

## REVIEW

on a competition for the academic position of "Associate Professor" in the professional direction "5.2 Electrical engineering, electronics and automation", for the needs of the section "Information processes and decision-making systems" at the Institute of Information and Communication Technologies - Bulgarian Academy of Sciences, announced in the State Gazette number 81/11.10.2022 with a single candidate Chief Assistant Dr. Iliyan Ivanov Petrov

Reviewer: Prof. Dr. Eng. Kosta Boshnakov, appointed as a member of the scientific jury for conducting the competition by order 356/9.12.2022 of the Director of IIKT-BAS

### 1. Biographical data for the candidate

Ch. Assist. Dr. Iliyan Ivanov Petrov graduated from secondary education in 1978 at the 9th high school with teaching in French, Sofia. From 1980 to 1985 he studied higher education at the Moscow State Institute of International Relations and obtained a MSc degree in "International Economic Relations". In the period 1991-1992 he specialized in "Monetary circulation and finance" at the University of Lorraine, Nancy, France. In 1993, at the University of National and World Economy, Sofia, he obtained the educational and qualification degree of Master in Law. In the period 2011-2015, he was a PhD student at the State University of Oil and Gas, Moscow, Russia, where he obtained the educational and scientific degree "doctor" in the professional field 3.8 Economics.

Worked successively as: Specialist/Chief specialist in the Ministry of Economy/Foreign Trade, TD Industrial Cooperation (1985-1990); Head of Department Preparation of economic analyzes and forecasts. Advising local and foreign investors in "Deloitte and Touche Bulgaria OOD" (1992-1993); Chief expert, Preparation of analyzes and forecasts for the financial risk and development of a branch network, TB "Electronica" /Biochim AD/ (1993-1995); Lecturer on "Corporate Finance" and "Credit Analysis" modules in professional training programs - Master's level, International Banking Institute - BNB (1995-2001); Executive Director on Development of financial investment strategy and portfolio management, Bulgarian-Holland Privatization Fund AD (1996-1999); Financial and legal expert on Development of analyses, forecasts and opinions in the field of local self-government, National Association of Municipalities in the Republic of Bulgaria (2000-2003); Head of the "Sales" department, Development, planning and implementation of commercial activity, Gebrüder Vai Bulgaria OOD (2004 - 2006); Associate in the Marketing and Export Development Department, Ministry of Economy, Industry Center of the Republic of Bulgaria in Moscow (2006-2011); Project "Amazon" Technical consultant level 1 and Project "NetApp/OnTap" Certified technical engineer level 1, Sutherland Bulgaria OOD, Sofia (06.06.2018 - 04.30.2019); Chief Assistant, IIKT-BAS (From 01.05.2019 to now)



## 2. General description of the presented materials

**To participate in the competition, the following documents and materials are submitted:** (0)

Application for admission to the competition for Associate Professor, (1) Curriculum vitae according to the European model, (2) Copy of the diploma for the educational and scientific degree "doctor", (3) Service note for Chief assistantship, (4) List of scientific publications of Ch. Assist. Prof Dr. Iliyan Petrov, (5) List of citations, (6) Summaries of scientific publications - in Bulgarian and English, (7) Copies of the scientific publications for participation in the competition, (8) Certificate of fulfillment of the minimum requirements of IKT for Associate Professor from Ch. Assist. Prof. Dr. Iliyan Petrov, (9) Reference for scientific and scientific-applied contributions of Ch. Assist. Prof. Iliyan Ivanov Petrov, PhD, (10) Declaration that no plagiarism has been proven in the candidate's scientific works, (11) Abstract of the PhD thesis.

**The candidate submitted for review a total of:** 20 scientific works.

## 3. Satisfying the minimum requirements, according to the Regulations

Table 1 presents the minimum requirements for occupying the academic position "Associate Professor" according to the Regulations for the specific conditions for acquiring scientific degrees and for occupying academic positions at the Institute of Information and Communication Technologies and the results achieved by the Ch. Assist. Prof. Dr. Iliyan Petrov.

Table 1

Group of indicators	Content	Minimum points required	Points achieved by the Ch. Assist. Dr. Iliyan Petrov
A	Dissertation work for awarding the educational and scientific degree "Doctor"	50	50
B (B4)	Habilitation work - scientific publications (not less than 10) in publications that are referenced and indexed in world-famous databases with scientific information	100	660
G	G7. Scientific publications in editions that are referenced and indexed in world-renowned scientific information		240
	G8. Scientific publications in non-refereed peer-reviewed journals or in edited collective volumes		60
	<b>Sum of indicators from G5-G11</b>	<b>220</b>	<b>300</b>
D	D12. Citations in scientific publications, referenced and indexed in world-renowned databases of scientific information, or in monographs and collective volumes		150
	D14. Citations or reviews in non-refereed peer-reviewed journals		10
	<b>Sum of indicators from D12 to D15</b>	<b>60</b>	<b>160</b>
E	<b>Sum of indicators from E16 to the end</b>	<b>20</b>	<b>20</b>
	<b>Total points</b>	<b>450</b>	<b>1190</b>

From the data in Table 1, it can be seen that the candidate for the academic position of "Associate Professor" according to the groups of indicators A and E fulfills the minimum required points, according to indicators G he exceeds them, and according to B and D he significantly exceeds them.



### **3. General characteristics of the candidate's scientific research and applied scientific activity**

**According to the group of indicators B - indicator B4.** Habilitation work - scientific publications in publications that are referenced and indexed in world-famous databases with scientific information. 11 scientific papers satisfying the formulated requirements are included.

A new hierarchical concept is introduced as an addition to the traditional entropy approach. The reliability of information systems was assessed with the traditional entropy indicator and hierarchy indicators [B4-1]; Research has been conducted and it is concluded that the entropy approach provides a tool for predicting the dynamics of the COVID-19 epidemic [B4-2]; A combined approach based on Analytic hierarchy process, information entropy, and multi-criteria decision-making techniques was applied to evaluate cloud computing systems [B4-3]; A combined Analytic hierarchical process approach for blocks and entropy is proposed to improve multi-criteria decision-making in cloud service selection [B4-4]; In [B4-5], a hybrid approach for multi-criteria evaluation of student performance is implemented in a flexible framework of three preferred scenarios, where theoretical training, practical skills and final exams are involved with different weights; Based on the hierarchy indicator, an assessment of the hierarchy in the structures of the energy mix and the role of renewable energies at the international, regional and national level was made [B4-6]; The application of combined methods and techniques to improve the assessment for the selection of projects for renewable energy sources has been investigated [B4-7]; In [B4-8], a multi-criteria analysis for making a decision on the selection of personal computers (PCs) is presented; Block weighting is included in an analytic hierarchy process in the PC selection decision procedure [B4-9]; Software for modeling and visualizing information entropy in Python was developed and the results were compared with those from Excel [B4-10]; The evolution of the semiconductor market is explored, taking into account the latest trends during the COVID-19 pandemic [B4-11].

**According to the group of indicators G - indicator G7.** Scientific publications in publications that are referenced and indexed in world-renowned databases of scientific information

A structured approach is presented that allows optimizing the combination of professional expert opinions and the objectivity of data-based entropy methods [G7-1]; In [G7-2], the application of a hybrid approach to the selection of industrial robots, including the subjective analytic hierarchy process and the objective entropy approach, was investigated; In [G7-3], a combined decision-making approach based on the Analytic hierarchy process and objective weighting of criteria with multi-criteria decision-making for the selection of portable computers is presented; In [G7-4], an analysis of the effectiveness of 13 technologies based on renewable energy sources was made; The paper [G7-5] focuses on aspects of the methodology for delineating the structure space and presenting a clearer understanding and visualization of the evolution of the system within the minimum and maximum levels of information in entropy and hierarchy estimates; Possibilities for improving the methodology for multi-criteria decision-making for the selection of cloud services were investigated in [G7-6].



**According to the group of indicators G - indicator G8.** Scientific publications in non-refereed peer-reviewed journals or in edited collective volumes

In [G8-1], the possibilities of an original method for evaluation and analysis of information about the hierarchy and concentration for distribution of resources are presented; In [G8-2], the possibilities of an original method for evaluation and analysis of information about the hierarchy and concentration for distribution of resources are presented; Improved methods for studying concentration and hierarchy in complex and dynamic systems are presented and applied [G8-3].

**According to the group of indicators E - indicator E18.** Participation in a national scientific or educational project.

The titles of two projects funded by the Scientific Research Fund are included: "Modeling and Research of Intelligent Learning Systems and Sensor Networks (ISOSeM)", contract No. KP-06-X47/4, 2022-2023 and "Mathematical Models, Methods and algorithms for solving difficult optimization tasks to achieve high security in communications and better economic sustainability", contract KP-06-X52/7, 2021-2024.

**4. Main scientific, scientific and applied contributions.** The scientific works submitted for participation in the competition contain the following more important scientific, scientific-applied and applied contributions:

1. A more detailed and advanced version of E. Harrington's evaluation scale is presented, which includes six phases and is designed to evaluate the aggregated macro-level results for entropy and hierarchy for different system configurations and distributions of relative weights [B4-1, G8-2];
2. To evaluate and analyze the complexity of the systems, logistic and power functions were introduced and studied as indicators of the hierarchy [B4-1, B4-6, G7-5];
3. It is proposed to integrate the "Analytic Hierarchy Process" for the systematization of block criteria in a combined Shannon objective entropy approach with the assessment based on the multi-objective optimization approach with ratio analysis [B4-7];
4. The original concepts of "Phase-Structural States (PhSS) and "Structure Concentration Index" are integrated with new indicators for quantitative and qualitative evaluation of industrial and market structures, forming an integrated "System for Evaluation and Classification of Structures " [G8-3];
5. To improve the methodology of multi-criteria decision-making, a combined approach based on the "Analytical Hierarchical Process" with criteria structured in blocks and objective weighting of the criteria with entropy was applied [G7-1];
6. To make a decision on the selection of robots, the objectivity of traditional entropy is combined with the method of the "Analytic Hierarchy Process", integrated with the "Technique for the order of preference by similarity to the ideal solution" [G7-2];
7. To evaluate the quality of cloud computing systems, the set of evaluation criteria is decomposed and logically structured into a certain number of blocks, thus reducing the task of calculating the weights [B4-3];



8. It is proposed to expand the independent information entropy with "block weighting" of the criteria in "Analytic Hierarchical Process" [B4-5];
9. The approach "Entropy - A technique for ordering preferences by similarity to the ideal solution" is extended with block weighting of the criteria in "Analytic Hierarchy Process" [B4-8];
10. Block criteria weighting with "Analytical Hierarchy Process" was implemented in the method "Entropy - Multi-objective optimization with ratio analysis" for making decisions on the selection of personal computers [B4-9];
11. With the hierarchy indicators proposed by the candidate, a classification of the energy balances of world energy was made [G8-2];
12. A method was developed to assess the hierarchy in the structures of the energy mix and the role of renewable energy sources [B4-6];
13. Developed software for modeling and visualization of information entropy in Python [B4-10];
14. The structural evolution and dynamics of the world market of semiconductor components are investigated with the traditional Shannon entropy concept in combination with the hierarchy concept [B4-11];
15. The possibility of applying information theory to analyze the dynamics of epidemic waves of COVID-19 has been investigated [B4-2].

#### **5. Significance of contributions for science and practice**

One of the significant indicators of the contributions of the scientific developments of Ch. Assist. Prof. Dr. Iliyan Petrov is the number of noticed citations. According to the list of publication citations attached by the applicant, the following citations were noted:

15 citations, in scientific publications, referenced and indexed in world-renowned databases of scientific information, or in monographs and collective volumes. Publication G8-3 was cited 4 times, G8-1 and B4-1 were cited 3 times each, G7-3 – 2 times and B4-5, B4-11 and B4-8 once each.

5 citations in non-refereed peer-reviewed journals. B4-8, G8-3, G8-1, B4-7 and one article that was not included in the list of publications for participation in the contest were cited 1 time.

#### **6. Evaluation of the candidate's personal contribution**

The entire scientific research work of the Ch. Assist. Prof. Dr. Iliyan Petrov is predominantly scientific-applied, with both scientific and applied contributions available. After I got acquainted with all the scientific works of the candidate, I was strongly impressed that in all of them he is the sole author, which gives me reason to assume that all published scientific developments and studies are the work of the Ch. Assist. Prof. Dr. Iliyan Petrov.

#### **7. Critical notes and recommendations**

1. There is a difference in the number of attached citations for G8-1 in the List of Citations, where there are 4 citations, and in the Reference for the Minimum Number of Points, where there are 3 citations.

2. Papers G8-1 and G8-3 have similar methodological parts. It would be possible to avoid repetition by making brief comments in G8-3 and citing G8-1.

### **8. Personal impressions and opinion of the reviewer**

I have no personal impressions of the candidate, Ch. Assist. Prof. Dr. Iliyan Petrov

### **CONCLUSION**

Ch. Assist. Prof. Dr. Iliyan Petrov has submitted for participation in the competition as a habilitation work - 11 scientific publications that are referenced and indexed in world-renowned databases with scientific information, in addition to them 6 scientific publications in publications that are also referenced and indexed in world-renowned databases of scientific information and 3 scientific publications in non-refereed peer-reviewed journals or edited collective volumes. The publications have 15 citations in scientific editions, referenced and indexed in world-famous databases with scientific information and 5 - in non-refereed journals with scientific review. The candidate participates in the development of two projects financed by the Scientific Research Fund. He has a sufficient number of scientific, scientific-applied and applied contributions, he has met, and according to the groups of indicators B(B4), G and D, he has exceeded the minimum requirements for occupying the academic position of "Associate Professor".

All the requirements of ZRASRB, the Regulations for its implementation, the Regulations for the terms and conditions for acquiring scientific degrees and holding academic positions at the BAS, as well as the Regulations for the specific conditions for acquiring scientific degrees and holding academic positions at IIKT, have been met. My assessment of the candidate's overall activity is positive.

Everything presented in the review gives me reason to suggest Ch. Assist. Prof. Dr Iliyan Ivanov Petrov to take the academic position "Associate Professor" in the professional direction "5.2 Electrical engineering, electronics and automation", for the needs of the section "Information processes and decision-making systems" at the Institute of Information and Communication Technologies - Bulgaria Academy of Sciences.

Date: 20.01.2023

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