R E V I E W

at the Contest for Lending the Academic Credibility "Associate Professor"
by professional field 5.2. **Electrical engineering, electronics and automation**,
specialty – "**Construction of electronic equipment**", to the Department of Electronic Engineering and Microelectronics at the Faculty of Computer Engineering and Automation,
Announced in the State Gazette №108/22.12.2020
with the candidate: **Assistant Professor Dr. Eng. Toncho Hristov Papanchev**
Member of the Scientific Jury: **Nikolay Lyuboslavov Hinov, Doctor, Associate Professor**

1. Brief biography and background

The competition for occupation of the academic position "Associate Professor" was announced on the proposal of the Departmental Council of the Department of Electronic Engineering and Microelectronics, confirmed by a decision of the Faculty Council of the Faculty of Computer Engineering and Automation of Technical University of Varna and later by the Academic Council of TU Varna- It's safe. The only candidate to submit the application is Assistant Professor Dr. Eng. Toncho Hristov Papanchev. After consideration of the submitted documents, the applicant is admitted to the competition.

Assistant Professor Dr. Eng. Toncho Hristov Papanchev was born on September 30, 1966. He graduated from the Technical School of Electrical Engineering "Marie Curie", Sliven, majoring in electrical engineering, in 1985. He studied at the Technical University - Varna from 1997 to 1992, receiving a master's degree, Electrical Engineer. Since 2010, he has been a PhD student in the Department of Electronic Engineering and Microelectronics at the Technical University of Varna, majoring in Electronics. He defended a dissertation for the acquisition of educational and scientific degree "Doctor" in 2015 on the topic: "Research, analysis and evaluation of the reliability of electronic products."

The teaching activity of the candidate is as follows: Assistant Professor (from 2010 to 2016); Chief Assistant (from 2016 to the present), in the Department of Electronic Engineering and Microelectronics in the structure of the Faculty of Computer Engineering and Automation at TU-Varna.

In addition to research work, the candidate has performed administrative and organizational activities in the Department of Electronic Engineering and Microelectronics and the University: Head of QMS at the Department of Electronic Engineering and Microelectronics; Member of the Risk Assessment Commission at the Faculty of Computer Science and Automation, TU-Varna; Chairman of the Automation Section at the SNS - 2018; Technical Secretary of Division "C" for the Jubilee Congress of TU-Varna "Science and Education in the Future", 2012.

2. Summary of the works presented in the application

To participate in the competition, the candidate has submitted a list of titles of 30 scientific publications, 1 textbook, reference for citations, lectures on disciplines, a list of guided graduates by year and participation in 12 research projects funded by NSF and other public funds from Bulgaria and various operational programs of the EU and other donors.

A total of 18 publications are indexed in Scopus and Web of Science. Three of these works are independent. The candidate participates in the competition with 11 publications, equivalent to a monographic work, indicator B. Citation of publications is presented - a total of 12 issues, including indexed in Scopus (Elsevier) and / or in the Web of Science (Thomson Reuters) are 10.

After getting acquainted with the submitted lists, I accept for review all the works of the candidate. During the detailed examination of the works submitted for participation in the competition, including publications, citations and other activities of the candidate, I present the following summary report on the fulfillment of the conditions for acquisition of AD "Associate Professor" by groups of indicators for OBO "5. Technical Sciences", Table 1.

Table 1. Report on the fulfillment of the conditions for acquiring an academic position "Associate Professor" by groups of indicators for the field of higher education „5. Engineering"

A set of metrics	Content by metrics	Minimum requirements for acquisition of Associate Professor	Assistant Professor Dr. Eng. Toncho Hristov Papanchev
А	**Indicator 1**	**50**	**50**
Б	**Indicator 2**	**-------**	**--------**
В	**Indicator 3 or 4**	**100**	**179**
Г	**Sum of indicators 5 to 11**	**200**	**237.29**
Д	**Sum of indicators 12 to 15**	**50**	**104**
Е	**Sum of indicators 16 to 28**	**------**	**------**
Ж	**Indicator 29**	**30**	**439**
	In total	**430**	**1009.29**

After comparing with the minimum requirements for acquiring the academic position of Associate Professor and the applicant's points, the conclusion is that Assistant Professor Dr. Eng. Toncho Hristov Papanchev fully covers the national requirements for occupying the academic position of Associate Professor, for the field of Technical Sciences in higher education, enshrined in Art. 2b of the Law for the Development of the Academic Staff in the Republic of Bulgaria and the Minimum Requirements, in accordance with the Rules for the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at the Technical University of Varna.

3. General characteristics of the applicant's research and applied activities

The applicant has submitted a reference for participation in 12 research projects in the period 2011-2020, and they are classified as follows: seven internal for TU-Varna, one candidate is the head, one with national funding under the national research program "Young scientists and postdoctoral students ", two with funding under the OP " Human Resources Development "and two under the OP " Science and Education for Smart Growth ".

The research and applied research activities of the candidate can be summarized in the following main areas:

- study of the possibilities for improving the reliability of electronic products and systems;
- automated design and production of electronic components, systems and devices;
- synthesis, modeling and analysis of new and improved solutions in the construction of electronic equipment;
- design and hardware implementation of monolithic integrated circuits and electronic systems based on analog programmable matrices;
- application of artificial intelligence-based techniques for the development of monitoring and control modules.

My overall assessment of the applicant's research and application is very good.

4. Evaluation of the applicant's teaching and pedagogical activity

The candidate has led lectures, laboratory and seminar exercises full-time and part-time students in Bachelor's and Master's degrees at the Department of Electronic Engineering and Microelectronics in Bulgarian and English in the following disciplines: "Analog Electronics", "Standards in Electronics", "Semiconductor components and integrated circuits", "Computer

electronics", "Electronics", "Design and reliability of communication equipment", "Electronic components", "Design of communication equipment", "Design and reliability of electronic equipment", "Design of electronic equipment", "Reliability of engineering infrastructure in case of disasters and accidents", "Semiconductor elements", "Electronic components and semiconductor devices", "Reliability of electronic equipment" and "Virtual tools in electronics".

Assistant Professor Dr. Eng. Papanchev has supervised 16 successfully defended the graduate and has reviewed 32 diploma theses. I was very impressed by the work of the participant in the competition with doctoral students and students on research projects, as well as to motivate their participation in scientific forums.

The participant in the competition is a co-author of a training manual on "Reliability of electronic equipment", as well as in the development of 9 new and updating of 11 training programs for training in various specialties.

The report on the pedagogical and educational-methodical activity of the candidate is a good attestation for his work as a teacher.

My overall assessment of the applicant's pedagogical preparation and activity is very good.

5. Main scientific and applied-science contributions

With regard to publications, the equivalent of a monographic work:

The presented results are mainly related to the assessment of the reliability of individual electronic elements, electronic devices and systems, and in particular can be summarized as follows: analysis based on models and data from operation of options for optimizing the maintenance of complex electronic systems with various applications (industrial electronics, communications, medical equipment), in order to improve and guarantee their performance; with the application of known methods for forecasting the reliability, an analysis of the requirements for achieving reliable and trouble-free operation of power semiconductor devices - MOSFET and IGBT; dynamic assessment of the operational reliability of complex electronic systems, based on the ongoing assessment of certain reliability indicators and the analysis of their changes in order to detect early critical states from the point of view of reliability; through a model-based approach, providing a given level of reliability at the stage of designing medical equipment; using the analysis of operational data, assessing the operational reliability of electronic devices with applications in medicine.

In connection with other submitted publications:

- Analysis of the reliability of power electronic elements - The main part of these papers present research and based on their analysis of the applicability of different methodologies for calculating the failure rate of different power semiconductor devices. The main methods for forecasting the failure rate of electronic elements and the related analysis of the influence of electrical and thermal regimes of the elements on their reliability are considered, and additional evaluation parameters are proposed, allowing the reporting of changes occurring in the electrical characteristics of elements during the test or during normal operation. An approach is proposed for extracting additional information and assessing the impact of influencing factors on the reliability of semiconductor switches, by analyzing databases from testing and operation of electronic products. This approach provides additional information about the changes in reliability and their dynamics at given load factors, separately for each of them. Such an analysis allows the determination of dominant factors through which to define specific modes of operation, as well as methodology and specific environment for the studied electronic products.

- Analysis and modeling of the reliability of electronic devices and systems - Modeling and analysis of the reliability of electronic systems is an important factor in ensuring the operation of devices and according to modern trends in electronics is a key tool in design, prototyping, production and operation. In this regard, a verified optimization approach for selection of an optimal structural scheme of an electronic system, satisfying the requirements for reliability and with additional limitations related to their construction, has been proposed and verified.

Using an analysis of the impact of operating conditions on the reliability of power electronic converters, an assessment of the impact of a combination of environmental factors is made and specific solutions are proposed to increase the reliability of the converters. On the basis of modern means of mathematics, solutions to some common problems encountered in the analysis and evaluation of the reliability of complex electronic systems are proposed.

- **Operational reliability and operation of electronic systems** - Based on the proposed generalized operating model of complex electronic systems at a given value of the probability of trouble-free operation and man-hours of the service team, dependences for determining stocks of spare parts are derived and a method is proposed to find the optimal terms of prevention of complex technical systems. An innovative approach is proposed for assessing the dynamics of the operational reliability of such systems, through ongoing assessment of selected reliability indicators and thus producing preventive signals for critical conditions occurring from the point of view of reliability.

Based on research on specific sites, techniques are proposed to overcome emerging difficulties related to lack of sufficient data or limitations in their accuracy in determining quantitative estimates of certain parameters related to the operational reliability of electronic equipment and the localization of elements / blocks, with the lowest reliability, with the possibility of "field" application.

- Modeling of schemes and processes in electronic systems through the application of artificial intelligence techniques - Approaches for data analysis and decision making based on the following specific artificial intelligence techniques have been developed and verified: genetic algorithms for optimizing design and fabrication of pulse transformers; an expert system based on the Random forest algorithm has been set up to facilitate the decision-making of electrical engineers when choosing between several applicable circuit design solutions; algorithm for control of the cyclic temperature change in the reliability test chamber by fuzzy logic. In addition, various simulation packages have been used to: design magnetic components; synthesis of process monitoring and analysis systems; system for monitoring and control of the processes of charge / discharge of energy storage elements.

6. Importance of the contributions for the science and engineering practice

As a result of the analysis of the candidate's publishing activity and its respective reflection by citation from other authors, it should be concluded that he is known to the scientific community in the field of the competition.

For participation in the competition Assistant Professor Toncho Papanchev, presented a list of 12 citations in scientific publications in the country and abroad of 8 of his works. An inspection of the Scopus database revealed that the applicant had a much higher number of citations than those indicated in his report and had a Hirsch index of h = 5.

The importance of the contributions to the practice can be indirectly judged by the active participation of the candidate in research projects, which was discussed in section 2 of this review.

In view of the above, it is evident that the quantitative indicators of the criteria for occupation of the academic position of Associate Professor in the field of higher education "Technical Sciences" have been met.

7. Critical remarks and recommendations for the applicant

My main remarks are related to the quality of the materials prepared for participation in the competition. There is no complete list of scientific papers for participation in the competition, which makes it difficult to evaluate its achievements. The contributions indicated in the applicant's report need to be clarified and edited, and they should be specific and clear and summarize the overall activities of the applicant.

I recommend to Assistant Professor Toncho Papanchev, to publish in scientific journals "class A" with impact factor and / or impact rank, as well as in indexed databases for scientific literature (SCOPUS, WoS). This will ensure improved citation and scientific recognition not only of the candidate, but also of the teams in which he works.

8. Personal opinion and statements of the reviewer

I do not know personally Toncho Papanchev, and I don't have personal impressions. From the materials submitted to me for review, it is evident that the candidate is actively working for the construction and renovation of the material and technical base of the Department of Electronic Engineering and Microelectronics at the Technical University - Varna. In addition, he is an active participant in the teaching, research and applied activities of the University.

9. Conclusion:

The submitted scientific production and preparation of the applicant's documents are in accordance with the law for the development of the academic staff in the Republic of Bulgaria and the Rules for its application in the part for acquiring the academic position „Associate Professor". The applicant's work and contributions are his main business and are completely sufficient for the award of the academic position of „Associate Professor".

On the basis of my acquaintance with the submitted scientific papers and their summaries, the applied scientific and scientific contributions and the fulfillment of the minimum national requirements, I find it reasonable to propose Assistant Professor Dr. Toncho Hristov Papanchev, to occupy an academic position of „Associate Professor" in the professional field 5.2 Electrical Engineering, Electronics and Automation at the Department of Electronic Engineering and Microelectronics, Faculty of Computer Engineering and Automation of Technical University of Varna.

06.04.2020 г. Reviewer:

/ Assoc. Prof. Dr. Nikolay Lyuboslavov Hinov /