R E V I E W

by competition for the academic position "Professor"
by professional direction 5.2. "Electrical engineering, electronics and automation", study discipline "Control of technological processes", at the department "Automation of Production", Faculty of Computer Engineering and Automation, announced by the Technical University - Varna, announced in SG No. 14 of 16.02.2024)

with candidate Assoc. Prof. Dr. Eng. Nikola Nikolaev Nikolov,

Reviewer: Prof. Dr. Eng. Kosta Petrov Boshnakov

1. General and biographical data

Assoc. Prof. Nikola Nikolov graduated from VMEI-Varna, Faculty of Electronics and Automation, Department of "Automation of Production " in 1989 and obtained the qualification of Master of Engineering in Electronics and Automation. In 2009, he defended a dissertation on the topic: "Research of algorithms for the synthesis of modal adaptive state regulators" and obtained the educational and scientific degree "doctor" in the scientific specialty 02.21.08 "Automation of the production (Automation of technological processes)". In the period from 1990-2012, he was successively an assistant, senior assistant and chief assistant in the "Automation of Production" department, Faculty of Computer Engineering and Automation (FCEA), Technical University - Varna (TU-Varna). Since 2013, he has been an associate professor at the "Automation of Production (AP)" department at TU-Varna, and from 2016 to the present, he is the head of the department.

Assoc. Prof. Nikola Nikolov has significant organizational skills and competencies: He is the head of AP department for more than 8 years; He is the chairman of the National Organizing Committee of the International IEEE Conference Automatics and Informatics (ICAI) - 5 consecutive years; Head of the "Marine Robotics" section at the National Center for Mechatronics and Clean Technologies - more than 6 years; Vice President of the John Atanasoff Society of Automatics and Informatics, Sofia, Bulgaria. In 2023, he was awarded the Golden Badge of the FNTS for personal contribution and merit in the activities of the FNTS.

He is a member of the editorial board of the journal "Automation and Informatics" (2020-2024) and a member of the SEC (Scientific Expert Council) at the "National Center for Mechatronics and Clean Technologies" (2018-2023) and others.

He is a member of the IEEE (Institute of Electrical and Electronics Engineers) and a member of the technical committee on Marine Systems (TC 7.2 on Marine Systems) of the IFAC (International Federation of Automatic Control).

Decisions of the governing bodies in TU-Varna to announce the competition

The competition for "professor" was announced on the proposal of the AP Department, based on the decision of the Department Council (DC) (protocol No. 6 of 06.12.2023) and the decision of the Faculty Council (FC) of FCEA (protocol No. 7) from 11.12.2023

The final decision to announce the competition was taken at a meeting of the Academic Council of TU-Varna and reflected in protocol No. 7 of 30.01.2024 and announced in State Gazette No. 14 of 16.02.2024. The competition is also announced on the TU-Varna website.

2. General description of the presented materials

The candidate submitted a total of 30 scientific papers for review, which I accept for review. A list of 3 national research projects in which Assoc. Prof. N. Nikolov participated and 3 other national research projects led by him, which will be taken into account in the final evaluation, is presented.

The following documents are submitted for participation in the competition: Application to the Rector for admission to the competition; Announcement in the Official Gazette; Curriculum vitae (CV European model); Diploma for educational and scientific degree "doctor"; The diploma for an academic position "associate professor"; Employment contract for academic position "associate professor"; Certificate of fulfillment of the minimum national requirements for occupying the academic position, specified in the regulations for the applicable groups of indicators; Reference to original scientific contributions; Abstracts of the scientific works participating in the competition (in Bulgarian); Abstracts of the scientific works participating in the competition (in English); Scientific works related to the competition; Declaration of reliability of the information provided; Declaration of originality; Plagiarism Statement; Other related documents proving the scientific, teaching and/or entrepreneurial activity under Article 22, paragraph 2 and paragraph 3 of Regulations on the Terms and Conditions for Occupying Academic Positions in Technical University – Varna (RTCOAPTUV) and paragraph 27(4) of Law on the Development of Academic Staff (LDAS) and paragraph 57a (2) of Rules for Implementation of the Law on the Development of the Academic Staff in the Republic of Bulgaria (RILDASRB): (Learning load reference; Doctoral Student Guidance Reference; Reference for membership in scientific organizations and scientific forums; Reference for participation in scientific juries; Reference for participation in National Research Projects); Certificate of awarding the FNTS Golden Badge and Copies of all specified documents in pdf format on electronic media.

Table 1 presents the points according to the minimum national requirements for a "professor" under 5.2 and achieved by the candidate, Assoc. Prof. Nikola Nikolov

Table 1

A group of indicators	A	B	G	D	E	J	Sum
Points according to the minimum national requirements for "professor" under 5.2	50	100	200	100	150	120	720
Achieved by the candidate	50	183	244.7	180	270	600	1527.7

Scores under Indicator Group A are achieved as a result of a defended dissertation for a 'PhD'. As habilitation thesis (group of indicators B), 10 publications are presented in editions, which are referenced and indexed in world-renowned databases of scientific information. The points achieved in the group of indicators G are based on 11 publications in publications that are referenced and indexed in world-renowned databases of scientific information (G.7) and 9 publications in non-refereed peer-reviewed journals or in edited collective volumes (G. 8). The points of the group of indicators D are fulfilled, based on the presented 18 citations in scientific publications, referenced and indexed in world-renowned databases of scientific information or in monographs and collective volumes (D.12). According to the group of indicators E, the points are the result of the supervision of 1 successfully defended doctoral student (E.17), participation in 3 national scientific or educational projects (E.18), supervision of 3 national scientific or educational projects (E.20) and attracted BGN 703,300 for projects managed by

the applicant (E.22). The points for the group of indicators J are formed from 600 lecture hours conducted at TU-Varna for the last three years (J.29).

From Table 1, it can be seen that the required 50 points were achieved for the group of indicators A, and for all others: B, G, D, E and J, the points achieved by the candidate exceed the minimum required. The fact that with the sum of the points for the separate groups of indicators of the required 720 points, according to the minimum national requirements for a "professor" of 5.2 points, Assoc. Prof. Nikola Nikolov has achieved 1527.7 points makes an impression.

3. General characteristics of the candidate's scientific-research and scientific-applied activities.

On the basis of the publications submitted for participation in the competition, can be formulated the following important directions in the research and scientific-applied activity of Assoc. Prof. Nikola Nikolov: Development and research of modal control of linear stationary discrete systems; automatic control of humidity of bulk materials; diagnostics of technological equipment and drinking water purification system; adaptive monitoring of linear stationary single-input single-output (SISO) systems; using modeling and analysis methods applied to engineering systems control theory for managing ecosystems and marine biological resources and automatic control systems.

Assoc. Prof. Dr. Eng. Nikola Nikolov participated in or led the following scientific or educational projects:

1. Participation in a national scientific or educational project (E.18)

1.1. Project No. BG05M20P001-1.001-0008 "National Center for Mechatronics and Clean Technologies", OP "Science and Education for Intelligent Growth", Laboratory "Robotic Mechatronic Technologies", Assoc. Prof. Nikola Nikolov is the head of Section L11S3 "Marine Robotics"

1.2. Project No. BG16RFOP002-1.005-0336-C01 "Conducting industrial scientific research for the development of a double take-out chain conveyor", OP "Innovations and Competitiveness"

1.3. Project NP8/2013 "Development and research of models and algorithms for the management of thermal and electromechanical objects and a fuel consumption control system", contract No. 526.

2.Guidance of a national scientific or educational project (E.20)

2.1. Project PD10/2015 "Synthesis of multi-model control of one-dimensional objects", contract No. 774.

2.2. Project NP6/2016 "Modeling and control of non-linear and non-stationary objects", contract No. 1068/26.04.2016

2.3. Project PD2/2018 "Application of engineering methods for modeling and identification of parameters of biological objects (BO)", contract No. 893-PF/16.05.2018.

3. Attracted funds for projects managed by the candidate (E.22)

3.1. Assoc. Prof. Dr. Eng. Nikola Nikolov is the head of Section L11S3 "Marine Robotics" under project No. BG05M20P001-1.001-0008. The funds raised are BGN 703,300.

Participation in scientific juries

Assoc. Prof. Nikola Nikolov participated in 4 scientific juries for the awarding of the educational and scientific degree "doctor", in two of which he was a reviewer and in two he

prepared an opinion. He participated in a jury for the academic position of "associate professor" by preparing a review.

4. Evaluation of the pedagogical preparation and activity of the candidate.

Based on the submitted documents for participation in the competition, it can be seen that Assoc. Prof. Nikola Nikolov has a large volume of teaching activities. He has lectured on the following disciplines: Control of technological processes, Automated electric drives, Logical control systems, Description of logical control systems, Technical tools for automation – 1, Design of automation systems, Mobile robots and Sensors in automation and robotics.

Assoc. Prof. Nikola Nikolov supervised three doctoral students, two of whom were awarded with the right of defense, and M.Sc. Eng. Ivelina Yordanova Zlateva, has defended her dissertation on the topic "Investigation of the possibilities of applying engineering methods in the management of marine resources", 2019. A fourth doctoral student is currently in the process of training under the supervision of Assoc. Prof. N. Nikolov.

5. Basic scientific and scientific-applied contributions.

As a habilitation thesis (B.4), 10 scientific publications are presented, in publications referenced and indexed in world-famous databases with scientific information, united under the general title **"Measurement and Control of technological processes and devices".** The 10 scientific publications in question contain the following more important scientific, scientific-applied and applied contributions:

1. Development and research of modal control of linear stationary discrete systems:

1.1. An algorithm was developed for calculating the elements of the feedback vector for a SISO system with a modal state regulator so that the poles of the closed system are located in a predetermined sector of the positive axis of the complex plane [B.4.1]

1.2. An adaptive structure of a modal state regulator has been synthesized. A relay-impulse regulator is included in the structure to complete input-output data for evaluating the object's parameters, which is activated under certain conditions [B.4.2].

1.3. An adaptive structure of a linear discrete system with a controller in the state space has been synthesized. An adaptation mechanism and an algorithm to stop recursive evaluation are created to prevent parameter explosion. An additional relay-pulse controller is introduced to control the process during the initial formation of the input-output data vectors required for the adaptive observer [B.4.3].

1.4.A modal state controller with improved response speed for a linear discrete system is designed and investigated. The controller includes an integrating element and a direct connection between the task and the managed object, implemented with an inverse model of the object [B.4.4].

1.5. A discrete modal state controller for ROV (Remotely Operated Vehicle) drive control is developed and investigated [B.4.10]

2. Automatic measurement of humidity of bulk materials:

2.1. An analysis was made to select a criterion for effectiveness in measuring the quality of bulk materials. A methodology for evaluating the quality of constructions of measuring devices for moisture of bulk materials from the agro-industrial complex is proposed [B.4.6].

2.2. Research has been carried out and a theoretical analysis has been made of a microwave method for measuring the moisture content of cotton materials. A pilot plant was developed to

study the electrophysical properties of grain products and mathematical dependences were derived for different bulk cotton materials [B.4.7].

2.3. Theoretical and experimental studies related to the use of the microwave method based on the selective absorption of energy in measuring the moisture content of grain and different types of grain materials have been carried out [B.4.8]

3. Diagnostics of technological equipment and drinking water purification system:

3.1. An algorithm has been developed for diagnosing the technological equipment in a grain processing enterprise, based on which technical and organizational methods for building a knowledge base are developed [B.4.9]

3.2. A variant of a combined local system for joint purification of drinking water from iron and arsenic with limitation of the level of harmful substances in the washing water is proposed. An algorithm has been developed to manage the washes at the first stage of the installation [B.4.5]

For participation in the competition according to indicators G.7 and G.8, 11 scientific publications in editions that are referenced and indexed in world-famous databases with scientific information (G.7) and 9 scientific publications in non-refereed journals with scientific review or in edited collective volumes (G.8). These publications contain the following more important scientific, scientific-applied and applied contributions:

4. Adaptive monitoring of linear stationary single-input single-output (SISO) systems:

4.1. A non-recursive algorithm for adaptive monitoring of linear time-invariant discrete systems with one input and one output (SISO) has been developed, which is based on the method of least squares [G.7.3, G.7.7]

4.2. A recursive algorithm for adaptive monitoring of SISO linear stationary discrete systems, developed on the basis of the recursive extended method of least squares, is presented [G.7.4]

4.3. An algorithm with reduced computational complexity is proposed for estimating the parameters of linear stationary discrete systems [G.7.7].

4.4. A non-recursive algorithm for adaptive monitoring of linear stationary discrete systems with one input and one output (SISO) is presented, which is based on the method of instrumental variables [G.7.10]

4.5. A comprehensive recursive estimation library has been developed and explored, which offers a solution to many of the challenges of real-time adaptive control. The library is very suitable for application in the educational process [G.7.11].

5.Using modeling and analysis methods applied in engineering systems control theory for managing ecosystems and marine biological resources

5.1. The opportunities for environmental ecosystem management are analyzed by using the modeling and analysis methods applied in engineering systems control theory [G.7.2]

5.2. A two-step procedure, developed on the basis of the method of least squares and the instrumental variable, is proposed for the identification of the growth parameters of biological objects (BO) in the von Bertalanffy model [G.7.5].

5.3. The length-weight relationship of the two most common fish species in the Bulgarian part of the Black Sea, obtained on the basis of experimentally measured data, was investigated [G.7.6]

5.4. The statistical distribution of "length-frequency of catch" was analyzed based on the samples of commercial fishing of species carried out in the Bulgarian part of the Black Sea [G.8.3]

5.5. The law of statistical distribution of the length of the two types of biological objects (BO) in the Bulgarian Black Sea coast was studied [G.8.4]

5.6. Information on the biomass of fish resources is collected, processed and transmitted through the management channel for decision-making and taking actions [G.8.5]

5.7. A program system was developed in MATLAB, in which 13 methods for the analysis of the length-weight relationship of biological objects are presented [G.8.6].

6. Automatic control systems

6.1. The development of an automatic control system (ACS) of the process - "catalytic vacuum pyrolysis", built on the basis of a programmable logic controller (PLC) is presented [G.8.7]

6.2 A long-delay Smith-predictor object control system has been developed in which the object is controlled by a discrete state controller system. The evaluation of the state vector is performed by a state observer [G.8.8].

6.3. The structural diagram of a SISO object control system with a modal state regulator with a built-in integrating component and a direct connection to an inverse model has been created [G.8.9].

6.4. Multi-model modal control of a nonlinear system with one input - one output based on Takagi-Sugeno fuzzy controller is synthesized [G.8.2]

The listed contributions can be attributed to the group "creation of new classifications, methods, constructions, technologies".

In the 30 scientific papers presented for participation in the competition, in 12 of them Assoc. Prof. Nikola Nikolov is the first author, in 8 he is the second and in the rest - third and subsequent. This gives me confidence that he has significant involvement into the formulated contributions.

From the presented list of 18 citations, it can be seen that the citations are in publications indexed in Scopus. Citations noted in the following journals: Signals, Advanced Mathematical Models & Applications, Bulletin of the Tomsk Polytechnic University and the proceedings of the following prestigious conferences: International Conference Automatics and Informatics (ICAI), International Conference on Energy Efficiency and Agricultural Engineering (EE&AE), International Conference on Power Science and Engineering (ICPSE), International Conference on Robotics and Control Engineering, International Scientific Conference Electronics, IOP Conference Series, International Ural Conference on Electrical Power Engineering, Wave Electronics and its Application in Information and Telecommunication Systems (WECONF).

Assoc. Prof. Nikola Nikolov's applied and innovative activity can be judged by the projects in which he participated or led (point 3). I believe it is of interest both in terms of volume and subject matter.

6. Significance of contributions for science and practice.

The scientific works submitted for participation in the competition contain a significant number of scientific, scientific-applied and applied contributions. From a theoretical point of view, the contributions related to modal control and the application of cybernetics methods for decision-making in the management of ecosystems and marine biological resources are of interest, and from an applied one - the contributions related to automatic control and management systems and diagnostics.

Table 1 shows that the minimum national requirements for a "professor" according to 5.2 are met, and according to the groups of indicators cited in point 2, they are exceeded. The total sum of the indicator points exceeds about 2 times the required minimum sum.

Based on the attached list of citations, I assume that Assoc. Prof. Nikola Nikolov is recognized among colleagues working in scientific fields similar to his in Bulgaria and abroad.

7. Critical notes and recommendations.

I recommend to Assoc. Prof. Nikola Nikolov, in this great teaching activity, to prepare and issue teaching aids in the disciplines chosen by him.

My other recommendation is that in the future he should direct his publishing activity to prestigious international journals as well, which will allow his developments to reach more colleagues from abroad.

8. Personal impressions and opinion of the review.

I know Assoc. Prof. Nikola Nikolov from our joint work in the John Atanasoff Society of Automation and Informatics and the organization of the International Conference on Automatics and Informatics, which takes place on the days of John Atanasoff (October). I believe that he is a business person with great organizational skills and experience.

CONCLUSION

The scientific works submitted for participation in the competition by Assoc. Prof. Nikola Nikolov contain a significant number of scientific, scientific-applied and applied contributions. He has participated/supervised research and applied projects. He has fulfilled, and in the groups of indicators B, G, D, E and J he has exceeded the minimum national requirements for a "professor" in 5.2 Electrical engineering, electronics and automation, and the sum of the points for the individual groups has been exceeded more than twice.

Based on the acquaintance with the presented scientific works, their importance, the scientific, scientific-applied and applied contributions contained in them, I find it reasonable to propose Assoc. Prof. Dr. Eng. Nikola Nikolaev Nikolov to occupy the academic position of "PROFESSOR" in the professional direction 5.2. "Electrical engineering, electronics and automation", in the study discipline "Control of technological processes", at the department "Automation of production", Technical University - Varna.

Заличена информация
по Регламент (ЕС)
2016/679

Date: 18 June 2024 **REV**

Boshnakov/