REVIEW

Authored by Prof. D.Sc. Raicho Todorov Ilarionov,
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concerning scientific works submitted for participation in competition for awarding the academic position of "Professor" in higher education area "Technical Sciences"; professional field "Mechanical Engineering" and scientific major "Metrology and metrological provision" (Quality management systems).

The competititon was announced in State Gazette, issue 58 from 23.07.2019, and also on the website of Technical University-Gabrovo (TUG) to address the needs of department " Mechanical and precision engineering", which is a constituent unit of the Faculty of Mechanical and Precision Engineering; with applicant associate professor Dr. Ilia Slavov Zhelezarov from department "Mechanical and precision engineering" at TUG .

1. Brief biography details

Associate professor Dr. Ilia Zhelezarov graduated TUG in 1994 with a degree in "Precision engineering". In 1995 r. he started his academic career as assistant professor in the subject of "Metrology and metrological provision" in the department " Mechanical and precision engineering" at TUG. From 1998 to 2006 he worked as senior assistant professor in the same department and, following a successful defense of dissertation on "Systems for measuring and management of quality of training in technical institutes of higher learning" he became chief assistant professor in that department. In 2007 Dr Zhelezarov was awarded the academic position of Associate Professor in the scientific major " Metrology and metrological provision" (Metrology and measurement equipment, quality control and management).

From 1999 to present associate professor Zhelezarov has managed the joint Bulgarian- German Institute for Quality and Industrial Managemen at TUG.

Within the period between 2004 and 2012 he was the deputy-director of the Center for quality of training at TUG and since 2012 he has been university Vice-Rector for research.

2. General description of submitted materials

Materials submitted for participation in above competititon include:

- one monograph (В.3);
- 5 scientific publications that have been reviewed and indexed in scientific data bases of world renown (Г.7);
- 23 scientific publications in non-referenced journals with scientific reviewing or in edited volumes of collections (Г.8);
- one course book (Е.23);
- one teaching material (Е.24);
- 8 other publications.

3. Reflection of candidate's scientific publications among the scientific community (known citations)

The list of citations for participation in the competition includes 8 citations in scientific editions which are referenced and indexed in scientific data bases of world renown (Д.12), 9(nine) are found in monographs and volumes of collections with scientific reviewing (Д.13) and another 12 (twelve) in non-referenced journals with scientific reviewing (Д. 14).

4. Overview of content and results in the submitted works

All publications submitted by the candidate for participation in the competition are summuarized in four thematic areas of applied metrology.

Group one includes methods and means for measuring dynamic and static quantities of moving objects which also measure certain parameters of theirs. This group concerns development and improvement of measuring equipment employed in defining parameters, which characterize time-space position, the mode of motion of automobiles, ships , aircrafts and other vehicles (Г.7.1, Г.7.4, Г.7.5). In this area there has been made an analysis of the design of the inductive systems for contactless transmission of energy during dynamic charge of electric vehicles. (Г.7.2). Also presented in here are mathematical models of static and dynamic characteristics for measuring devices, which are readily employed in practical use as they feature clear physical meaning and can easily be related with the design features of the measuring device. By employing mathematical models it is possible to easily determine the characteristics of measuring devices for linear and angular quantities that ensure the conditions for unity of measurement of constant quantity with known dispersion (Г.8.19, Г.8.23).

Publications in the second thematic area concern quality management systems, which are based on the standards of ISO; the analysis of their applicability in the sphere of higher education; internal and external evaluation of these systems and the possibilities for further improvement plus the enhancement of customers' satisfaction. There have been presented methods, models and algorythms which support the function of quality management systems ,their measuring, analysis and evaluation as well as their improvement on the basis of the amalyzed data. Also identified are the components of a system for internal and external measuring and evaluation of a quality management system in an institute of higher learning; application of methods and techniques for measuring and quality management of educational product during implementation of its life cycle. (В.3.1, Г.8.9, Г.8.4, Г.8.15). The university systems for quality management are based on international quality standards and function effectively thereby creating conditions for improvement of quality of training and feed-back receipt on behalf of students and users of cadres. Furthermore, the system for quality management is developed in accordance with the requirements of standards ISO 9001 and IWA2, it meets the stipulations of theHigher Education in Bulgaria Act and underlies the documentation for accreditation (be it institutional and/or program one) of technical institutes of higher learning. (Г.8.12, Г.8.15, Г.8.21, Д.1, Д.2).

Thematic area three reviews statistical methods and tools for quality management and also makes analysis of their applicability. Here are presented efficiency indicators; elements of analysis and evaluation of the efficiency of the quality management system as well as a summary of standard tools for efficiency evaluation. In selecting and application of models and methods for analysis of the system it is necessary to include risk planning plus possibilities related with the application of selected methods, adequacy of efficiency indicators; the necessity of additional information; provision of resources, the level of competence and motivation of staff, the needs and expectations of stake holders (В.3.1, Г.8.1, Г.8.2). A due regard is given to the sequence for effecting analysis of measuring control systems in terms of qualitative and quantitative aspect. The analysis of the tools for measurement and the measuring systems themselves allows to make assessment of the measuring means and systems; the quality of measurements and control, objectivity of measuring results and data, establishment of consequences due to errors during control

and disposition with certain product or process Г.8.6, Г.8.11, Г.8.13). A classification of statistical methods for management and improvement of quality plus their practical application is presented. Observation is made of the possibilities for application of statistical management of technological processes with control cards with regard to quantity and precontrol cards (В.3.1, Г.8.8, Г.8.10, Г.8.18, Г.8.20).

Group four contains publications concerning systems for control and management of quality and metrological characteristics of systems and means for measurement. Here are presented contactless sonar method for identification of materials by means of pulses within the ultrasonic range whereby initial data is processed through the method of recognition; method for investigation the roughness of surface in carbon steel which was preliminary treated with abrasive water gush, by using complete factor planning with three factors at two levels which employs analysis of mean values and dispersion analysis whereas regression analysis is employed to find the correlation between roughness of surface and factors of the process; a method for control of involute gears with asymmetric profile of teeth by means of measuring rolls and dependences for identification of the size of rolls for asymmetric tooth profile with or without teeth inclination (Г.7.3, Г.8.5, Г.8.7). Also observed are the prerequisites for the normal functioning of laboratory for calibration of measuring devices which has developed and introduced systems for management in accordance with international standard ISO/IEC 17025 (Г.8.7, Г.8.16). There have been proposed processes for optimization of measurement and quality control by means of experimentation planning based on Taguchy approach. This involves activities for preparation and planning of the experiment, its implementation and analysis of results with concrete methods for quality measurement and control (Г.8.14).

5. General characteristics of candidate's activity

5.1. ***Teaching and pedagogical activity*** (work with students and postgraduate students)

Assoc. professor Zhelezarov takes part in curricula development and reads lectures in the subjects: "Quality management systems" , "Industrial systems for control", " Quality control and management" , "Metrology" , "Integrated systems for control" all of which are conctituent parts of the syllabi of the bachelor and master degree courses taught to full-time and part-time students at the Faculty of Mechanical and Precision Engineering .

A course book in quality management and instruction guide for lab exercises in metrology and measuring equipment were publish to support the process of studies in the taught subjects.

So far Mr. Zhelezarov has been the academic advisor of over 50 graduates of bachelor and master degree courses; he has advised one doctoral degree graduate whose thesis was on " Modeling of non-circular small module gear transmissions with asymmetric profile of teeth".

5.2. ***Scientific and applied research activity***

The candidate has submitted 1 monograph, 34 scientific publications (articles published in journals and conference papers) 5 of which were published in referenced and indexed editions (three of them are with "impact factor" and two are included in SCOPUS data base). From the total of 34 publications (articles and papers) 12 are of exclusive authorship, 22 are co-authored (7 with two authors; 10 with three authors and 5 with more than three authors) ; in 10 of these publications he is the first author. 12 of these were published in Bulgarian; three others in Russian and 20 in English. Assoc. Professor Zhelezarov has authored 1(one) course book, co-authored 1(one) teaching instruction guide and 2(two) manuals. These publications do not duplicate the materials which the

candidate submitted for his participation in the competition for awarding of Associate Professor academic position.

He also has a large number of participations in national and international scientific and educational projects: for participation in this competition the candidate has pointed 9 national projects in 6 of which he was the manager and in three others participant. There were 5 other international projects in three of which he was the manager and in two a participant. Of special importance are the projects under axis 1 of the Operational program " Science and education for smart growth".

The documentation for participation in the competition contains evidence for meeting the minimum national requirements for holding the academic position of "Professor":

Group of indicators	Content	Minimum required number of points, according to groups of indicators, for holding the academic position of "Professor"	Declared points according to groups of indicators for holding the academic position of "Professor"
А	Indicato 1	50	50
Б	Indicator 2	-	-
В	Indicators 3 or 4	100	100
Г	Sum of indicators from 5 to 11	200	377.66
Д	Sum of indicators from 12 to 15	100	131
Е	Sum of indicators from 16 to end	150	387

as well as the minimum requirements of TUG for holding the academic position of "Professor":

Content	Minimum requirements of TUG for holding the academic position of "Professor"	Indicators declared by the candidate for holding the position of "Professor"
Total number of publications (articles and papers)	30 at least 5 of which are of exclusive authorship and 3 with IF (WoS)	34 of which 12 of single authorship and 3 with IF (WoS)
Number of known citations made by other authors	20	29
Published course books and study guides	2	2
Number of students who have defended Ph.D thesis	1	1
Managing projects and contracts	3	8

5.3.*Implementation activity*

The candidate has a long standing expertise in implementation of applied research projects; he has managed projects in over 200 organizations related to development, implementation and improvement of quality management systems according to ISO 9001; systems for environmental management according to ISO 14001 ; systems for health and safety management according to ISO 45001 and OHSAS 18001; systems for energy management according to ISO 50001; systems for management of test labs according to ISO 17025 and others. A telling evidence of his professional expertise is the high number of certificates which the candidate has attached to his CV

6. **Contributions** (scientific and related to applied research and application).

I hereby accept the contributions which are included in the copyright record of the candidate: 3 scientific, 9 pertaining to applied research and 5 related to application:

Scientific contributions:

1. A method has been proposed for measuring parameters of moving objects. Said method allows to design measuring systems which feature far better quality factors and metrological characteristics.

2. There has been developed a mathematical apparatus which enables the definition of dynamic error in devices for measuring angular deviations of moving objects whose dynamic accuracy is ensured by real time dynamic error correction.

3 A method has been developed for analyzing models used for presenting management systems based on standards of ISO and approaches proposed for measuring, analysis and evaluation of efficiency and effectiveness of quality management systems and the instruments for their implementation.

Applied research contributions:

1. High dynamic accuracy system for measuring has been developed for measuring moving objects parameters. Its accuracy is ensured by a correction module which employs signals of differentially connected MEMS gyroscopes and adaptive algorithm based on Kalmann's method.

2. On the basis of two channels operating in parallel there has been presented a measuring system designed to measure the roll , yaw and trim of boats.

3. Another model has been developed for internal and external measurement and evaluation of the quality management system by applying statistical methods and techniques of measuring and management of the final product's quality during its lifecycle

4.A model for analysis and assessment has been developed to evaluate effectiveness of quality management systems as well as of methods for registering, measuring, systematizing analyzing and evaluation of information and its applicability..

5. There has also been presented a model for management of risk and uncertainty of measuring results in a quality management system based on ISO 9001:2015 as well as methodology which ensures adequate analysis of the measuring system.

6. An algorithm has been developed for analysis of measuring devices and systems for control according to quantitative and alternative aspect; evaluation of statistical capacity of means for measuring and control ; objectivity of measuring results; establishment of error consequences during control and disposition of certain product or process.

7. Also proposed is a method for control of involute cylindrical gears with asymmetric profile of teeth by means of measuring rolls and dependences for defining the size of rolls with asymmetric tooth profile with or without teeth inclination.

8. An integrated control system model has been developed in compliance with ISO 9001,systems for environmental control according to ISO 14001, systems for health and

occupational safety management according to OHSAS 18001 /ISO 45001 as well as methods proposed for improvement of the integrated control system.

9. Mathematical models of static and dynamic characteristics of measuring devices have also been presented whereby it is possible to determine precisely the measuring devices characteristics for linear and angular quantities.

Application contributions:

1. Developed , implemented and certified model of system for quality management of education and research in TUG in compliance with standards ISO 9001:2008 и ISO 9001:2015.

2.Developed model of the system for control of the university laboratory for calibration of measuring devices in compliance with ISO/IEC 17025 requirements.

3. A modified device has been developed for defining the size of rolls in case of odd number of teeth and exclusion of tangential errors during measurement.

4**.** Statistical methods for optimization of control and manufacture have been systematized by means of which efficiency , effectiveness and flexibility are enhanced and the performance of the quality management system is raised.

5. There has been developed a model for evaluation of the quality management system of institutes of higher learning by applying statistical methods and techniques of measuring and management of quality of educational product during its lifecycle.

7. Evaluation of candidate's personal contribution.

One of the indicative factors concerning the merits of candidate's contributions is his personal involvement in them. 12 out of 34 publications are of his exclusive authorship; another 22 are co-authored (7 with two authors; 10 with three authors and 5 with more than three authors) ; in 10 of these publications he is the first author. His fruitful educational and research activity provide solid evidence of top tier professional competence. The content of the materials submitted for the competition indicates top quality expertise and leaves no doubt that scientific and applied research contributions of the candidate are solely his work or the product of teamwork, in which his creative involvement is substantial. Another praiseworthy fact is that associate professor Zhelezarov participates in the competition with a monograph.

8. Critical notes and rcommendations

The following formal notes can be made with regard to the submitted materials:

I would advise for more publications in foreign referenced journals and conferences which could result in larger number of citations.

The candidate should not stretch over too many study subjects

9. Personal impressions

I have known associate professor Zhelezarov for well over 20 years and have first hand impression of his research, pedagogical and organizational activity. My impressions could be summarized as follows:

He is well familiar with scientific sources, professional and corporate literature as well as with the contemporary state of the area related to the competition.

Furthermore, Mr. Zhelezarov's scope of scientific interests goes beyond the frame of this competition for awarding professoral position, which is a good advantage thereof.

Along with his creative activity the candidate has made a network of contacts with business which he uses for the needs of TUG.

Possesses solid experience as business and research manage.

The candidate is in possession of excellent organizational skills for development and implementation of scientific achievements and managing of projects.

He is held in high regard among his colleagues and the university leadership for his responsible attitude as academic teacher and research expert.

10. Conclusion:

Associate professor Zhelezarov has made presentation of works and personal details which successfully stand in favor of his claims concerning this competition. My conclusion is grounded on the following summary point:

1. The candidate has submitted scientific works and genuine achievements of top scientific and research level which are sufficient to meet the established requirements concerning academic professoral position.

2. Displays the qualities of scientist in the field of metrology, evaluation and control of quality.

3. He is well able to set and resolve scientific tasks which demand the level of solid research worker; is likewise in good command of relevant instruments for accomplishment of said tasks and last but not least, Mr. Zhelezarov is good at organizing and leading research teams.

Drawing upon above I propose that associate professor Dr. Ilia Slavov Zhelezarov be awarded the position of "Professor" in the area of higher education "Technical sciences", professional field "Mechanical engineering" and major "Metrology and metrological provision" (Quality management systems).

15.11.2019. Reviewer: /signature/

/Prof. D.Sc. Raicho Ilarionov/