OPINION
by Dr. Sotir Ivanov Sotirov,
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of a dissertation for award of the educational and scientific degree “Doctor”
in: Field of Higher Education: 5 – Technical Sciences;
Professional Field: 5.3 “Communication and Computer Engineering”;
Doctoral Program: “Automation of areas of the intangible sphere (Medicine, Education, Science, Administrative Activities, etc.)”

Author: Anatoliy Rosenov Parushev
Title: “AUTOMATION OF A LABORATORY FOR ECO-ENERGY TECHNOLOGIES”
Scientific Supervisor: Prof. Dr. Eng. Rumen Kostadinov Popov

1. General presentation of the procedure and the doctoral candidate

By order No. РД 22-2023 of 22.10.2025, of the Rector of Paisii Hilendarski University of Plovdiv (PU), I am appointed as a member of the scientific jury in the procedure for the defense of a dissertation on the topic “AUTOMATION OF A LABORATORY FOR ECO-ENERGY TECHNOLOGIES,” for obtaining the educational and scientific degree “Doctor" in the field of higher education: 5 “Technical Sciences,” professional field: 5.3 “Communication and Computer Engineering,” doctoral program: “"Automation of areas of the intangible sphere (Medicine, Education, Science, Administrative Activities, etc.).”

The author of the dissertation is Anatoliy Rosenov Parushev, a full-time doctoral student at the Department of ECIT under the supervision of Prof. Dr. Eng. Rumen Kostadinov Popov at Paisii Hilendarski University of Plovdiv.

The set of materials presented by M.Sc. Eng. Anatoliy Rosenov Parushev in paper form complies with Art. 36(1) of the Rules for the Development of the Academic Staff at PU and includes the following documents:

- Application to the Rector of PU to open the procedure for defending a doctoral dissertation;
- Curriculum vitae in European format;
- Minutes of the Department Council regarding the readiness to initiate the procedure and preliminary discussion of the dissertation;
- Abstract in Bulgarian and English;
- Declaration of originality and authenticity of the submitted documents;
- Statement of compliance with minimum requirements;
- Dissertation;
- List of scientific publications related to the dissertation topic;
- Copies of scientific publications.

The doctoral candidate submitted six publications related to the dissertation topic.

Anatoliy Rosenov Parushev completed his secondary education at the Vocational High School of Economics “Karl Marx,” Smolyan, in 2016. He graduated with a Bachelor’s degree in 2020 from Paisii Hilendarski University of Plovdiv, majoring in “Computer and Communication Systems.” In 2021, he obtained a Master’s degree in “Information Security” at the same university. Since March 2021, he has been enrolled as a doctoral student at the Department of ECIT, Faculty of Physics and Technology, PU Plovdiv. From 15.03.2017 to 03.09.2020, he worked at “Digital Systems” Ltd., Varna, as Technical Manager. From 05.10.2020 to 05.11.2021, he held the position of Key Account Manager at “Eco-Spa-Agarti” Ltd., Devin. Currently, he holds the academic position of Assistant at the Faculty of Physics and Technology, PU Plovdiv.

2. Relevance of the topic

The main goal of the dissertation is the development, construction, and experimental validation of an automated laboratory stand with remote control capabilities, intended for teaching and studying thermal processes. The system is designed to be scalable, reliable, and applicable in both educational and research environments. I consider the topic highly relevant, as the development of automated laboratories with remote access is directly related to contemporary educational trends and challenges. It enables modern solutions for quality education and equal access to technological resources. The problem addressed reflects real changes in the educational environment and the needs of students and institutions today.

3. Knowledge of the problem

The dissertation cites 139 literature sources, all in English, with 29 of them being online links. Most cited works were published in the last 10 years. The analysis of these sources demonstrates that the doctoral candidate is well-informed about the leading scientific trends shaping the modern development of the studied field, providing a solid theoretical foundation for the dissertation.

4. Research methodology

The dissertation comprises 224 pages, 26 tables, 89 figures, and 2 appendices.

The main objective is the development, construction, and experimental validation of an automated laboratory stand with remote control capabilities for studying thermal processes. Eight tasks were formulated and successfully completed by the doctoral candidate.

- Chapter 1 analyzes the current state of technologies related to automated laboratory systems and remote access to educational resources, as well as trends in remote engineering education and the application of IoT and SCADA in academia.
- Chapter 2 describes the measurement methods used in the SR1162E stand and approaches for its modernization, functional characteristics, measurement accuracy, and possibilities for remote access integration. Optimization proposals for the stand as an engineering and research tool are presented.
- Chapter 3 details the design and construction of the automated stand, including hardware structure, communication architecture, and software integration of

modules. A stable and scalable platform applicable for both education and research was created, with well-justified technical solutions and hardware-software interconnections.

- Chapter 4 presents experimental studies confirming the functionality and practical applicability of the developed stand, including measurements of air velocity, volumetric and mass flow rates under different operating modes, and analysis of thermal and thermodynamic parameters of air.
- Chapter 5 contains conclusions and contributions of the dissertation, classified into two groups: scientific-applied (3 contributions) and applied (5 contributions).

Appendix 1 presents two developed laboratory exercises:

1. Determination of air velocity profile and volumetric flow in a rectangular duct.
2. Specific heat capacity of air at constant pressure.

Appendix 2 presents software configuration for communication management between Node-RED and hardware devices controlled via Modbus. Program codes for measuring air flow rate and controlling an asynchronous motor with STM32 microcontroller via Modbus and Node-RED visualization are included.

5. Characteristics and evaluation of the dissertation and contributions

I evaluate the dissertation as useful. The developed ideas and results are successfully presented. The doctoral candidate formulated eight contributions: three scientific-applied and five applied. These contributions reflect achievements in developing a remote laboratory infrastructure and methodologies for conducting real experimental measurements online, integrating modern technological solutions with engineering methods adapted to remote learning and research needs. Their relevance is supported by the growing demand for remote laboratories in contemporary education and engineering practice. In the dissertation, technical inaccuracies are noted in the writing of some formulas, as well as in the citation of some of the literary sources.

6. Assessment of publications and personal contribution

The dissertation results are presented in six publications, all in English and co-authored with the scientific supervisor. One of these is indexed in Scopus. In three publications, the doctoral candidate is the first author. All articles address different aspects of the dissertation. I consider the publications clearly reflect the candidate's personal contribution.

7. Abstract

The abstract is presented in Bulgarian and English, consists of 32 pages, and meets the requirements. It summarizes the main contributions of the dissertation and includes relevant publications.

8. Recommendations for future use of dissertation contributions and results

I consider the results to have significant practical value and recommend that in the further development of Eng. Parushev as a university researcher, they be applied to the development of additional remote laboratory exercises.

CONCLUSION

The dissertation of Eng. Anatoliy Rosenov Parushev contains scientific-applied and applied results that constitute an original contribution to science and comply with the requirements of the Bulgarian Law on Academic Staff Development, its implementing regulations, and the relevant Rules of Paisii Hilendarski University. The dissertation demonstrates that the doctoral candidate possesses deep theoretical knowledge and professional skills in the scientific specialty “Automation of areas of the intangible sphere” (Medicine, Education, Science, Administrative Activities, etc.)”, and shows the ability to conduct independent research.

Based on the above, I confidently give a positive assessment of the research presented in the dissertation, abstract, results, and contributions, and I propose to the esteemed scientific jury to award the educational and scientific degree of Doctor to Anatoliy Rosenov Parushev in the field of higher education 5. Technical Sciences, professional field 5.3 Communication and Computer Engineering, doctoral program “Automation of areas of the intangible sphere (Medicine, Education, Science, Administrative Activities, etc.)”.

Date: 17.11.2025 Prepared by:…….

Assoc. Prof. Dr. Sotir Ivanov Sotirov