REVIEW

Subject: competition for the academic post of Professor
Professional field: 5.2. Electrical Engineering, Electronics and Automatics,
Speciality: "Automated Information Processing and Control Systems"
Reviewer: Prof. Naiden Chivarov, Ph.D.

1. General applications and bibliographical data.

On the basis of Order No. 42/09.02.2024 of the Director of IICT-BAS, I have been appointed as a reviewer for the competitive procedure for the acquisition of the academic position "Professor", announced in State Gazette No. 103/12.12.2023 for the needs of the section "Distributed Information and Control Systems", with the only candidate Assoc. Prof. Nikolay Stoimenov, Ph.D. From the documents submitted to me for review, it is clear that Assoc. Prof. Nikolay Stoimenov Ph.D. is 35 years old. He completed his education at the Department of Automation of Discrete Manufacturing, where he obtained his Bachelor's degree and later his Master's degree at the Technical University - Sofia. He started his career at the Institute of Information and Communication Technologies at the Bulgarian Academy of Sciences (IICT-BAS) as a student. After his Master's degree, he enrolled in a PhD program and in 2016 successfully defended his dissertation on "Study of movement and interaction of different shape bodies". Shortly after obtaining his PhD degree, he was appointed as a senior assistant professor at the same institute in 2017. His next academic position was in 2020, when he was appointed as an "Associate Professor" at the IICT-BAS. From August 2021, he was appointed Head of the Department "Distributed Information and Control Systems", and from November 2021 to the present, he is also Deputy Director at the same Institute.

Assoc. Prof. eng. N. Stoimenov Ph.D. has submitted 57 scientific papers for review in the competition. The works include 56 publications and 1 chapter of a monograph, 1 patent and 2 utility models. He has also participated in projects, in particular, out of 6 scientific research projects, he has been a participant in 3 of them, and has been a supervisor of 3 others. He has also presented funds attracted in research projects for an institute where he works. In May 2022, he was appointed Deputy Director of the National STEM Centre, a sub-structure of the Ministry of Education and Science.

In the submitted works: 36 publications are in indexed and refereed journals in world-known databases of scientific information; 1 number of published chapter of a collective monograph, which is not submitted as a major habilitation work; 20 number of scientific publications in non-refereed peer-reviewed journals or in edited collective volumes; 3 number of intellectual property protection, of which 1 number of patent and 2 number of utility models; 6 number of scientific research projects.

It is noteworthy that the majority of the papers are in the field of the competition specialty. A check in the world indexed and refereed database SCOPUS shows that Assoc. Prof.

Nikolay Stoimenov PhD has 49 publications and h-index 6, by using the option exclude self-citations in the database. In the last three years his average activity is slightly over 9 publications in the cited database, which indicates a good and high publication activity.

The reference clearly shows that the national minimum requirements and the minimum requirements of the IICT for obtaining and holding the academic position of professor have been exceeded. According to the attached reference, the **over-performance is more than 2 times**, and according to the SCOPUS data, not all works and citations are presented.

Table 1. Requirements and indicators for acad. position professor, according to the ADAPRB, RAPRB, and IICT-BAS of Assoc. Nikolay Stoimenov.

Indicators Group	Criteria according to the RAPRB	Increased requirements of IICT-BAS	Points submitted by the candidate
A	50	50	50
B	100	100	290
Г	200	220	365,3
Д	100	120	414
E	150	150	243,6
Total	600	640	**1362,9**

2. General characteristics of the candidate's scientific research, scientific- applied and pedagogical activities.

In the materials submitted by the candidate, the substantial part of the research and applied activities are focused on specific tasks and problems in the field of the announced competition. Assoc. Prof. Nikolay Stoimenov PhD shows knowledge in the field of motion processes and behavior of grinding bodies and media, wear resistance of 3D printed materials, including composites, as well as 3D Simulation modeling, scanning and printing. Evidence of the above topics is also provided by the materials presented, distributed as follows:

- Indicator "B4. Habilitation work - scientific publications (***not less than 10***)" - 12 scientific papers in publications indexed and refereed in the world-known database of scientific information - Scopus. The publications exceed the requirements in the Regulations on the Specific Conditions for the Acquisition of Scientific Degrees and Academic Positions at the IICT-BAS, where it is stated that at least 10 publications are required. Of the submitted materials, the indicator is present a single article, refereed in IEEE, indexed in SCOPUS, 2 pieces with one co-author, 7 pieces with two, 2 pieces with three.
- Indicator "Г7. Scientific publications in journals that have been refereed and indexed in world-known databases of scientific information" - presented a list of 24 publications in journals that have been refereed and indexed in world-known databases of scientific information Scopus. Of these, there are 2 with one co-author, 13 with two, 1 with three, 9 with 4, 2 with 5 and 6 co-authors, 1 with 8 co-authors.

- Indicator "Г8. Scientific publications in non-refereed peer-reviewed journals or edited collective volumes" - 5 pcs. first co-author.
- Indicator "Г9. Published chapter of a collective monograph" - not presented as a major habilitation work.
- Indicator "Д12. Citations or reviews in scientific journals, refereed and indexed in world-known databases of scientific information, or in monographs and collective volumes" - 37 citations of 13 publications.
- Indicator "Д14. Citations or reviews in non-refereed peer-reviewed journals" contains a list of 22 citations in non-refereed peer-reviewed journals.
- Indicator "E18. Participation in a national scientific or educational project" - a list of 3 projects.
- Indicator "E20. Leadership of a national scientific or educational project" - list of 3 projects submitted.
- Indicator "E22. Funding attracted by projects led by the applicant"- list of 3 projects submitted.
- Indicator "E26. Acknowledged utility model, patent or copyright application" - list of 3 submitted.

Assoc. Prof. Stoimenov PhD from 2022 is the supervisor of one part-time and from 2023 of one full-time PhD student in the specialty "Automated Information Processing and Management Systems".

It makes a good impression that the scientific works submitted under the competitive procedure for the academic position of professor are scientific works that clearly outline a thorough continuation of the investigated processes occurring in grinding bodies and media, which started already in his dissertation and the works submitted for the academic position of associate professor. A clear indication of the significance of the research is also a ranked junior research project at the National Science Fund, which has found its continuation as a basic research project at the Fund.

In scientific circles and not only, he is a respected and highly qualified specialist in the field, working extremely actively, and his results related to research and practice clearly indicate this.

3. Main scientific, scientific and scientific-applied contributions.

The main scientific and scientific-applied contributions contained in the candidate's scientific works are developments and research aimed at optimization of motion and interaction in bodies with variable shape, through the application of innovative technologies, determination of characteristics of different types of materials, including composites, creation of methodologies for research on the topics under consideration, including through simulation models and verification with laboratory experimental studies.

I positively appreciate the creation of verified simulation models to find application in industry. The key to creating accurate simulation models is to investigate the factors influencing real experiments.

The mentioned contributions of the candidate in his scientific works can be grouped as follows:

- **Movement processes and behaviour of grinding bodies and media:**
  - Determined the required fill volume in a 2D laboratory ball mill, parameters to achieve the operating modes of the laboratory ball mill, separation angles from the grinding media (lifters) of the grinding bodies with different types of materials, including composites, and the angle of incidence
  - The operating modes of a laboratory ball mill and the behaviour of grinding bodies with different types of 3D printed materials; critical speeds of a laboratory ball mill with different types of 3D printed materials on grinding bodies and media, the influence of the rolling coefficient for different types of material pairs were investigated.
  - A comparative analysis of theoretical and experimental determination of critical speeds of a laboratory ball mill with different types of 3D printed materials on a laboratory ball mill with grinding bodies is made. Experimentally are determined critical speeds of grinding bodies of different material types.
  - A methodology is proposed to determine factors such as critical speed, separation angle and angle of incidence for laboratory ball mills using a high-speed camera.
  - Difference in research based on material characteristics is reported.
  - Developed an experimental method to determine the gaps between grinding bodies in ball mills by investigating and determining the gaps between different sizes of grinding bodies.
- **Durability of 3D printed materials, including composites.**
  - The parameters of an experimental study on the wear of polymer composites have been determined. Mass wear was measured and wear characteristics, wear intensity and wear resistance were calculated.
  - Material types tested were investigated in four friction regimes: dry friction with sliding speed and friction with grease lubrication. Wear rate, wear intensity and wear resistance were calculated.
  - Results and graphical relationships for mass wear, wear rate, wear intensity and wear resistance of each material in the four friction modes were obtained. A comparative analysis of the abrasion wear resistance results of the materials under dry and boundary friction at the same sliding speed was performed.

- **3D Simulation Modelling, Scanning and Printing.**
  - Developed: a library of 3D models of a laboratory ball mill; different types of grinding media and grinding bodies with predefined characteristics with different material properties; a 3D simulation model of a laboratory ball mill, allowing rapid reconfiguration of dimensions, grinding media, grinding bodies and properties of the materials used. By using 3D technologies (3D modelling and 3D printing), a bench was developed for the determination of gaps at different grinding body sizes.
  - Parameters such as diameter, density, volume and number of grinding bodies required to create a 3D simulation model were determined. The influence of recovery coefficients, friction and rolling friction in simulation models were considered; In a 3D simulation environment, separation angles from the shoulder of a laboratory mill were determined.
  - Through 3D simulation modelling, key factors for increasing the energy efficiency of ball mills have been identified, such as: critical speeds, operating modes, and the need for accurate determination of material characteristics. A comparative analysis of theoretical and experimental data for laboratory ball mill speeds is made.
  - A methodology for scanning 3D printed lifters for metrological control in 3D printing and wear after operation in aggressive environments is proposed.
  - Constructed: drum of a laboratory ball mill in 2D mode (single row of grinding bodies) by 3D modelling and 3D printing, allowing the use of different types of grinding media; different types of grinding media, including an innovative one (lifters) by 3D modelling and 3D printing, allowing fast loading with grinding bodies, including the possibility of automated loading.
  - A 3D model of a high energy mechanical alloying mill has been developed. Developed a 3D simulation model of the motion of the mechanical alloying process in a high energy mill. The particle behaviour of a high energy mill for mechanical alloying of copper, boron and zinc was investigated.

The contributions are in the area of competition. Their formulation is a consequence of the author's research and faithfully reflect the results achieved.

The plans for future work of the candidate described in the contributions, together with the noted continued activity in the world's refereed databases on the subject matter he has developed, makes a good impression and ensures sustainability for the development of the subject matter.

I accept the contributions presented in the candidate's reference and evaluate them positively.

4. Significance of contributions to science and practice.

It makes a good impression that the contributions of the candidate are focused on the use of ICT technologies to solve real problems in the field of motion and interaction of bodies, finding application in the industry of milling processes and automation of systems for processing the results obtained. Developments in the field of 3D technologies, in addition to simulation modelling for optimisation purposes, contribute to the development of society by involving the use of methods and tools for the presentation of tactile information among blind and partially sighted people.

In the submitted materials, the paper from group B4 has been cited 10 times by independent foreign authors, which is an indication of recognition not only at home but also abroad.

5. Critical remarks.

I have found no inaccuracies, inconsistencies or errors of principle. There are some gaps and shortcomings among the material presented, the main ones being:

- Contributions are not sufficiently clearly described in some publications;
- The enclosed summary of the candidate's scientific and scientific-applied contributions could use some consolidation and refinement;
- In the attached reference, in indicator D14, the amount of cited publications is not numbered. The points for citations are given in total and not against each citation, as above for publications.
- In the materials provided, there are no separation protocols for the contributions in the evaluated scientific works. For this reason, under the Rules of the Academic Personnel of the Republic of Bulgaria, I consider the authors to have equal contributions;
- I recommend in the future a greater number of self-publications in SCOPUS refereed journals and intellectual property protection.

6. Personal impressions and other activities.

I know the candidate personally from our work together on projects and conferences. Over the years he has proven himself as a researcher, experienced project manager, leader of scientific teams, approaching the tasks with diligence. His work on the scientific topics he develops is distinguished by precision, thoroughness, and ambition to investigate a given problem by applying interdisciplinary approaches.

His work in scientific circles is highly appreciated by the organization in which Assoc. Prof. N. Stoimenov PhD works and develops. Proof of this are diplomas awarded by the management team of the institute that he works such as "High scientific achievements", "Great merits for the development of the institute". His ability to work in a team is proven by his publication activity including co-authorship including participation in international teams.

His achievements in scientific circles, proven leadership among colleagues, organization and the responsibility with which he approaches the tasks are the reason for being

invited as Deputy Director in a substructure of the Ministry of Education and Science. As over the years, he proved his expertise there as well. His increasing publication activity, international citations (more than 80 in refereed databases) clearly show that he can combine different positions and activities.

Conclusion

Considering the above, my overall assessment of the research output of Assoc. Prof. Nikolay Stoimenov PhD, I consider that he satisfies the conditions, criteria and requirements for the academic position of "Professor". On this basis, **I give my positive vote and propose that the esteemed scientific jury vote in the affirmative**.

From the materials submitted for the competition, which satisfy all the requirements of the Law for the Development of Academic Staff of the Republic of Bulgaria, the Regulations for its implementation, the Regulations for the Conditions and Procedure for the Acquisition of Scientific Degrees and for the Occupation of Academic Positions at the Institute of Information and Communication Technologies at BAS, it is clearly evident that sufficient scientific and applied contributions have been obtained. **I strongly recommend the esteemed members of the Scientific Council of the Institute of Information and Communication Technologies to elect Assoc. Nikolay Ivanov Stoimenov for the academic position of "PROFESSOR"** in the professional field 5.2. Electrical Engineering, Electronics and Automation, specialty "Automated Information Processing and Control Systems".

На основание
ЗЗЛД

Sofia,

01.04.2024