

REVIEW

by **Prof. Ivan Borisov Evstatiev, PhD**, „Angel Kanchev“ University of Rousse of the materials submitted for participation in the competition to occupy 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 "Elements and devices of automation and computer science" (Microprocessor circuit engineering).

In the competition for **associate professor**, announced in the State Gazette, issue 47 of 24.06.2022 and on the website of the Technical University of Gabrovo, for the needs of the department of Electronics at the faculty of Electrical Engineering and Electronics, as a candidate participates **Ch. Assist. Prof. Eng. Valentina Vasileva Rankovska, PhD**.

1. BRIEF BIOGRAPHICAL DATA

Ch. Assist. Prof. Eng. Valentina Rankovska graduated from VMEI - Gabrovo (now Technical University of Gabrovo), specialization "Diagnostics of microprocessor systems", in 1989. Defended the scientific degree "Doctor" in 2010 at Technical University - Gabrovo. The scientific specialty of the doctoral program is "Elements and devices of automation and computer science". The topic of the dissertation is "Development and research of digital single-channel and two-channel systems for generating control and drive signals".

Dr. Rankovska's professional career began in 1989, as a design engineer at "Gama-Proekt" JSC, Gabrovo. Since 1996 she has been an assistant, later a senior assistant and ch. assistant professor at Technical University of Gabrovo.

Fluent in Russian and English languages.

She is a member of the Union of Scientists and the Union of Electronics, Electrical Engineering and Communications.

2. GENERAL DESCRIPTION OF THE SUBMITTED MATERIALS

The publications of Ch. Assist. Prof. Valentina Rankovska, Ph.D., presented in the competition for associate professor, are **36**. To participate in the competition, the candidate submitted **12** publications, referenced and indexed in world-famous databases, equivalent to a monographic work under the general title "Electronic systems for industrial process management".

For participation in the competition outside of the materials equivalent to a monographic work, reflected in the list of points for fulfilling the minimum requirements are:

- **20** scientific publications in non-refereed peer-reviewed journals or in edited collective volumes;

- **3** textbooks authored by Dr. Rankovska: "Microprocessor Circuit Engineering", "Designing Circuits in a Programmable Environment" and "Microprocessor Circuit Engineering" (electronic edition);

- **1** manual for laboratory exercises in Microprocessor circuit engineering in co-authorship.

A list of a total of **20** known citations is presented, of which **16** are in scientific publications, referenced and indexed in world-renowned databases of scientific information or in monographs and collective volumes, and **4** citations in non-refereed peer-reviewed journals.

Also, the author has a document for **1** implementation of an electronic system in practice, as well as **1** guide to a project funded by the National Research Institute of the Ministry of Education and Science. Information is also presented on the participation of Ch. Assist. Prof. Rankovska in **2** European projects and one university funded by the "Scientific Research" fund of the Ministry of Education and Culture and **11** research projects funded by the state budget for scientific research.

3. REFLECTION OF THE CANDIDATE'S SCIENTIFIC PUBLICATIONS IN THE SCIENTIFIC COMMUNITY (known citations)

A reference is presented with a total of **20** citations, of which **16** are in scientific publications, referenced and indexed in world-renowned scientific information databases (SCOPUS) and **4** citations are in non-refereed peer-reviewed journals. All citations are traceable.

4. OVERVIEW OF THE CONTENT AND RESULTS IN THE PRESENTED PAPERS

Dr. Rankovska's publishing activity is focused on electronic systems for industrial processes control.

The main thematic directions are "**Design of digital and microprocessor devices and systems and innovative technologies in engineering education**", "**Intelligent measurement and control systems**", "**Application of big data in the economy**".

The publications in the topic area "**Design of digital and microprocessor devices and systems and innovative technologies in engineering education**" are [1, 2, 4, 5, 7, 8, 9, 12, 13, 14, 22, 23, 24, 25, 27, 28, 29, 30, 31, 32]. In [1], a universal demonstration module containing commonly used peripheral blocks in microprocessor systems was designed. It is designed to replace a number of breadboards and expansion boards in development systems with various mid- and high-end microcontrollers (PIC, AVR, ARM and other cores). The designed PIC18F25K50 based module in [4] was also used, as well as additional I/O executive devices [32].

A flexible educational model for WEB-based monitoring and control was designed for demonstration with Wi-Fi and Ethernet connectivity [2].

Approaches have been developed to study interrupts in Arduino-based microcontrollers [5] using programmable logic [8].

Innovative approaches in teaching and learning embedded systems have been analyzed [7, 9, 28]. Their application in "smart house" projects with different sets of functional capabilities is presented [12, 30]. A training and test system was also designed [13].

A hardware system has been developed for the design of microprocessor devices and systems based on 8-bit microcontrollers PIC16F87x, working with the MPLAB integrated programming environment of the Microchip company [14].

In [29], the advantages of virtual Internet environments and applications, in particular cloud computing platforms, are justified and example applications are presented.

A comparative analysis of the main characteristics and parameters of common wireless interfaces has been performed. Their advantages and disadvantages, limitations and potential areas of application are analyzed in the context of embedded system architecture as well as its applications [31].

In [22], the modern technology for designing digital and microprocessor circuitry, as well as programmable logic with FPGA architecture, is presented. Attention is paid to the simulation of the project as an important stage in its verification.

A classification of microprocessor cores for programmable logic with FPGA architecture was made and design stages of programmable microprocessor cores for FPGA circuits were proposed in [23, 27].

In [24, 25], an approach was developed for mastering the design technology of embedded microprocessor systems using programmable logic and ready-made microprocessor cores. A microprocessor system was designed.

The publications in the thematic direction **"Intelligent measurement and control systems"** are [3, 6, 10, 15, 16, 17, 18, 19, 20, 21, 26].

In [3], an advanced version of software was developed to measure the surface of an arbitrarily shaped skin using a USB camera.

In [6], a module for a labeling machine for automatic labeling on a glass jar was designed, based on FPGA programmable logic.

Functional capabilities are justified and the block diagram and schematic solution of an active power meter that can be used for a wide frequency range using phototransistor or photodiode optocouplers is developed [16]. A variant solution of a WEB-based digital electricity meter is presented, intended for application in a centralized information system that uses the Internet as a transmission medium, by means of various technical means - radio modems, mobile terminals (GSM), local and global networks [17].

Synthesizers of sinusoidal signals have been designed [20, 21].

A variant for the design of highly efficient control devices in electric drive systems is proposed based on an innovative approach using the latest element base, such as programmable logic devices [26].

A hybrid approach is proposed for spectral analysis and voice profile recognition using machine learning and artificial intelligence techniques. For voice processing procedures, the Fast Fourier Transform algorithm is applied. Synthesized k-NN (non-parametric method for supervised learning) and FFNN (neural network) models with respect to personal voice profile [10].

Models of different types of inverters in the phase space have been synthesized and studied [15, 18, 19]. Alternative methods are proposed for their calculation during design.

The thematic direction **"Application of big data in economics"** is in [11]. A prototype big data analysis system based on data mining techniques, Hadoop information infrastructure platform for distributed data collection and MATLAB analytical environment was designed. The obtained results of test activities related to some system modules for cluster analysis, recognition and classification of tasks for defined economic goals and processes are presented.

I believe that the thematic areas, content and results in the presented works fully correspond to the specialty "Elements and devices of automation and computing" (Microprocessor circuit engineering).

5. GENERAL CHARACTERISTICS OF THE CANDIDATE'S ACTIVITY

5.1. Educational and pedagogical activity (work with students and doctoral students)

According to the submitted documents and references, the most important achievements of Dr. Rankovska in the field of educational and pedagogical activities are **4** lecture courses for the Bachelor's degree program "Industrial and automotive electronics" in which the candidate is a leading teacher and leads lectures and exercises in full-time and part-time form of education and **8** lecture courses for the Master's degree programs of Electronics and Automotive Electronics specialties, in which Dr. Rankovska also leads lectures and exercises.

For the Bachelor's degree course, they are the following:

- "Microprocessor circuit engineering";
- "Industrial and automotive interfaces";
- "Circuits design in a programmable environment";
- "Embedded Microprocessor Systems".

For the Master's degree course, the disciplines are:

- "Programming of Arduino-based systems";
- "Designing embedded systems and the Internet of Things";
- "Diagnostics and debugging of microprocessor systems";
- "Automotive microprocessor systems";
- "Automotive communication systems";
- "Remote control of embedded microprocessor systems";
- "Information, navigation and security systems";
- "Automotive comfort and safety systems".

Ch. Assist. Prof. Rankovska is an independent author of **3** textbooks:

- "Microprocessor circuit engineering" for students of Electronics;
- "Designing circuits in a programmable environment" for students of Industrial and Automotive Electronics;
- "Microprocessor circuit engineering" for students of Industrial and Automotive Electronics.

She is the co-author of **1** manual for laboratory exercises "Microprocessor circuit engineering".

The three textbooks and the guide are presented for the Associated Professor procedure.

Dr. Rankovska regularly overfills the auditorium occupancy. She also participated in creating 2 teaching laboratories.

Ch. Assist. Prof. Rankovska participated in the development of **3** curricula for the specialties "Industrial and automotive electronics" for the bachelor's degree program, "Electronics" and "Automotive electronics" for the master's degree, as well as in the development of **12** study programs for the bachelor's degree and master's degree as follows:

Dr. Rankovska participated in the development of the following study programs for the Bachelor's degree of Industrial and Automotive Electronics:

- "Microprocessor circuit engineering";
- "Industrial and Automotive Interfaces";
- "Circuits design in a programmable environment";
- "Embedded Microprocessor Systems".

For the Master's degree of Electronics, the study programs developed with the participation of Dr. Rankovska are:

- "Programming of Arduino-based systems";
- "Designing embedded systems and the Internet of Things";
- "Diagnostics and debugging of microprocessor systems".

For the Master's degree in Automotive Electronics, she participated in the development of the following study programs:

- "Automotive Microprocessor systems";
- "Automotive communication systems";
- "Remote control of embedded microprocessor systems";
- "Information, navigation and security systems";
- "Automotive comfort and safety systems".

Dr. Rankovska has created **2** laboratories on "Microprocessor Circuit Engineering" and "Circuits design in a programmable environment".

I believe that the educational and pedagogical activity of the Chief Assistant, Valentina Rankovska, PhD, is impressive and fully meets the necessary requirements for opening a procedure for an associate professor.

5.2. SCIENTIFIC AND SCIENTIFIC-APPLIED ACTIVITY

It follows from the presented materials that the candidate's research and applied activity is related to the following main directions: development and implementation of virtual technologies for distance learning, digitalization of the economy in a big data environment, contactless transmission of information, development, application and programming of microprocessor systems for industry and in the educational process, etc.

A significant part of the publications are related to the topics of scientific research projects, which emphasizes the practical application of the candidate's scientific activity.

The topics of Dr. Rankovska's scientific and scientific-applied activity is current. It is related to application of modern methods of research, training and modeling of processes related to training and industry. I believe that the teaching-pedagogical and scientific-applied activities fully meet the generally accepted requirements for the procedure for an associate professor.

5.3. Implementation activity

The implementing activity is represented by **1** implementation of an electronic system in practice, **1** management of a project financed by the National Research Fund with the Ministry of Education and Science, and participation in **2** European projects and **11** research projects financed by the state budget for scientific research.

The topics of the projects correspond to the field of the applicant's scientific publications.

I believe that the pioneering activity of Dr. Rankovska meets the requirements for the disclosure procedure for an associate professor.

6. CONTRIBUTIONS (scientific, scientific-applied, applied).

The reviewer's view of the contributions is that they are scientific-applied and applied.

Scientific-applied contributions

Contributions of a scientific-applied nature can be summarized in the following form:

1. Synthesis of signals and creation of models of different types of inverters in the phase space [15, 18, 19, 20, 21].
2. Synthesized method for image recognition with USB camera [3].
3. Design of electronic devices, by applying modern approaches and techniques in the electronic industry [1, 4, 22].
4. Creation of training methods in the field of microprocessor technology [2, 5, 8, 10, 11].

Scientific-applied contributions are related to the enrichment of knowledge in the field of application of modern means and technologies in electronics.

Applied Contributions

1. Design of microprocessor modules and systems [6, 23, 24, 25, 26, 27, 28, 29].
2. Creation of electronic devices and training systems [7, 9, 12, 13, 14, 31, 32].
3. Electronic measurement and control systems [16, 17].
4. Designing an electronic system for a "smart house" [30].

Applied contributions relate to the application of modern approaches in device development.

I believe that the scientific-applied and applied contributions in the materials for the opening of an associate professor procedure are relevant to the development of modern theory for the development and management of electronic systems for industry and the educational process.

7. ASSESSMENT OF THE CANDIDATE'S PERSONAL CONTRIBUTION

In the works presented for the current competition, Dr. Rankovska is the independent author of **12** publications and **3** textbooks, in **11** publications and **1** guide she is a co-author, in **7** publications with two co-authors and in **2** publications with three co-authors.

20 known citations are presented, **16** of which are of publications referenced in Scopus. The candidate has managed **1** research and development contract and participated in **14**.

Considering this information, it can be confidently asserted that the personal contribution of chief assistant Dr. Valentina Rankovska in the presented production is beyond any doubt.

8. CRITICAL NOTES AND RECOMMENDATIONS

I have no critical notes.

In the further activity of the candidate, I would recommend that he keep the following in mind. To use the accumulated knowledge, focusing on more active implementation of

its developments in practice. I believe that the developments and contributions of the candidate are important for the industry and the educational process.

9. PERSONAL IMPRESSIONS

I know Dr. Valentina Rankovska from meetings at scientific conferences. It is worth noting her prominence in scientific circles, proven by 20 citations, of which 16 in Scopus.

I also want to note the fulfillment of all requirements for registration with NACID.

I think that as a scientist and specialist she possesses very high qualities and has great opportunities for development.

It can be said that at the present moment, Dr. Rankovska is one of the pillars of the educational process in the "Electronics" department of TU-Gabrovo.

With the successful completion of this competition, Technical University - Gabrovo will be enriched with a possible excellently prepared qualified specialist both as a teacher and as a researcher, implementer and organizer.

10. CONCLUSION:

Bearing in mind the above, I propose that chief assistant eng. Valentina Vasileva Rankovska, PhD, be elected as an "associate professor" in the field of higher education 5. Technical sciences, professional direction 5.2. Electrical engineering, electronics and automation, specialty "Elements and devices of automation and computer science (Microprocessor circuit engineering).

26.10.2022

Reviewer: /signature/

/Prof. I. Evstatiev, PhD/