

POSITION

Competition for the academic position of "Professor"

in area **5. "Technical Sciences"**,
Professional field **5.2 "Electrical Engineering, Electronics and Automation"**
Scientific specialty: **"Interactive Robotics in Education"**

for the needs of the Department of **Interactive Robotics and Control Systems**,
announced in State Gazette No. 44 of May 21, 2024 by the Institute of Robotics – BAS (IR-BAS)

with the only candidate: **Assoc. Prof. Dr Snezhanka Petrova Kostova** from IR-BAS

Member of the Scientific Jury, Order No. 62/23.07.2024 **Prof. Dr Vera Angelova Angelova-Dimitrova**, Institute of Information and Communication Technologies – BAS, Sofia 1113, ul. "Acad. G. Bonchev", bl. 2.

Assoc. Prof. Dr Snezhanka Petrova Kostova has submitted all the necessary documents, references and declarations according to the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDAS in the Republic of Bulgaria), the Regulations for its implementation, the Regulations on the Terms and Conditions for the Acquisition of Scientific Degrees and Academic Positions at the Bulgarian Academy of Sciences and the Internal Rules for the Development of the Academic Staff of the Institute of Robotics at the Bulgarian Academy of Sciences. The candidate participated in the competition with 26 scientific publications (13 of which are refereed and indexed in world scientific databases (Scopus and Web of Science); 11 scientific publications in non-refereed journals with scientific peer review or in edited collective volumes); a List of 52 citations. The indexing in Scopus of 2 publications [4.10, 7.5] in the proceedings of a conference held in 2024 represents a justified legal expectation based on the established practice in historical terms, but until the time of the competition, they are not visible in the world scientific databases, which is why I accept their status as scientific publications in non-refereed journals with scientific peer review or edited collective volumes. To fulfil the requirement of the Regulation for implementation of the LDAS in the Republic of Bulgaria for indicator B4 Habilitation work – scientific publications (not less than 10) in journals that are referenced and indexed in world scientific databases, in indicator B4 I include publication [7.4] instead of [4.10] and correct the number of points (see Table 1). The correction made ensures compliance with the Law. All publications on the competition are presented in full text. The applicant submits for participation in the competition and documents for participation in the implementation of 3 national and 6 international scientific or educational projects and management of 1 international scientific or educational project. A reference for attracted funds for projects managed by the applicant is attached.

1. Fulfilment of the requirements of Art. 60, para. 1 of the Regulation for implementation of the LDAS in the Republic of Bulgaria

a) Points 1 and 2

Assoc. Prof. Dr Snezhanka Petrova Kostova defended her PhD in the professional field 5.2 "Electrical Engineering, Electronics and Automation", specialty "Theory of Automatic Control" in 2002 before the Specialized Scientific Council: "Automation and Control

Systems". Since 2007 until now, she has held the academic position of Associate Professor at the Institute of Robotics at the Bulgarian Academy of Sciences.

b) Points 3 and 4

A reference in the Register of Academic Positions and Dissertations of NACID shows that the scientific publications submitted for participation in the competition do not repeat those submitted for acquiring the educational and scientific degree of "Doctor" and for occupying the academic position of "Associate Professor". Four of the publications are independent; the other 22 are co-authored. The candidate has not submitted protocols for scientific contribution between the authors of the publications; therefore, according to the Regulations for implementation of the LDAS in RB, I accept equal participation from all authors. Of the 26 publications participating in the competition, six are with Impact Factor, and another seven are with SJR rank.

Assoc. Prof. Dr Snezhanka Petrova Kostova presented a list of 52 independent citations of 10 publications for participation in the competition. All 52 citing sources are visible in world scientific databases.

c) Point 5

According to the Internal Rules for the Development of the Academic Staff of the Institute of Robotics at the Bulgarian Academy of Sciences, the minimum requirements of the Institute of Robotics coincide with the minimum national requirements. The number of points for indicators of the publications, citations and participation in scientific or educational projects presented by Assoc. Prof. Dr Snezhanka Kostova exceeds the minimum national requirements (minimum requirements of the Institute of Robotics – BAS) by indicator groups B, Г, Д and E:

Indicator group	Minimum required, NACID, IR-BAS	Submitted for participation in the competition	Adjusted number of points
A	50	50	50
B	100	120	120.19
Г	200	222	205.86
Д	100	520	520
E	150	311	311

Table 1. Number of points by indicators

d) Point 6

Assoc. Prof. Dr Snezhanka Kostova does not have plagiarism in scientific publications proven by Law.

2. Evaluation of the scientific and applied activities of the candidate and contributions to the materials submitted for review

The results of scientific and applied contributions in the scientific works of Assoc. Prof. Dr Snezhanka Kostova are thematically grouped into two groups:

A. Introduction of new technologies in education (ordinary, non-formal, education of children with special educational needs) and the rehabilitation process through the application of commercial social robots and platforms:

- Review, study of the possibilities and specifics for introduction, study of attitudes and results of their use, analysis of their effectiveness
- Analysis of good practices and research on the use of assisted technologies in people with autistic and neurological disorders
- Analysis of the psychosocial and psychophysical aspects of interaction with robots
- Formalization of the interactive game process through the apparatus of linear discrete control systems
- Developed conceptual framework for application at all stages of the rehabilitation process
- Developed a system for speech therapy with application in other areas for educational and/or therapeutic purposes
- Developed a model for natural language communication in human-robot interaction using GPT models as a service in IoT

B. Solved problems for control of positive linear discrete systems and applications

- Stabilization in state feedback, based on Bauer's theorem
- Linear quadratic regulator for a discrete system with state non-negativity constraints
- Sufficient conditions for the existence of a solution to the synthesis problem by given eigenvalues
- Maximizing the radius of immunity through state feedback to reduce sensitivity to external interference
- Application of the apparatus of positive discrete systems for:
 - Pollution pattern of connected sea basins
 - Methodology for studying the external environmental costs accompanying each activity.

The effectiveness of the proposed models and solutions, the developed systems and the conducted studies and analyses described in the scientific publications presented for the competition show a high knowledge of Assoc. Prof. Dr Snezhanka Kostova on the theoretical basis in the control of positive linear discrete systems and the free operation and application of their capabilities.

The research activity of Assoc. Prof. Dr Snezhanka Kostova is also expressed in the management and participation in the implementation of two research projects with the National Science Fund, one with the Ministry of Education and Science, four projects funded by EU programs, as well as participation in scientific specializations and visits to Croatia, Norway, Spain, Germany and Austria.

The scientific and applied results of the candidate are in the field of positive discrete linear control systems, their application in ecology, the introduction of new technologies in education (ordinary, non-formal, education of children with special educational needs) and the rehabilitation process.

3. Assessment of the candidate's pedagogical activity

According to data from the CV, Assoc. Prof. Dr Snezhanka Kostova has been teaching at the Academy of Economics "D. A. Tsenov" - Svishtov, Institute of Internal Affairs - Sofia, PhD course in the Faculty of Economics of Sofia University "St. Kliment Ohridski". Kliment Ohridski", and under the Erasmus+ program in France, Greece and Great Britain.

4. Relevance of contributions to science and practice

All scientific publications submitted for the competition have been checked by independent reviewers, confirming the results' reliability. The reference for independent citations is evidence of recognizing the significance of the candidate's results among the scientific circles in Bulgaria and abroad.

I accept the candidate's claims for results of a contributing nature. The results are concrete and practically applicable and confirm the importance of the applicant's contributions.

I have no critical remarks and recommendations.

Conclusion

The documents and materials presented by Assoc. Prof. Dr Snezhanka Petrova Kostova meet the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for the Implementation of the Academic Staff Development Act in the Republic of Bulgaria, the Regulations on the Terms and Conditions for the Acquisition of Scientific Degrees and Academic Positions at the Bulgarian Academy of Sciences and the Internal Rules for the Development of the Academic Staff of the Institute of Academic Studies in the Republic of Bulgaria. The achievements of Assoc. Prof. Dr Snezhanka Petrova Kostova, the results correspond, and in two of the groups of indicators (D and E) – significantly exceed the minimum national requirements (the requirements of the IR-BAS) for occupying the academic position of "Professor".

On the basis of the presented documents and scientific papers and the analysis of their significance and contributions, **I give a positive conclusion for the election of Assoc. Prof. Dr Snezhanka Petrova Kostova to the academic position of Professor at IR-BAS** and recommend to the Scientific Jury to propose to the Scientific Council of IR-BAS Assoc. Prof. Dr Snezhanka Petrova Kostova for the election of the academic position of Professor at IR-BAS, for the needs of the Department of Interactive Robotics and Control Systems, in the professional field 5.2 "Electrical Engineering, Electronics and Automation", scientific specialty: "Interactive Robotics in Education".

20.09.2024

Sofia

Prepared the position:

/Prof. Dr Vera Angelova/
