G.8.30; G.8.31].

- By place of publishing: publications in referenced international editions - 11 [B.4.1 – B.4.11]; reports in scientific proceedings from international scientific conferences abroad - 7 [B.4.2 – B.4.4; B.4.11; G.8.4; G.8.10; G.8.11]; articles in national journals – 7 [G.8.8; G.8.9; G.8.12; G.8.15; G.8.19; G.8.21; G.8.30]; reports in scientific studies from international scientific conferences in Bulgaria - 24 [B.4.1; B.4.5 – B.4.10; G.7.1; G.8.7; G.8.13; G.8.14; G.8.16 – G.8.18; G.8.22 – G.8.29; G.8.31; G.8.32]; reports in scientific university studies - 6 [G.8.1 – G.8.3; G.8.5; G.8.6; G.8.20].

- By the language in which they are written: in English - 29 [B.4.1 - B.4.11; G.7.1; G.8.1; G.8.2; G.8.4; G.8.5; G.8.10; G.8.11; G.8.15 - G.8.18; G.8.21; G.8.25 - G.8.27; G.8.29 - G.8.31]; in Bulgarian - 15 [G.8.3; G.8.6 - G.8.9; G.8.12 - G.8.14; G.8.19; G.8.20; G.8.22 - G.8.24; G.8.28; G.8.32].

- By number of the co-authors: independent - 6 [B.4.6; B.4.11; G.7.1; G.8.6; G.8.12; G.8.32]; with one co-author - 6 [B.4.7; G.8.1, G.8.2; G.8.4; G.8.5; G.8.7]; with two co-authors - 25 [B.4.1 - B.4.3; B.4.5; B.4.10; G.8.3; G.8.8 - G.8.10; G.8.13 - G.8.21; G.8.24; G.8.26 - G.8.31]; with three or more co-authors - 7 [B.4.4; B.4.8; B.4.9; G.8.11; G.8.22; G.8.23; G.8.25]. In 15 of the collaborative works [B.4.8; B.4.10; G.8.3; G.8.6; G.8.7; G.8.10 - G.8.13; G.8.16; G.8.18; G.8.20; G.8.24; G.8.26; G.8.28] the candidate is in first place.

3. Reflection of the scientific publications of the candidate, based on the scientific community (well-known citations)

Ch. Assist. Prof. Eng. Dimitrina Koeva, PhD, presents her reference for 15 citations of 12 scientific publications, as one of these works has been cited 3 times. According to the scientific publications, the citations are as follows:

- Citations in publications with IF – 2;
- Citations in publications referenced in Scopus – 10;
- Citations in publications other than those with IF or referenced in Scopus – 3.

There are 9 citations from Bulgarian authors and 6 from foreign authors.

All these facts are enough for me to conclude that the candidate is a well-known author, who has published papers in significant scientific journals and proceedings in the area of the competition.

4. Overview of the content and results of the works that have been submitted

The candidate in the competition meets and exceeds the minimum national requirements on certain indicators. Ch. Assist. Prof. Eng. Dimitrina Koeva has a diploma for educational and scientific degree "PhD" in the scientific speciality of "Electrical Machines" (№ TUS-IPF45-NS1-021/30.04.2014), issued by TU-Sofia. She has defended her dissertation on "Automated system for control, monitoring and diagnostics of wind turbines" (index A - 50 points). She has also presented 11 publications, equivalent to habilitation thesis, which are published in journals reviewed and indexed in globally recognized database with scientific information (indicator B - 295 points). One publication in a journal reviewed and indexed in globally recognized database with scientific information and 32 scientific publications in non-referenced journals and proceedings with scientific reviews or in edited collaborative works (group indicators G.7 - 40 points and G.8. - 261.73 pts.); 12 citations in scientific editions, reviewed and indexed in globally recognized database with scientific information and 3 citations in non-referenced proceedings with scientific reviews (group of indicators D - 126 pts., of which indicator D.12

- 120 pts. and indicator D.14 - 6 pts.). The candidate has one utility model application that has been recognized – The Utility Model Patent No 218/30.09.1999 (indicator E.26 - 40 points), and three university textbooks that have been published (indicator E.24 - 60 points).

Group of indicators	Minimum national requirements for the academic position of an associated professor	Ch. Assist. Prof. Dimitrina Koeva
A	50 т.	50 т.
B	100 т.	295 т.
G	200 т.	301,73 т.
D	50 т.	126 т.
E	-	40 т.

Ch. Assist. Prof. Eng. Dimitrina Koeva, covers and by certain indicators exceeds the scientometric data according to the minimum requirements of TU-Gabrovo. With the requirement of 15 publications, of which 4 are independent, she has submitted 44 publications, as 6 of them are independent. With the requirement of 5 citations, the candidate has 15. Dr. Koeva is also the co-author of 3 textbooks.

Indicators	Minimum national requirements for the academic position of an associated professor at the Technical University of Gabrovo	Ch. assist. Prof. Dimitrina Koeva
Total number of publications	15	44 [With SJR (Scopus) 3 items – B.4.7; B.4.8 и B.4.11]
Independent publications	4	6
Number of known citations by other authors	5	15
Published textbooks	2	3
Leadership of projects and contracts	1	1

5. General characteristics of the candidate's performance

5.1. Teaching practice (work with undergraduate and postgraduate students)

Ch. Assist. Prof. Eng. Dimitrina Koeva, PhD, is an established lecturer at TU-Gabrovo. She has 32 years of work experience in the field of higher education, as 7 years of them are a part of her teaching experience at TU-Gabrovo. According to the presented report on the schedule of classes that have been held at TU-Gabrovo for the last 5 years, she has spent 3499 hours with both full-time and part-time students in the following disciplines:

- "Electrical machines I", "Energy technologies and ecology", "Electrical equipment" and "Electrical equipment of industrial machines and processes", "Optimal design of electrical machines" and "Technical means of energy storage" for the specialty " Electric Power Supply and Equipment";

- "Electromechanical devices" for the specialties " Automation, Information and Control Systems", "Industrial and automotive electronics", "Communication technologies and cyber security" and "Technical safety".

Main Associate Dr. Koeva is also the co-author of 3 textbooks:

- Rachev S., D. Koeva. Driving techniques, Vasil Aprilov University Publishing House, Gabrovo, 2015, ISBN 978-954-683-545-1. (243 pages);

- Koeva D., S. Rachev. Energy technologies and ecology, Vasil Aprilov University Publishing House, Gabrovo, 2016, ISBN 978-954-683-560-4. (133 pages)

- Rachev S., D. Koeva, L. Dimitrov. Electrical equipment, Vasil Aprilov University Publishing House, Gabrovo, 2022, ISBN 978-954-683-673-1. (233 pages), <https://epublish.tugab.bg/component/jdownloads/?task=download.send&id=113&catid=37&m=0&Itemid=101>

The candidate in this competition is the author/co-author of the study programs in the disciplines "Electrical machines I", "Electrical equipment", "Electrical equipment of production machines and processes", "Energy technologies and ecology", "Optimal design of electric machines", "Electromechanical devices" , "Energy-saving electric drives" and "Transient processes in electrical systems" for the specialty of " Electric Power Supply and Equipment".

Ch. Assist. Prof. Eng. Dimitrina Koeva, has participated in the following activities at the Postgraduate Qualification Center at TU-Gabrovo:

- author/co-author of a training course plan for "Fitter of energy equipment and installations" (code 522040), specialty "Renewable energy sources" (code 5220408), professional direction "Electrical engineering and energy" (code 522);

- author/co-author of a curriculum for a training course on "Modern software products and approach to automated design in power supply and electrical equipment";

- author of a curriculum for a training course on "Optimal design of electric motors with industrial application - software and hardware solutions".

Main assistant Dr. Dimitrina Koeva was the supervisor of 80 graduates who successfully defended their theses.

The above-mentioned facts give me reason to assess the pedagogical preparation and activity of Main assistant Koeva as very good.

5.2. Scientific and scientific-applied activities

Ch. Assist. Prof. Eng. Dimitrina Koeva, was in charge of 1 university research project (Contract 2104E/2021 "Electric drives for electric vehicles and industrial applications, electrical components and systems - practical and model studies with a view to energy and economic efficiency").

She also participated in 7 university research projects: contract D1602E/2016 "Analysis and use of modern energy-efficient electrical components and systems with application in the industrial sector"; contract D1703E/2017 "Research and use of modern energy-efficient electrical components and systems with application in the industrial sector"; contract D1804E/2018 "Research of operating modes of modern energy-efficient electrical components and systems with application in the industrial and public sector"; contract 1901U/2019 "Modern energy-efficient applied solutions for integrating an electric vehicle and infrastructure for charging and storing energy in urban conditions"; contract 1901U/2020 "Modern energy-efficient applied solutions for integrating an electric vehicle and infrastructure for charging and storing energy in urban conditions"; contract 2206C/2022 "Applied mathematical research in power supply and electrical equipment aimed at energy and economic efficiency"; contract 2206C/2023 "Applied mathematical research in power supply and electrical equipment, aimed at energy and economic efficiency - II stage".

Ch. Assist. Prof. Eng. Dimitrina Koeva has been involved in:

- one international educational project: European Vocational Skills Week 2020 BEE-VET 2019-1-BG0-KA202-062584 (Co-funded by the Erasmus+ Program of the European Union); 2020-1-BG01KA202-079042 (considered from 01.03.2021);

- one national educational project: National Ministry of Education and Culture BG05M2OP001-2.011-0001 "Support for success", "Interest-based activities" platform.

Ch. Assist. Prof. Eng. Koeva has certificates for active participation in conferences of the Scientific and Technical Union of Mechanical Engineering - Bulgaria, 2017 and 2018, Association for Promoting Electric Vehicles in Romania – 2019, International Scientific Conference INDUSTRY 4.0 – 2017, 2018, 2019 and 2021, International Conference "Ecological Truth" - University of Belgrade, Serbia - 2015, International Conference on Communication, Information, Electronic and Energy Systems, CIEES - 2021 and 2022; International Conference on Electronics, Engineering Physics and Earth Science, EEPES – 2022 and 2023.

She participated in the following scientific forums: Unitech, CIEES, EEPES, INDUSTRY 4.0, Energy Forum, Lighting 2020, etc.

Dr. Dimitrina Koeva was the reviewer of 10 scientific publications in magazines reviewed and indexed in globally recognized database with scientific information. They are as follows: International Journal of Applied Power Engineering, ISSN 2252-8792, <https://ijape.iaescore.com> – 1 ; International Conference on Communication, Information, Electronic and Energy Systems, CIEES – 6 , (2021, 2022 and 2023); International Conference on Electronics, Engineering Physics and Earth Science, EEPES – 3 (2023).

The candidate's publications can be summarized in 6 thematic areas:

- *Electric machines: asynchronous motors, power transformers and electric drives for industrial applications*

The virtual model studies have determined the losses in steel during the operation of asynchronous motors, power transformers and electric drives for industrial applications. By using mathematical models of the electromechanical system, optimal operating parameters have been determined under different load conditions and operating modes. The developed methods, algorithms and mathematical models allow the study of the working and energy characteristics of the electrical machines in established modes and in the frequently occurring dynamic modes [B.4.2 -B.4.4, B.4.10]. In order to study and analyze the influence of the parameters of electrical machines and mechanism on their operation and energy characteristics, **studies** were conducted with adequate mathematical models, methods, algorithms and software [G.7.1, G.8.1 – G.8.3]. When choosing a specific topography of the model and precise electromagnetic calculations, tracking of mechanical loads and deformations and temperature profile during the working process for pre-specified "critical" points of the structure, ANSYS Motor CAD [B.4.8] was used. The obtained results of model studies are of direct application in the study and optimization of the dynamic characteristics in the design (synthesis) of power electric drives and control systems from the point of view of the mechanical part, the construction of an electric motor and its regulation in different work cycles [G.8.14 , G.8.15, G.8.17, G.8.19, G.8.32]. A comparative analysis of the mass-overal dimensions of low-power motors [G.8.33, G.8.4] was performed.

- *Energy transition, energy and industrial sustainability*

The current situation and trends regarding energy transformation and the Net Zero scenario applied in the Industry sector are examined. The general analysis of the current situation in the country is complemented by an analysis of the specific technical characteristics of the operation of nearly 1700 induction motors in two high-energy enterprises: a chemical plant and a food processing plant [B.4.11]. Energy losses on an annual basis are determined by using several parameters and quantities [G.8.5, G.8.13, G.8.18]. Recommendations and key factors for energy efficient investments are presented.

- *Electric loads: losses, harmonics, energy and resource efficiency in industry*

The operating modes of commonly used electrical equipment (transformers supplying combined nonlinear loads) in the public sector are considered from the point of view of optimizing energy and resource efficiency [G.8.1, G.8.13, G.8.20].

The impact of higher current harmonics penetrating the ESS/ power grid and causing false tripping of relay protections as well as interference to high frequency links and automation systems is considered [B.4.1]. The harmonic composition of the current, the fractional distribution of the energy consumed by the individual nonlinear loads and the adverse influence of current harmonics of a prominent nature on the operation of the power transformer are evaluated [B.4.10, G.8.21]. Specific power facilities are examined, and their performance is studied and technological, technical, and other issues are identified in the context of energy and resource efficiency management [B.4.6].

- *Pumps, water systems, turbomachines, furnaces*

The research in this direction is aimed at an innovative method of energy saving, related to the vector control of an asynchronous electric motor [B.4.5, B.4.9]. Analytical studies of vector control of an electric drive with an asynchronous electric motor for a specific consumer - pump units - have also been carried out. The possibility of energy saving of drives with adjustable speed was considered. Numerical values were obtained for the change of electrical power losses in specific designs of asynchronous electric motors with different control methods [G.8.1, G.8.2]. The research was conducted by creating a mathematical model represented by a system of differential equations, transformed and solved using appropriate software [G.8.16, G.8.19, G.8.30 – G.8.32].

- *Energy, electricity prices and markets*

The most common failures in electric generators are summarized and the priority subsystems subject to control, monitoring and diagnostics in wind generators are defined [G.8.6 – G.8.10]. The possibility of integrating small wind turbines in an urban environment has been investigated [G.8.11]. Existing methods for monitoring and diagnostics of wind turbines, selection of sensors and their deployment for the implementation of a reliable control and monitoring system have been analyzed [G.8.11, G.8.16]. A comparative analysis of the qualities of different models for forecasting the consumption of generated and/or consumed energy by energy facilities was conducted and on this basis adequate models were selected [B.4.7, B.4.11, G.7.1].

- *Electric cars, charging infrastructure*

Through practical and mathematical model studies, with a view to energy and economic efficiency, the work processes of electric motors driving electric vehicles [B.4.4, B.4.8], as well as issues and guidelines for converting a conventional car into an electric one [D.8.29]. Charging processes of electric vehicles have been studied [G.8.22 – G.8.24]. Estimated models for the consumption of electrical energy from charging stations have been developed [G.7.1, G.8.26]. On this basis, an optimized organization of the charging infrastructure in terms of location and capacities is proposed in order to limit network overload [G.8.28].

6. Contributions

I accept the formulated contributions in the presented works. They have a scientific-applied and applied nature and are related to proving with new means essential and new aspects of existing scientific problems and obtaining confirmatory facts in the field of research, modeling and application of electronic devices in the power industry and their use in the educational process.

6.1. Contributions in publications that are equivalent to a monography

Scientific-applied contributions

- Methodologies, algorithms and mathematical models of the electromechanical system of driving motors with industrial application have been developed [B.4.2 - B.4.4, B.4.9, B.4.10].
- Models to forecast the energy consumption of energy facilities have also been developed [B.4.7].
- An approach to determine the energy losses on an annual basis is presented by using the parameters and magnitudes of about 1700 induction motors, that were included in the study carried out in two high energy consuming plants. After identifying the technological, technical and other issues in the context of energy and resource efficiency management, key factors for energy efficient investments have been presented [B.4.6, B.4.11].

6.2. Contributions in the publications, except those that are equivalent to a monography

Scientific-applied contributions

- Different models, algorithms and diagnostic techniques have been proposed. They can be combined with the wind turbine control and the monitoring system. A model for implementing a diagnostics system has also been selected [G.8.6 - G.8.10, G.8.12, G.8.16].
- Different models have been studied in order to forecast the consumption of generated and/or consumed energy. The main purpose is to establish their degree of adaptation in the power system [G.7.1, G.8.26, G.8.28].
- A mathematical model, represented by a system of differential equations, is designed, transformed and solved using appropriate software in order to carry out analytical studies of vector control of the electric drives with induction motors for specific consumers [G.8.1 - G.8.3, G.8.13 - G.8.15, G.8.30 - G.8.33].

Applied contributions

- On the basis of the measurements that have been carried out and the load schedules of various types of non-linear loads in the industry and the public sector, an approach for the distribution of combined non-linear loads is proposed. This approach considers the energy-efficient and reliable operation of the power transformer [G.8.5, G.8.18, G.8.19 - G.8.21, G.8.25, G.8.27].

7. Evaluation of the personal contribution of the candidate

My assessment of the candidate's contributions and results in the competition is high. The presented works, quotations and participation in projects correspond to the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDASRB) and the Regulations for its implementation, as well as the minimum requirements of TU-Gabrovo for the scientific and teaching activities needed for acquiring the academic position "associate professor".

8. Critical comments and recommendations

I did not find any significant gaps in the candidate's scientific works. I believe the contributions can be summarized. I recommend preparing publications with IF.

9. Personal impressions

I know Ch. Assist. Prof. Eng. Dimitarina Koeva as a respected colleague. I have no publications with her. I am not related to her within the meaning of paragraph 1, p. 5 of the

Additional provisions of the Law on the Development of the Academic Staff in the Republic of Bulgaria.

Conclusion:

In conclusion, I can give a positive assessment of the overall scientific research and pedagogical activity of Ch. Assist. Prof. Eng. Dimitrina Yordanova Koeva, who meets the requirements for the academic position "associate professor".

Having in mind the above statements, I propose Ch. Assist. Prof. Eng. Dimitrina Yordanova Koeva to be chosen for "associate professor" in the following field of higher education: 5. Technical Sciences, professional direction: 5.2. Electrical Engineering, Electronics and Automation, specialty Electric Power Supply and Equipment (Electrical machines I).

08.11.2023

Reviewer: /signature/
/Prof. A. Aleksadrov, PhD/