

OPINION

authored by Prof. Irina Stefanova Aleksandrova, Ph.D., Technical University of Gabrovo

concerning materials submitted for participation in competition for awarding academic position of “Associate Professor” in higher education area - 5. Technical sciences, professional field - 5.1. Mechanical engineering, scientific major – “Methods, converters and devices for measurement and control of physical, mechanical and geometric quantities”

There is one applicant, Chief Assistant Professor Tsanko Vladimirov Karadzhov, Ph.D., for participation in the competition for awarding the position of Associate Professor announced in the State Gazette, issue 50/15.06.2021 and on the website of Technical University of Gabrovo for the needs of department “Mechanical and Precision Engineering” which is a constituent unit of the faculty of Mechanical and Precision Engineering

1. Overview of content and results in the submitted works

For participation in the competition for awarding the academic position of Associate Professor, chief assistant professor Tsanko Karadzhov, Ph.D. has submitted 34 scientific works including: one habilitation work – monograph; 12 scientific publications in referenced editions indexed in world renowned data bases of scientific information; 21 scientific publications in non-referenced journals with scientific reviewing or in edited volumes of collections; 1 course-book in co-authorship and 1 study-guide of sole authorship.

The monograph “*Methods and means for measurement of physical and mechanical quantities*” reflects the author’s achievements related to development of methodologies for optimization of measuring systems and converters, formulation of major issues, that need to be solved in order to increase measurement accuracy and development of new circuit solutions of microprocessor systems for measuring physical and mechanical quantities.

Said publications are systematized in 5 thematic areas directly related to the topic of this competition:

- *Methods for measuring noise and vibrations and dynamic measurements*” – here 7 publications are included [Г.7.2, Г.8.1-Г.8.3, Г.8.8, Г.8.13, Г.8.16], related to development and analysis of methods for measuring noise and vibrations for the purposes of vibroacoustic diagnostics of rotary and piston machines, and study of sound waves absorption and resonant phenomena. Also presented are: new methods for diagnostics of gears by means of vibroacoustic measurements and methods for experimental determining of frequencies of natural transverse oscillations of a complex shape cantilever beam; methods for determining the frequency of the free transverse and longitudinal oscillations of a straight beam anchored at one end; measuring system for determining natural frequencies of a mechanical distributed parameter system; methods for investigation of sound waves absorption by various materials; mathematical models and analysis of new methods for measuring dynamic parameters of moving objects.

- *Methods for measuring temperature* including 6 publications [Г.7.1, Г.7.3, Г.7.6, Г.8.4, Г.8.10, Г.8.21] related to development and analysis of methods for contact and contactless measuring of temperature. In this area the following have been developed: microprocessor systems for signal processing from linear temperature sensors and for control of a multichannel electronic device for measuring 4 temperatures, operating on the principle of temperature conversion into voltage; multichannel microprocessor system for determining temperature regimes of electrical machines; method for contactless measurement of temperature with two photo receivers with different spectrum sensitivity and algorithm for signal processing based on single-chip microprocessor system; methodology for contactless temperature measurement with a photodiode; static characteristic nonlinearity error analysis models finding application in increasing the accuracy of temperature measuring instruments.

- *Methods for measuring illuminance, time, pressure and angular velocity* includes 5 publications [Г.8.6, Г.8.7, Г.8.14, Г.8.15, Г.8.19], related to development and analysis of methods for measurement of illuminance, time, pressure and rotational speed. In this area the following can be included: microprocessor system for measuring illuminance with single-chip microcontroller; system for determining the 24 hour error of mechanical watch by measuring the vibrations on the case; classification, comparison and analysis of methods and instruments for measuring pressure; methodology for determining the static characteristic of centrifugal tachometer.

- *Laser technologies* – includes 7 publications [Г.7.4, Г.7.5, Г.7.10, Г.8.5, Г.8.9, Г.8.17, Г.8.20] related to the laser marking process.

- *Other* – here publications [Г.7.7-Г.7.9, Г.7.12, Г.8.12, Г.8.18] are included, which are related to investigations in various areas: synthesis of gears with asymmetric tooth profile considering small module gears which find application in devices for measuring physical and mechanical quantities and the possibility of increasing gear ratio; introduction of a method for determining transparent and opaque plastics absorption and a device for determining the reflection and transmission coefficients for different wavelengths; examining the motion of a sphere with thick walls on a slope, the results of which find application in centrifugal tachometers; experimental determination of the amount of propelling charge for reusable training-practice mortar round for short distance firing.

2. General description of candidate's activity

2.1. Teaching and pedagogical activity (advising students and postgraduate students)

The candidate - chief assistant professor, Ph.D. Tsanko Karadzhov has substantial teaching experience in the Technical University of Gabrovo. He started his career at the University in 2008 as an assistant professor and in 2009 he was appointed chief assistant professor in the department of Physics. He has been holding the position of chief assistant professor in the department of Mechanical and Precision Engineering since 2010.

The candidate in the competition reads lectures in “Devices for measurement of physical and mechanical quantities”, “Smart positioning systems” and “Processing of measuring signals”, conducts laboratory classes in “Devices for measuring physical and mechanical quantities”, “Smart positioning systems” and “Processing of measuring signals”, “Industrial control systems” and “Vibroanalysis and noise protection”. He has taken part in developing course syllabuses in subjects like “Processing of measuring signals” intended for bachelor degree courses and “Devices for measuring physical and mechanical quantities” intended for bachelor and master degree courses. He is a co-author of a textbook titled “Computer design in mechatronics” and a sole author of a study guide for laboratory classes titled “Devices for measurement of physical and mechanical quantities”. Over the years he has actively participated in and managed his students' research activity.

Chief assistant professor, Ph.D., Tsanko Karadzhov has completed a two week training course in Engineering pedagogy in Graz, Austria and in Laser technology in LIM, Germany.

2.2. Scientific and applied research activity

For his participation in the competition the candidate has submitted 34 scientific publications: 1 habilitation work – monograph; 12 scientific publications [Г.7.1-Г.7.12] in referenced and indexed editions, stored in the databases of Scopus and WoS, one of them [Г.7.10] in a journal with Impact Factor and 2 [Г.7.8, Г.7.9] in editions with SJR; 21 scientific publications in non-referenced journals with scientific reviewing or in edited volumes of collections (Г.8.1-Г.8.21). Out of all 34 publications, 5 [8.4, 8.5, 8.7, 8.13, 8.15] are of sole authorship, 28 are written in co-authorship, the candidate being first author in 9 publications [Г.7.1, Г.8.1, Г.8.6, Г.8.9-Г.8.11, Г.8.14, Г.8.16, Г.8.19]; 18 of the presented publications are in English.

The list of citations for participation in the competition includes 15 citations – 12 in scientific editions referenced and indexed in world databases of scientific information (Д.12) and 3 in non-referenced journals with scientific reviewing (Д.14). After consulting Scopus citation databases it becomes evident that Chief assistant professor, Ph.D. Tsanko Karadzhov has a “Hirsch index”- h=2.

Chief assistant professor, Ph.D., Tsanko Karadzhov has participated in 1 national and 4 international educational projects, as well as in research projects financed with state budget funds

intended to support research or artistic activity specific to institutes of higher learning. The candidate is the manager of 1 applied research project at the University Center for Research and Technology.

2.3. Implementation activity

Candidate's activity in this particular field is directly related to his teaching and research activity. He has contributed to the development and construction of an infrastructure for noise and vibrations reduction in rotary machines for production of mechanical engineering parts, and the development of technical construction file for asymmetric gear profile and industry standard for controlling technology dimensions of gears with asymmetric tooth profile.

3. Contributions. Significance of contributions for science and practice

The candidate has submitted an author's report on the contributions which includes 6 thematic areas and 18 summarized contributions in those areas. According to their significance the contributions can be categorized into:

- *Applied research contributions* – they include contributions related to: development of classifications of the methods and means for measurement of physical and mechanical quantities, types of errors and methods for increasing measuring instruments accuracy; development of models, schematic solutions and methods for eliminating errors in measuring transducers, models for analysis of static characteristic nonlinearity error of measuring instruments, generalized mathematical model of dynamic characteristics and methods for optimization of measuring systems and transducers; development of methods for diagnostic by means of vibroacoustic measurements, determination of gearing frequency, calculation of the second natural frequency of transverse oscillations of a beam with length varying section, measurement of dynamic parameters of moving objects and contactless measurement of temperature with two photo receivers with different spectrum sensitivity; development of computer measuring system for determination of natural frequencies of mechanical distributed parameter systems, microprocessor system for processing signals from temperature sensors and automated devices for measuring temperature with improved parameters; development of methods for investigation of sound waves absorption in various sound insulating materials and experimental determination of the static gear drive characteristic of centrifugal tachometer.

- *Applied contributions* – these include the results of research on the process of laser marking of parts of different materials and proposed specific solutions to improve the quality of this process.

In my opinion the applied research and applied contributions contained in the works submitted for reviewing are topical and important for the development and advancement of research work in the field of methods, converters and devices for measurement and control of physical, mechanical and geometric quantities.

4. Evaluation of candidate's personal contribution

My assessment of the personal contribution of the candidate in the competition regarding the results achieved from the teaching, pedagogical, scientific and applied research activity is entirely positive. Candidate's personal contribution is evident by the number of his sole authored publications (5 in number), and first authored publications (9 in number). This makes me to conclude that the contributions are the candidate's genuine work or accomplished with his leading role.

The candidate in the competition fully meets and even exceeds the minimum national requirements. In 2007 he successfully defended dissertation work entitled "Investigation, modeling and circuitry of multicomponent photo receivers" for awarding of Ph.D. degree in scientific major "Quantum and optoelectronics" (indicator A – 50). The candidate has submitted a habilitation work – monograph "*Methods and means for measurement of physical and mechanical quantities*" (indicator B – 100); 12 scientific publications in editions referenced and indexed in world renowned data bases of scientific information and 21 scientific publications in non-referenced journals with scientific reviewing or in edited volumes of collections (indicator Γ -436); 15 citations (indicator Д – 126); co-author in 1 course-book and a sole author of 1 study guide (indicator E -40).

Chief assistant professor, Ph.D. Tsanko Karadzhov meets and according to some indicators exceeds the minimum requirements of TU-Gabrovo concerning teaching and research activity of candidates for the position of “Associate Professor”. The candidate submits 33 publications, 5 of which of sole authorship, 1 with IF (WoS) and 2 with SJR (Scopus) while the number of publications required is 15, at least 4 of which of sole authorship and 1 with IF (WoS) or SJR (Scopus). The candidate submits a list of 15 citations, 12 of which in scientific editions referenced and indexed in world-renowned data bases of scientific information, which exceeds significantly the required 5 citations.

5. Critical remarks and recommendations

I did not find any serious omissions in the works of the candidate. I believe that the contributions in the monograph should be defined separately from the other contributions.

I would recommend that the candidate be focused on fewer thematic areas of research, publish the results in journals with IF and SJR and further develop his expertise and implementation activity.

6. Personal impressions

I am well familiar with candidate’s academic performance. I know Tsanko Karadzhov, Ph.D. as a professional colleague and can attest to his professional competence. I am fully convinced that the candidate is a highly qualified and well-read lecturer who enjoys genuine respect and authority among his colleagues in the department, faculty and university.

I believe that the bulk and quality of the results accomplished by the candidate in the area of his applied research and teaching activity do meet the requirements for awarding the academic position of “Associate Professor” and correspond to the stipulations of the Act for Academic Staff Development in Republic of Bulgaria and the Rule for Acquisition of Academic Titles and Positions of TU-Gabrovo.

7. Conclusion:

In view of the above, I propose to the esteemed jury that Chief Assistant Professor, Tsanko Vladimirov Karadzhov, Ph.D. be awarded the academic position of “Associate Professor” in the higher education area of 5. Technical sciences, professional field 5.1. Mechanical engineering and scientific major “Methods, converters and devices for measurement and control of physical, mechanical and geometric quantities”.

24.10.2021

Member of jury: /signature/
/Prof. I. Aleksandrova, Ph.D./