

# Evaluation statement

**For the competition for the academic position of "Associate Professor" in field - 5 "Technical sciences", in the professional field - 5.2 "Electrical engineering, electronics and automation" (Power supply and Electrical equipment),**

**announced in the State Gazette, issue 87 of 19.10.2021 on behalf of Burgas Free University (BFU).**

*There is a single candidate: Assistant Professor Eng. Ginko Angelov Georgiev PhD.*

*Member of the scientific jury: Assoc. Prof. Dr. Eng. Kamen Dimitrov Seymenliyski, Center for Informatics and Technical Science of BFU.*

## **1. Short Biography**

Ginko Angelov Georgiev was born on August 19, 1967. He graduated from the Secondary School Acad. N. Obreshkov in Burgas in 1985. In 1992 he obtained a Master's degree in VMEI - Varna / TU-Varna / in the speciality "Electrical supply and electrical equipment", with a qualification Electrical Engineer. After winning a competition, he was appointed an assistant in the ESEO Department of the Faculty of Engineering in the same year. He was successfully certified as a senior assistant in 1995. In 1999 he left TU-Varna and started working in Kuwait Oil Tanker Company (KOTC) as a marine electro-technical officer (ETO). He successfully defended his dissertation in the scientific specialty 02.04.15 Electricity supply and electrical equipment in 2012 in VVMU N. J. Vaptsarov's Faculty of Engineering at the Department of Electrical Engineering. Ginko Angelov Georgiev has been an assistant at Burgas Free University (BFU) since 2014.

## **2. General description of the materials submitted in the competition**

According to the materials provided by the candidate, the requirements of Art. 24. (1) of ZRASRB and Art. 49 (3) of the Regulations for development of the academic staff for holding the academic position Associate Professor are fulfilled:

1. The candidate has obtained an educational scientific degree Doctor of Philosophy (PhD) (2012);
2. The candidate has been occupying the academic position of Assistant for more than two years (1992-1997 and 2014-2021);
3. The candidate has provided a published monograph different from the dissertation presented for obtaining the educational and scientific degree Doctor;
4. The candidate has presented 23 publications different from the dissertation for educational and scientific degree Doctor.

The candidate has also provided the necessary according to Art. 50 (2) of the Act for the development of the academic staff for holding the academic position Associate Professor:

1. A reference on the scientific contributions in the respective scientific field;
2. References and certificates for project participation
3. Training courses or complete methodological units included or prepared for the inclusion in e-learning platforms.

According to Art. 50 (3) of the Regulations for the development of the academic staff, each center may impose additional requirements on the candidate (Appendix 2).

The candidate has complied with the additional requirements of the Center for Informatics and Technical Sciences of BSU according to Appendix 2:

- The candidate has presented 3 workbooks on disciplines studied at BSU, fulfilling the requirement for presenting one coursebook and two workbooks;
- The candidate has presented 23 publications different from the dissertation for the educational and scientific degree Doctor. 5 of them are independent and 4 publications were presented in scientific forums abroad. Two of the publications are indexed in Scopus;
- The candidate has presented information for guiding and counseling 22 graduate students, fulfilling the requirement for a minimum of 10 graduate students that have successfully defended their degrees;
- The candidate has presented information for participation in 10 projects (with him being the lead in two of them) contracted by international and national institutions, fulfilling the requirement to participate in three.

The presented materials form the following scientometric indicators:

**TABLE WITH SCIENTIFIC INDICATORS:**

Area 5. Technical sciences PN 5.2. Electrical engineering, electronics and automation

Indicators	Content	Requirement	Result
A	Indicator 1. Dissertation presented for obtaining the educational and scientific degree Doctor	50	<b>50</b>
B	Indicator 3 or 4. Monograph	100	<b>100</b>
C	Sum of indicators 5 to 11	200	<b>217.5</b>
D	Sum of indicators 12 to 15	50	<b>78</b>
	<b>Total</b>	<b>400</b>	<b>445.5</b>

**3. Evaluation of the candidate’s overall academic development**

**3.1 General characteristics of scientific work and publishing activity**

The presented information on the contributions is dominated by works with mainly practical-applied and applied science character:

- frequency control of AC machines;
- a study of the indicators for the quality of the electricity and minimization of the inactive capacities in the power supply systems and assessment of their reliability;
- development of complex systems for conducting practical training.

### **3.2 Scientific activity - dissemination and application of the applied-science achievements of the candidate among the scientific community**

In addition to the monograph written for this competition, Ginko Angelov Georgiev has independently written a coursebook and two workbooks in the disciplines Energy efficiency of electrical systems, Electrical machines and Electrical appliances.

The scientific fields in which the publications are provided are:

1. Electrical equipment - 1 monograph; 8 articles (number 4,10,12,13,15,20,22,23);
2. Electricity supply - 6 articles (number 24,25,26,27,31,32);
3. Quality of electricity, 6 articles (numbers 1,3,14,16,28,29)
4. Using renewable energy and accumulation of energy - 2 articles (number 17,22);

These publications highlight practical-applied and scientific-applied contributions related to conducting simulation research and real experiments. The characteristics of the frequency inverters and the indicators for the quality of the electric energy are studied and the possibilities of the space vector as a powerful tool for research and construction of control systems are proven. Practical problems for modernization of various electric drives have been solved. Electricity management of a number of industrial enterprises was carried out and recommendations were made to improve energy efficiency.

### **3.3 Project participation and leadership**

Ginko Angelov Georgiev has participated in 3 projects contracted by international and national institutions and 7 projects funded by BSU. He was the leader of two of them. These projects are not reflected in the table of scientometric indicators, as they do not fall into the requirements for the competition for the positions of Associate professor.

## **4. Participation in teaching and learning activities, including scientific guidance and consulting of graduates**

Ginko Angelov Georgiev leads the following courses: Electrical Machines, Electrical Appliances, Electrical Supply, Electrical Equipment, Energy Efficiency of Electrical Systems. He has supervised or advised 22 graduate students.

## **5. Main scientific and applied scientific contributions**

### **5.1. Evaluation of the contributions in the monograph submitted for participation in the competition for Associate Professor**

The monograph *The Space Vector in Frequency Inverters*, published in 2021, consists of 107 pages and includes an introduction and 7 chapters. The monographic paper examines the application of the space vector as a basis for the frequency control of AC electric machines and demonstrates the trends in the subsequent development of frequency control. The main contribution to the monographic work is the detailed examination of the space vector: its mathematical substantiation and its decomposition into different coordinate systems in order to facilitate the solution of complex differential equations with variable coefficients. A general idea for building a speed control system for both asynchronous and synchronous permanent magnet motors is analyzed, taking into account all the limitations arising from the specifics of the machines. Pulse-width modulation is substantiated as the main method for realization of the stator voltage vector in vector control systems and the full

use of the DC link voltage is proved. Simulations and real tests of vector controlled electric drives were performed. Their results prove the advantages of vector control, including at speed close to zero. The last chapter of the monograph summarizes the directions for the development of control systems of modern electrical machines.

## **5.2. Evaluation of the contributions in the presented publications**

### *5.2.1 Contributions in Publications: P0, P4, P10, P12, P13, P15, P20, P23, P22*

These publications highlight the following contributions:

- The differential equations of the asynchronous machine are solved using the Laplace's method and there is a proposed method to determine the parameters of the asynchronous machine by capturing the space vector of the starting current and the Laplace's inverse transformation;
- A model of softstarter electric drive has been created in Matlab and a model study of the starting mode of a powerful asynchronous electric drive has been made;
- It has been demonstrated that the suppression of low-frequency interference can be performed quite effectively with vector control;
- It is recommended that when applying a contour with a reference model for the need to check the stability system;
- A physical model was created, and subsequently a practical solution was obtained for the retrofit of an electric elevator drive;
- Possible causes of accidents of asynchronous electric drives were researched at the request of Bulgarian State Railways and The National Railway Infrastructure Company and it was proven that the conversion of electricity from single-phase to three-phase with the appropriate quality is not a condition for accidents;
- A model of laboratory frequency electric drive has been created in Matlab and a comparison with a physical one has been made. The identity of the research results has been proven;
- The possibility of determining the electrical losses in induction motors in transient mode has been proven;
- The possibilities for the development of electric drives by increasing the number of phases in electric machines and hence imposing fault tolerance to them were demonstrated;
- Studies of asynchronous motors in vector control of voltage and current, with and without feedback, were conducted;
- Results were obtained for the torque of the induction motor at zero and close to zero speed;
- A complex system for power supply recovery has been developed.

### *5.2.2. Contributions in publications: P24, P25, P26, P27, P31, P32*

These publications highlight the following contributions:

- An attempt has been made to evaluate the reliability of electricity supply in the sectoral structure of the country using the method of equivalent conversion. Recommendations are given for different types of reservations depending on the specific case;
- The impact of electricity quality indicators on the reliability of electrical systems has been assessed. The joint operation of power transformers, bank of condensers, cable lines, etc in the conditions of asymmetric and non-sinusoidal load is analyzed. An approach to complex

assessment based on the theory of experimental planning is proposed;

- An experiment was performed using a probabilistic-statistical approach on the multiplicity of overvoltage when switching a group of powerful SD, and a substantial deterioration of electromagnetic compatibility was found;
- The probability of electromagnetic disturbances entering the systems of automation and control, relay protections, control and monitoring systems caused by the high multiplicity of overvoltages in the switching processes has been confirmed;
- Experiments conducted in Solvay Sodi have shown that resonance occurs at reduced loads in the higher frequencies, while in reactive load compensation the probability of overload of capacitor banks shifts in the lower frequencies.

#### *5.2.3. Contributions in publications P1, P3, P14, P16, P28, P29*

These publications highlight the following contributions:

- Experimental results have been obtained from real images of the space vector of voltage and current, as well as phase currents during operation of asymmetric load and nonlinear load powered by a synchronous generator. It has been proven that the space vector is a powerful tool that can serve for rapid qualitative assessment of the processes and phenomena that occur in such a power supply system;
- The power supply systems of a number of enterprises have been studied, the dangers of electric resonance according to the levels of high harmonics have been shown and recommendations for its avoidance have been made;
- It was proven that when the space vector is being used, the components of the total power are generally determined in case of disturbances of the power systems with higher harmonics and asymmetries;
- The expediency of using the space vector in combination with the “instantaneous power” method for analysis and assessment of the state of power supply systems and the possibilities for impact on disturbances caused by asymmetry and high harmonics has been proven.

#### *5.2.4 Contributions in publications P17, P22*

These publications highlight the following contributions:

- Studies related to the extraction of hydrogen from a fuel cell using electricity obtained from the photovoltaic plant have been conducted;
- Experimental results have been obtained for the amount of hydrogen that can be produced using different numbers of photovoltaic panels based on experimentally obtained data on the values of solar radiation for a certain period of time;
- A complex system suitable for practical student (laboratory) classes has been developed. It allows for tracking and analyzing a cycle of technological processes - production of electricity from renewable energy sources, production and storage of hydrogen and reverse conversion of energy into electricity;
- Software applications for receiving, processing, visualization and archiving of data received from the meteorological station of BFU have been created;
- Software applications have been created for calculation and visualization of saved greenhouse gas emissions during the operation of a photovoltaic plant;
- A mobile application has been developed, with the help of which information on energy production from the photovoltaic plant can be obtained in real time.

## **6. Citations of the candidate's publications in the national and foreign editions (publication image)**

12 citations were provided to 6 of the candidate's publications. Most of the cited works were published abroad.

## **7. Critical remarks and recommendations**

I have no serious remarks on the materials provided to me.

I can only make the following recommendation:

The candidate should intensify his publishing activity in respected international journals and conferences abroad and especially those indexed in the established world databases, such as Scopus and Web of Science.

## **8. Conclusion**

The educational activity and scientific work of Assistant Professor Eng. Ginko Angelov Georgiev, the implementation of the legal requirements of the Law on the Development of the Academic Staff of the Republic of Bulgaria on the announced competition and all the above give me a reason to conclude that the conditions for getting the academic position of Associate Professor are met. I end this opinion with a positive conclusion for the election of Assistant Professor Ginko Angelov Georgiev, PhD, for the academic position of Associate Professor at the Burgas Free University, in the scientific field of Technical Sciences - Professional 5.2. "Electrical Engineering, Electronics and Automation", specialization "Power supply and Electrical equipment".

19.01.2022

Assoc. Prof. Dr. Eng. Kamen Dimitrov Seymenliyski