O P I N I O N

from Assoc. Prof. Eng. Boyan Dimitrov Karapenev, PhD, Technical university of Gabrovo

on a competition for the academic position of „professor“ in
field of higher education 5. Technical Sciences,
professional field 5.3 Communication and computer technology,
scientific specialty „Communication and Computer Engineering“ (Wireless communications and cyber security in WiFi networks, Internet of Things (IoT) and cyber security systems)

In the competition for a professor, announced in the State Gazette, No. 48/13.06.2025 and on the TU-Gabrovo website for the needs of the Department of „Communication Techniques and Technologies“ at the Faculty of „Electrical Engineering and Electronics“, as a candidate participate Assoc. Prof. Eng. Krasen Kirov Angelov, PhD from TU-Gabrovo.

1. Overview of content and results in the presented works

A total of 43 scientific works were submitted for participation in the competition, all of them in the scientific direction 5.3 Communication and computer technology in the scientific specialty „Communication networks and systems“: 26 scientific publications are referenced and indexed in world-renowned databases with scientific information, 15 - in non-refereed peer-reviewed journals or in edited collective volumes and 2 textbooks.

2. General characteristics of the applicant's activity

2.1. Educational and pedagogical activity

Assoc. Prof. Eng. Krasen Kirov Angelov, PhD has developed curricula and is a leading lecturer in the disciplines „Wireless Communications and Cybersecurity in WiFi Networks“, „Electromagnetic Compatibility“, „Access Control Systems“, „Security and Monitoring Systems“, „Internet of Things (IoT) and Cyber Security Systems“, „Cyber Security of Web and Cloud Applications“, „Audio and Video Systems“, „Security Engineering“, „Wireless Communications and Broadcasting“, „Interactive Cable TV Networks“, „Communication technologies in IoT“, „Information cyber security management systems“, „Identification and counteraction of cyber attacks“, included in the curricula of the majors „Communication technologies and cyber security“ and „Communication technology and technologies“ in the faculty of „Electrical engineering and electronics“ - full-time and part-time form of education for educational and qualification degree (EQD) „Bachelor“ and „Master“.

He was the supervisor of more than 110 graduates in EQD „Bachelor“ and „Master“. At the moment, he is the scientific supervisor of 3 doctoral students and one doctoral candidate in the doctoral program „Communication Networks and Systems“ from professional field 5.3 Communication and computer technology.

To ensure the learning process, the candidate participates in publishing 2 textbooks on „Wireless Communications“ as an independent author and on „Digital Television Technologies“ - as a co-author.

2.2. Scientific and scientific-applied activity

To participate in the competition, the candidate submitted 41 scientific publications (journal articles and conference reports), of which 26 are in publications referenced and indexed in world-renowned databases with scientific information (Scopus/Web of Science), with 3 of them having an "impact factor" and 8 having an SJR rank. Of the total number, 6 are independent and 35 are co-authored (4 with two authors, 14 with three authors and 17 with more than three authors, and in 10 of them he is the first author). 15 of the publications are in Bulgarian, and 26 in English, and a total of 2 textbooks have been published. The publications do not repeat the articles, reports, textbooks and teaching aids for the ONS "doctor" and the academic position "associate professor" attached to the competition documentation. According to a reference in the world-famous Scopus database, Assoc. Prof. Eng. Krasen Kirov Angelov, PhD

has 89 citations in 72 documents (papers) of prestigious publications (November 2025). The candidate has participated in a large number of national and international scientific and educational projects. In the materials for the competition, he indicated participation in 11 national projects, of which he was a leader in 4 and a participant in 7) and 1 international project as a participant.

2.3. Implementation activity

No documents have been submitted for implementation activity. The candidate participated in the construction of laboratories, stands, models and models for laboratory exercises and practical training of students in the disciplines „Wireless communications and cybersecurity in WiFi networks, „Broadband mobile networks“, „Access control systems“ and „Internet of Things (IoT) and cybersecurity systems“, etc. He worked and works as an expert in various projects with businesses related to the implementation of modern communication technologies in the field of the Internet of Things and smart cities, „Quantum communication, intelligent systems for security and risk management (Quasar)“, „Student practices“, „Modernization of higher education for sustainable use of natural resources in Bulgaria“, „Digitalization of the economy in a big data environment“ - phase I, etc.

3. Contributions (scientific, scientific-applied, applied)**. Significance of contributions to science and practice**

The candidate's contributions can be highly valued and presented as follows:

Scientific contributions:

1) A modified OTP (One-Time Pad) algorithm-based image encryption scheme consisting of chaotic synchronization (based on feedback control to create complex and unique encryption keys) and artificial neural networks (ANN) is developed for improved security, efficiency and resistance to various cryptographic attacks.

2) A hyperchaotic system for synchronization of two identical new mathematical models of fourth-order hyperchaotic systems has been developed and investigated. An active control based on Lyapunov's second stability law is synthesized. A stable chaotic synchronization between two nonlinear systems is achieved, which serves as a basis for secure data transmission through chaotic masking over unprotected communication channels.

3) An improved neural network model that combines spatial data obtained using Convolutional Neural Networks (CNN) with sequential data analyzed using Long Short Term Memory (LSTM) networks for the purpose of predicting radio wave attenuation in 5G networks is built and investigated.

4) A robust control for a class of nonlinear systems with parametric uncertainties is synthesized by modified input-output linearization via linear-nonlinear decomposition feedback.

Scientific-applied contributions:

1) A categorization approach (by clustering, categorization and cross-validation using different algorithms) of the key roles and responsibilities of stakeholders and their impact on ensuring cybersecurity in IoT ecosystems and prioritizing and allocating resources to address the most critical security risks in building a secure and reliable IoT platform is proposed and explored.

2) Simulation models have been developed to predict and analyze the radio coverage of LoRaWAN networks to determine the maximum range, parameters, quality of service (QoS) and performance under a complex change of configuration parameters.

3) An approach to design, build and deploy low-energy mesh networks in an indoor scenario based on IQRF technology is proposed and investigated.

4) Advanced power control and signal amplification methods designed for next-generation mobile cellular networks are explored and analyzed, including centralized, distributed, and machine learning-based approaches.

5) A conceptual model of a visible optical spectrum communication system using wavelength division multiplexing (WDM) to simultaneously transmit data streams from different

sources over a free-space optical (FSO) channel, with application to vehicular communication in urban and non-urban environments, has been synthesized and investigated.

Applied contributions:

1) A universal integrated system for monitoring wired and wireless communication networks and communication nodes is developed and its functionality and applicability in several different applications are presented.

2) Demonstration models have been developed to implement an energy-efficient narrowband long-range (LoRa) communication network in the Internet of Things (IoT) concept for controlling and monitoring indoor lighting systems; measurement, visualization and control of electrical and non-electrical parameters of low-voltage power supply networks in real time; remote intelligent management and control of household appliances in home automation systems.

3) A vehicle tracking system based on LoRaWAN IoT network has been developed in Smart City concept.

4) Practical approaches have been developed to optimize the energy consumption of self-powered LoRaWAN end devices in different modes of their operation.

5) A downlink physical layer simulation model based on MATLAB 5G NR is developed and investigated for the purpose of realistic 5G NR performance evaluation.

6) Modeling approaches and simulation models for research, analysis and performance evaluation, and solving optimization tasks in high-speed multi-channel passive and active optical networks using different optical signal modulation formats (NRZ, RZ, CSRZ, DM, MDRZ), and different dispersion compensation schemes (symmetric, pre-compensation and post-compensation) have been developed and investigated.

I appreciate the author's contributions of high scientific, scientific-applied and applied value, and it can be noted that they expand knowledge in the field of wireless communications, Internet of Things (IoT), cybersecurity systems and offer solutions for implementing innovations in practice.

4. Evaluation of the candidate's personal contribution

Research, analysis, conclusions and contributions in the candidate's scientific publications have been presented at international and national scientific journals and conferences, a large number of which are indexed in Scopus or in Web of Science, which is a guarantee of the significance of the achieved results.

My impressions of Assoc. Prof. Eng. Krasen Kirov Angelov, PhD are entirely positive - he is not only an outstanding specialist in the field of professional field 5.3 Communication and computer technology with his scientific and scientific research work and achievements (41 scientific publications), a teacher who actively supports students in their studies and work, has 2 published textbooks and has experience gained from his participation in various scientific research projects, expert and working groups.

5. Recommendations

I would make the following recommendations regarding the applicant's future work and activities:

- I recommend that he continue and further deepen his scientific and research work in professional field 5.3 and develop current and future trends in communication and computer technologies;
- Actively continue to participate in the educational process, update educational content in accordance with modern scientific innovations and achievements, participate in the development of new educational documentation and other similar activities;
- I recommend that he continue to be actively involved and work in international, national and university research projects, expert and working groups and in other similar directions.

6. Personal impressions

Assoc. Prof. Eng. Krasen Kirov Angelov, PhD is distinguished by high competence, responsibility and consistency in the performance of his scientific and teaching commitments. Demonstrates exceptional initiative and analytical thinking, combining in-depth theoretical knowledge and acquired practical experience. In his work, he is demanding, organized and correct, demonstrating a high culture of academic communication and cooperation.

7. Conclusion

Bearing in mind the above, I propose that Assoc. Prof. Eng. Krasen Kirov Angelov, PhD be elected as a „professor“ in the field of higher education - 5. Technical sciences, professional field 5.3 Communication and computer technology, scientific specialty „Communication and Computer Engineering“ (Wireless communications and cyber security in WiFi networks, Internet of Things (IoT) and cybersecurity systems).

05.11.2025 Member of the scientific juri:

/Assoc. Prof. Eng. B. Karapenev, PhD/