

REVIEW

by Prof. Anatoliy Trifonov Aleksandrov, PhD, Technical University of Gabrovo of the materials submitted for participation in the competition to occupy the academic position of associate professor in the area of higher education: 5. Technical Sciences, professional trend: 5.2. Electrical Engineering, Electronics and Automation, scientific subject: Elements and devices of automation and computer science (Microprocessor circuit engineering)

Chief assist. prof. Valentina Vasileva Rankovska is participating in the competition for associate professor, published in the State Gazette, issue 47 of 24.06.2022 and on the website of TU-Gabrovo, for the needs of the Department of Electronics at the Faculty of Electrical Engineering and Electronics, Technical University of Gabrovo.

1. Brief biographical data

Valentina Vasileva Rankovska was born on 10.08.1964. During the period 1984–1989 she has been a student at the Technical University of Gabrovo (TU-Gabrovo) and acquires an educational and qualification degree "Master of Science" with professional qualification "Electrical Engineer". During the period 2008-2010, she was a doctoral student at TU-Gabrovo. In 2010, she acquired the educational and scientific degree "doctor" in the specialty "Elements and devices of automation and computer science".

Valentina Rankovska joined TU-Gabrovo in 1996 as an assistant, and since 2010 she has been a chief assistant in the Department of Electronics at the Faculty of Electrical Engineering and Electronics (FEE) of TU-Gabrovo.

Valentina Rankovska is the only candidate in the announced in the State Gazette, issue 47/24.06.2022 and on the TU-Gabrovo website for the needs of the department of Electronics at the faculty of Electrical Engineering and Electronics, a competition for the academic position of associate professor in professional field - 5.2 Electrical engineering, electronics and automation, specialty "Elements and devices of automation and computer science" (Microprocessor circuit engineering). The competition was announced by decisions of the Academic Council of TU-Gabrovo (protocol No. 10/31.05.2022) and the Faculty Council of FEE (protocol No. 5/17.05.2022), on the proposal of the Department Council of the Department of Electronics (protocol No. 4/13.05.2022).

2. General overview of the submitted materials

In the competition for the academic position "Associate Professor" Ch. Assistant Professor Valentina Rankovska participated with 32 scientific works, of which: equivalent to a monographic work, publications in journals, referenced and indexed in world-famous databases with scientific information (indicator B.4) – 12 items [1 – 12]; scientific publications printed in peer-reviewed journals and collections (indicator Г8) – 20 items [13-32]. Also 3 textbooks and one manual for laboratory exercises in Microprocessor circuit engineering are presented.

The publications can be classified as follows:

- articles in proceedings of international scientific conferences abroad – 12 pieces [4, 12, 15, 18-20, 25, 26, 28, 30-32];
- articles in Bulgarian magazines - one issue [22];
- articles in proceedings of international scientific conferences in Bulgaria – 15 pieces [1, 2, 5, 9-11, 13, 14, 16, 17, 21, 23, 24, 27, 29];
- articles in proceedings of national scientific conferences - 4 pieces [3, 6-8].

The candidate is an independent author of 12 publications [2, 7, 9, 13, 21, 23-25, 27-30], she has a co-author in 11 publications [1, 4, 5, 8, 12, 15, 20, 22, 26, 31, 32] and in the rest 9 publications she has two and more co-authors [3, 6, 10, 11, 14, 16-19]. The candidate

is the first co-author of 8 of the collective works [1, 4, 5, 8, 12, 22, 31, 32]. Twenty-five publications are in English and seven in Bulgarian.

3. Effect of the scientific publications on the scientific community (known citations)

Ch. assistant professor Valentina Rankovska, PhD, presents a report on 20 citations of 16 scientific works. 16 citations are in scientific publications, referenced and indexed in world-renowned databases of scientific information, and 4 citations are in non-refereed peer-reviewed journals.

On that basis I can conclude that dr. Rankovska is a well-known author who has published in high-impact journals and periodicals in the area of the competition.

4. Overview of the content and results of the works submitted

The candidate in the competition meets and by certain indicators significantly exceeds the minimum national requirements. Ch. assistant professor Dr. Rankovska holds a diploma for the educational and scientific degree "doctor" in "Elements and devices of automation and computer science" (No. 34108/25.05.2010), issued by the Higher Attestation Commission. She defended a dissertation on the topic: "Development and research of digital one-channel and two-channel systems for generating signals for control and management" (indicator A - 50 points). She presented 12 publications, equivalent to a monographic work, which are in editions, referenced and indexed in world-famous databases with scientific information (indicator B - 400 p.). 20 scientific publications in non-refereed journals with scientific review or in edited collective volumes are presented (indicator D8 – 273.35 points), 16 citations in scientific publications, referenced and indexed in world-famous databases with scientific information (indicator D12 – 160 items) and 4 citations in non-refereed journals with scientific review (indicator D14 – 8 items).

Group of indicators	Minimum national requirements for the academic position of an associated professor	Ch. assist. Prof. Valentina Rankovska
A	50 p.	50 p.
Б	-	-
B	100 p.	400 p.
Г	200 p.	273,35 p.
Д	50 p.	168 p.
E	-	-

Ch. Assistant Professor Valentina Rankovska covers and in certain indicators exceeds the scientometric data according to the minimum requirements of TU-Gabrovo. With the required 15 publications, of which 4 are independent, she has submitted 32 publications, of which 12 are independent. With the required 5 citations, Dr. Rankovska has 20, and with the required 1 textbook and 1 study manual, she is the author of 3 textbooks and 1 teaching-methodical guide.

Indicators	Minimum national requirements for the academic position of an associated professor at the Technical University of Gabrovo	Chief assist. Prof. Valentina Rankovska
Total number of publications	15	32
Independent publications	4	12
With IF (WoS) or SJR (Scopus)	1	3
Number of known citations by other authors	5	20
Published textbooks	1	3
Published teaching materials	1	1
Leadership of projects and contracts	-	1

5. General characteristic of candidate's performance

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

Ch. assistant professor Valentina Rankovska, PhD, is an approved lecturer at TU-Gabrovo. She has 32 years of work experience, of which 26 years of teaching experience at TU-Gabrovo.

According to the presented report on the schedule of classes held at TU-Gabrovo for the last 3 years, Dr. Rankovska spent 1558 hours with full-time and part-time students in the disciplines "Microprocessor Circuit Engineering", "Designing Circuits in a Programmable Environment", "Industrial and Automotive Interfaces", "Embedded Microcomputer Systems" for "Electronics" and "Industrial and Automotive Electronics" specialties.

Ch. assistant Professor Rankovska is the author of 3 textbooks - two textbooks on "Microprocessor circuit engineering" and one on "Designing circuits in a programmable environment". He is the co-author of a textbook - "Manual for laboratory exercises in microprocessor circuit engineering". She is the author of the curricula for the disciplines "Microprocessor Circuit Engineering", "Industrial and Automotive Interfaces", "Designing Circuits in a Programmable Environment", "Embedded Microcomputer Systems", "Arduino-Based Systems Programming", "Microprocessor Diagnostics and Debug systems", "Remote control of embedded microprocessor systems", "Information, navigation and security systems", "Automotive comfort and safety systems" and co-author of the curricula on "Design of embedded systems and the Internet of things", "Automotive Microprocessor systems" and "Automotive communication systems" for the Bachelor's degree course of "Industrial and automotive electronics" and the Master's degree course of "Electronics".

Ch. assistant professor Valentina Rankovska participated in the construction of the educational laboratories for "Microprocessor Circuit Engineering" and "Designing Circuits in a Programmable Environment" and was the supervisor for the last five years of 25 graduate students who successfully defended their diploma theses.

The above-mentioned data give me reason to assess the candidate's pedagogical preparation and activity as very good.

5.2. Scientific and scientific-applied activities

Ch. Associate Professor Valentina Rankovska, Ph.D., was the head of 1 university research project (Contract 2002E/2020 "Non-contact transmission of information from sensor networks managing energy flows in building automation and electric transport"). She participated in 2 projects under operational programs (project BG05M2OP001-1.002-0002-C01 "Digitalization of the economy in a big data environment" under the Operational Program "Science and Education for Intelligent Growth" and project BG051PO001-4.3.04-0051 "Development and implementation of virtual technologies for sustainable development of distance learning in TU-Gabrovo" under the Operational Program "Development of Human Resources").

Dr. Rankovska has participated in the following scientific forums: Unitech, ICEST, ELECTRONICA, ELECTRONICS, etc.

Dr. Rankovska's works could be systematized in the following 3 thematic trends:

1. Design of digital and microprocessor devices and systems and innovative technologies in engineering education

1.1. Stages and tools for designing digital and microprocessor devices and systems and training in microcontroller related disciplines

A universal demonstration module containing commonly used peripheral blocks in microprocessor systems [1], a microcontroller module including an 8-bit general-purpose microcontroller [4], a flexible educational model for web-based monitoring and control for Wi-Fi demonstration and learning have been designed and Ethernet connectivity [2], two models of "smart houses" with different sets of functional capabilities [7, 30] and an automated program training and testing system [13]. A microprocessor development system with the possibility of application of microprocessor modules with various medium and high-end microcontrollers [32] and a hardware system for designing microprocessor devices and systems based on 8-bit microcontrollers PIC16F87x have been developed [14]. Two approaches have been proposed to study the nature and mechanism of interrupt handling in microcontrollers [5, 8]. The need to apply project-based learning, as well as the latest trends with the application of the CDIO framework, is justified [7, 28]. An analytical overview of research and laboratory equipment based on open-source hardware and designed for various application areas was made [12]. Functional capabilities and resources of two types of open-type development boards were analyzed: based on microcontrollers and those based on programmable logic [9]. The advantages of cloud computing platforms are justified and a brief literature review is made on useful practices with their application in different universities [29]. A comparative analysis of the main characteristics and parameters of common wireless interfaces in the context of embedded system architecture and its applications was performed [31].

1.2. Stages and tools for designing digital and microprocessor devices and systems and training in subjects involving programmable logic

The characteristics, resources, advantages and disadvantages of a modern element base - programmable logic with FPGA architecture are analyzed and the modern design technology in its application is presented [22]. A classification is made and the advantages and disadvantages of microprocessor cores for programmable logic with FPGA architecture are analyzed. Their main characteristics and functional capabilities are summarized. Design stages of programmable microprocessor cores for FPGA circuits have been proposed [23, 27]. A microprocessor system with elementary functions was designed, intended for educational purposes and using the SOPC Builder program module available in the integrated design environment [24]. A methodology has been proposed for studying the design of MP cores and systems with elementary functions for educational and research purposes [25].

2. Intelligent measurement and control systems

2.1. Intelligent systems for measuring, generating and recognizing signals and control

Software for leather surface measurement using a USB camera [3], a sinusoidal signal synthesizer by the direct digital synthesis method [20], a synchronization method by monitoring the speed of a labeling machine for automatic labeling on a glass jar have been developed [6] and a methodology for designing a DDS sine/cosine signal synthesizer based on the vector rotation and angle recoding method [21]. A grapho-analytical methodology was created for sizing an active power meter in RF circuits, built on the basis of phototransistor or photodiode optocouplers [16]. A variant solution of a web-based digital electricity meter designed for application in a centralized information system is presented [17]. A variant for the design of highly efficient control devices in electric drive systems based on programmable logic [26] and a hybrid approach for spectral analysis and recognition of voice profiles through techniques based on machine learning and artificial intelligence [10] have been proposed.

2.2. Modeling of industrial objects for the purpose of management

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.

3. Application of big data in the economy

A high-quality ICT prototype of a big data analysis system based on data mining techniques, the Hadoop information infrastructure platform for distributed data collection, and the MATLAB analytical environment was designed and tested [11].

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 new sides in existing scientific problems and obtaining confirmatory facts in the field of research, modeling and application of microprocessor devices and systems in electronics and in the educational process.

6.1. Contributions in the publications equivalent to a monography

Scientific-applied contributions

- Two approaches have been developed to study interrupts in microcontrollers [5, 8].
- Innovative approaches and good practices in the teaching and learning of embedded systems, including project-based learning and the application of the CDIO framework, were analyzed and a variant of the "smart house" model was designed [7].
- Functional capabilities and resources of open-type development boards with microcontrollers and programmable logic have been analyzed [9].
- A hybrid approach has been proposed for spectral analysis and recognition of voice profiles using techniques based on machine learning and artificial intelligence [10].
- An ICT prototype of a big data analysis system was designed and tested [11].
- An analytical overview of research and laboratory equipment based on open-source hardware was made [12].

Applied Contributions

- A universal demonstration module containing commonly used peripheral blocks in microprocessor systems, a training model for web-based monitoring and control with Wi-Fi and Ethernet connectivity, and a microcontroller module based on a general-purpose 8-bit microcontroller were designed [1, 2, 4].
- Software has been developed to measure the leather surface using a USB camera [3].
- A synchronization method was implemented by monitoring the speed of a labeling machine for automatically placing labels on a glass jar [6].

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

Scientific-applied contributions

- A graph-analytical methodology for sizing an active power meter in HF circuits with phototransistor or photodiode optocouplers, a methodology for designing a DDS synthesizer of a sinusoidal/cosinusoidal signal based on the method with vector rotation and angle recoding and a methodology for studying the design of MP cores and systems with elementary functions for educational and research purposes [16, 21, 25].
- Models of different types of inverters in the phase space have been synthesized and studied [15, 18, 19].
- The characteristics, advantages and disadvantages of programmable logic with FPGA architecture are analyzed and the design technology is presented [22].
- A classification is made and the advantages and disadvantages of microprocessor cores for FPGAs are analyzed. Design stages of programmable microprocessor cores for FPGA circuits have been proposed [23, 27].

- An option for the design of highly efficient control devices in electric drive systems with programmable logic was proposed [26].
- Modern approaches in learning related to microcontrollers were analyzed and models with different functional capabilities were designed [28].
- The advantages of cloud computing platforms are justified and useful practices based on them are presented [29].
- A comparative analysis of the main characteristics and parameters of common wireless interfaces was performed [31].

Applied contributions

- An automated program training and test system, a microprocessor system for training purposes using the SOPC Builder program module and a hardware system for designing microprocessor systems have been designed [13, 14, 24].
- A sinusoidal signal synthesizer using the direct digital synthesis method with implementation in FPGA, two models of a "smart house" with the application of wireless interfaces in building automation and a microprocessor development system with the possibility of application of various medium and high-end microcontrollers were developed. A variant solution of a WEB-based digital electricity meter is presented [17, 20, 30, 32].

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, citations and participation in projects correspond to the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations for its implementation, as well as the minimum requirements of TU-Gabrovo for the scientific and teaching activities for acquiring the academic position "associate professor".

8. Critical comments and recommendations

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

9. Personal impressions

I know Ch. Assistant Professor Valentina Rankovska as a respected colleague. I have no joint publications with her. I am not a person related to it in the sense of paragraph 1, item 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. Assistant Professor Valentina Rankovska, Ph.D., who meet the requirements for holding the academic position "Associate Professor". Sufficient and significant scientific-applied and applied contributions have been obtained.

Based on my familiarity with the presented scientific works, their significance and the scientific-applied and applied contributions contained in them, I find it reasonable to propose Ch. Assistant Professor Valentina Rankovska, PhD, to take the academic position "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).

28.10.2022

Reviewer: /signature/
 /prof. Aleksandrov/