

## **SCIENTIFIC REVIEW**

according to an announced competition for occupying an academic position

"ASSOCIATE PROFESSOR"

in the professional field 5.4 Energetics,

scientific specialty "Industrial Heat Engineering"

department "Heat Engineering" at TU-Varna, declared in SG c. 13/ 07.02.2023г.

with a candidate: Chief Assistant Professor Krastin Yordanov, Ph.D., Eng. –

TU-Varna

Reviewer: Full Professor Liliana Zashkova. Ph.D., Eng. - university of

Chemical Technology and Metallurgy – Sofia, SS 5.4 Energetics,

scientific specialty "Industrial Heat Engineering"

### **1. General provisions and biographical data**

The materials presented to me for participation in a competition for "Associate Professor" at the Technical University of Varna are a personal work of Chief Assistant Professor Ph.D., Eng. Krastin Krasimirov Yordanov from the same university, appearing as the only candidate in the competition. Chief Assistant Professor Krastin Yordanov, Ph.D., Eng. he graduated from secondary education in 2005 at the Professional High School of Mechanical Engineering - Ruse. He graduated from TU - Varna, majoring in "Heating Engineering". In 2017, he defended his doctoral dissertation on the topic: "Identification of the thermal modes furnace chamber type for the heat treatment". With the topic developed by him, he was awarded a doctorate. He worked consecutively after completing his bachelor's and master's degrees in "Argus 91" and "Apolon Climate Engineering" as a designer, and since 2013, after a competition, he works as an assistant in the department "Heat Engineering" of TU - Varna. In 2018, again after a competition, he was elected as head. assistant professor in the same department where he currently works.

### **2. General description of the presented materials**

In the contest ch. assistant professor Krastin Yordanov participated in a total of 48 papers, evenly distributed over the years he worked at the university. They are very well equipped and described, including 7 pcs. scientific publications on the doctoral work, 5 pcs. scientific publications related to the competition for ch. assistant professor, 10 publications are combined as equivalent to a monographic work on a topic "Research and modeling of heat transfer and mass transfer in various industrial processes" and 26 pcs. scientific publications in the scientific field for announcing the competition. The total number indicated above also includes 8 pcs. scientific projects on a university level, with companies and those of an international nature. The candidate also indicates 6 pcs. scientific citations made by Bulgarian and foreign scientists in various journals indexed in Scopus. It is good to highlight the development of 12 pcs. study programs, developed lecture courses and those for seminars and laboratory exercises. Ch. Associate Professor Yordanov has developed, designed and built laboratory installations with which the reviewer is well acquainted. Other research and scientific-applied works and activities that the candidate has carried out during his years of work at the university can also be included in this point of the requirements.

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

In the works presented to me as a scientific production outside of those on the dissertation work and for ch. assistant statistics show that 2 pcs. are independent, 7 pcs. he is the first author, 14 nos. is in second place, and in the remaining 13 pcs. is in third and subsequent place.

From my detailed acquaintance with the scientific output of Ph.D. Yordanov, it is clear that he works in several main scientific directions. All of them are related to the fields of theoretical and industrial heat engineering, energy and environmental efficiency and RES. In detail, his works cover the following main aspects (directions):

- Study and modeling of heat and mass transfer in various industrial processes;
- Research and modeling of devices for the utilization of thermal energy;
- Research and modeling of the thermal behavior of buildings from traditional and alternative building materials;
- Exploration of energy resources for power generation;
- Analysis and evaluation of a natural gas transmission chain.

The above directions contain those for his dissertation work - 7 pcs., for ch. assistant - 5 pcs., to the scientific production equivalent to a monographic work 10 pcs. and those on the subject of the competition 26 pcs. Mainly, his scientific production can be classified as such in scientific journals in our country, 16 pcs. abroad 6 pcs., scientific collections from conferences in our country 21 pcs. and abroad 5 pcs.

The candidate has also presented a list of found citations by our and foreign scientists, 6 pcs. indexed in Scopus.

The number of his scientific production, including scientific publications, scientific projects, reports, citations and others exceed the requirements accepted by the Technical University of Varna for participation in the competition for the academic position "Associate Professor". In addition, the reviewer would like to emphasize that Ch. Associate Professor Yordanov has developed and defended a dissertation work with a high level in the field of theoretical heat engineering, bearing in mind that his work regarding heat treatment methods in chamber furnaces, as a surface treatment method, are widely used worldwide with unconditional significance in solving tasks from theoretical heat engineering.

From my presented scientific production, my detailed knowledge of his dissertation work and the team with which he works, it is established that Ph.D.

Krastin Yordanov is known to the scientific community in our country and abroad.

#### **4. Assessment of the candidate's pedagogical training and activity**

Chief Assistant Professor Yordanov conducts lectures on the disciplines of EQD "Bachelor" and EQD "Master":

- Heat exchangers;
- Thermodynamics and heat transfer;
- Biogas sources and technologies;
- Heat engineering measurements;
- Thermal part of the TPP;
- Thermodynamics and heat engineering;
- Gas supply systems;
- Purification of air and gases.

For EQD "Bachelor" and EQD "Master" and exercises in the disciplines:

- Heat exchangers;
- Thermodynamics and heat transfer;
- Heat engineering;
- Heat supply and gas supply;
- Heat engineering measurements and devices;
- Computer systems for engineering design;
- Biogas sources and technologies;
- Heat engineering measurements;
- Fuel technology and technologies;
- Refrigeration Equipment;
- Refrigerators and refrigeration installations;
- Heat property;
- Technologies for converting solar energy into heat and electricity;
- Geothermal and hydrokinetic facilities and installations for the production of energy from biomass;

- Thermodynamics and heat engineering;
- Thermal power engineering;
- Energy management;
- Renewable energy sources;
- Purification of air and gases.

He was the head of 8 pcs. graduates - 6 pcs. bachelors and 2 pcs. masters.

A characteristic feature of the candidate's educational and pedagogical activities are the built 4 pcs. laboratory installations: for comparative performance analysis between monocrystalline and polycrystalline photovoltaic panels; for measuring the heat flow through vertical walls, roofs and ceilings of buildings made of heterogeneous materials of the layers; designed and assembled an ultrasonic resonance fatigue test bench and a real vibration fatigue test rig for teaching and research purposes, with which the reviewer is familiar. In addition, Ph.D. Krastin Yordanov is a diligent and demanding pedagogue, and my long-term observations give me reason to say that he is a very good teacher with knowledge and a broad culture, he knows the possibilities of information technologies extremely well, he has a perfect command of computer programs in the field of the subject it teaches. He has built a good name among the students of the teacher.

### **5. Main scientific and applied contributions**

Scientific-applied and applied contributions stand out in the specified directions in which the candidate works and which were already noted by the reviewer and of course the related scientific works. According to the reviewer, the following scientific and applied contributions can be defined in a concise form:

To the monographic work

- 3D simulation models based on the finite element method were developed, showing the distribution of both temperature fields and allowing the

simultaneous determination of the magnitudes and distribution of stresses from different load cases from the operation of machines using software products.

- Infrared thermography processing software has been developed, by which a connection is made between the temperature measurements and the heat given off by the surfaces of the processed electronic elements.

- An algorithm has been developed for simulation modeling of stationary heat conduction in different types of walls made of ceramic grid bricks and walls with a matrix of clay and sand with and without straw additives, which adequately recreates the ongoing thermal processes and shows good repeatability of the obtained results of experimental studies.

And contribution of an applied nature:

- Values of some parameters of the microclimate in houses made of natural wood and results for the seasonal efficiency of the air-water heat pump system in heating mode at precisely measured outdoor air temperatures, characteristic of the Black Sea climatic zone, were experimentally obtained, which can be used in design of air-water heat pump systems, and when surveying buildings for energy efficiency.

In the remaining scientific output:

- A device has been developed for the utilization of low-potential thermal energy from waste water of systems for domestic hot water supply in buildings, called "chamber thermosyphon".

- A methodology for researching the energy efficiency of a building with complex geometry through 3D modeling has been developed and applied to a real object.

- An algorithm has been developed for 3D modeling of thermal processes with different thermal insulation materials and coatings, allowing the use of software products with the help of which the course of processes can be predicted by varying the output parameters.

- 3D simulation models of heat transfer processes and stress state evaluation under different surface treatments have been developed in the environment of suitable software products, which allow testing of different technologies, by changing the initial parameters of the regimes or by using different materials.

- An algorithm has been developed combining the assessment of the solar potential of two energy systems, the solar resources and various integration models, the solutions of which give results for a realistic assessment of the use of solar energy in Bulgaria.

And the following contributions of an attached nature:

- The dependences of the internal thermal resistance and the average temperature of the wall in the cooling zone of inclined thermosyphons on the power of the transmitted heat flow and on their angle of inclination relative to the horizontal, on which their operability depends, were experimentally investigated, under the relevant operating conditions.

- A theoretical-experimental study of the relationship between the technological parameters of the air-plasma surface treatment processes and the quality characteristics of the resulting surface layers was made. A three-factor experiment was conducted to determine the effect of the factors on the resulting hardness in the heat-affected zone and a regression equation was obtained and isolines were drawn showing the effect of these factors.

- A theoretical study of the different renewable energy sources has been made to present the need for an energy mix in the energy system of Romania and Bulgaria for the period 2017-2019, which can help in the development of projects related to the energy strategy of both countries.

- In order to optimize the natural gas supply chain, it is necessary to represent the path of natural gas from its extraction in natural gas fields to its distribution to the end user. For this purpose, a transmission and supply chain

has been developed, presented as a model of a single product (natural gas), in which four stages have been introduced.

In my presented package of scientific works, it is good to mention again that Chief Assistant Professor K. Yordanov participated in both 3 pcs. national and international and 5 pcs. scientific projects, he also worked as a contractor on projects financed by various companies.

### **6. Significance of contributions to science and practice**

Taking into account what has been written so far about the candidate, it is clear that he is the author of scientific production, pedagogical activity, creation of new teaching and research stands and laboratories, citations of his scientific production by other authors, his extensive teaching work is proof, as I have already mentioned that he is a well-known scientist, a specialist among the scientific circles at home and abroad in the field of theoretical and industrial heat engineering, RES and others, and his works and contributions in them have a certain significance for science and practice. The research direction he established in the field of renewable energy sources in the part of technologies for converting solar energy into heat and electricity is of high achievement.

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

In such a serious work expressed in the scientific production presented by me, some minor errors could be found, but in the scientific publications regarding the presentation of the works, the stated goals and the way to solve them, the reviewer does not find any errors, nor are there any comments or recommendations. The same for original solutions and have contributions to both science and practice. However, the fact is indisputable that the candidate must strengthen and activate the writing of a teaching aid related to the topic of a scientific specialty in the disciplines taught by him.

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

I know the candidate personally and have met him back in the years when he was working on his dissertation work, which he completed and defended at a



high level. The scientific fields in which he works are extremely difficult and responsible, for which a researcher needs to have high competence and knowledge in the field of industrial heat engineering, mastery of computer programs and a lot of diligence to achieve good final results, which the candidate possesses. Chief Assistant Professor Krastin Yordanov is a highly ethical and well-intentioned colleague who can successfully work in a team and enjoys a very good attitude from the students.

### **Conclusion**

Based on my in-depth familiarization with the presented scientific production, the achieved results and scientific-applied and applied contributions and the fulfillment of the minimum national requirements, according to the law and the regulations for the growth of the academic staff, I find it reasonable to propose to the Honorable Scientific Jury under the procedure to propose of the Faculty Council of the Shipbuilding Faculty at TU - Varna Chief Assistant Professor Ph.D., Eng. Krastin Krasimirov Yordanov to be elected and hold an academic position "Associate Professor" in the professional field 5.4 Energetics, scientific specialty "Industrial Heat Engineering".

Date: 01.06.2023г.

Заличена информация  
по Регламент (ЕС)  
2016/679  
Reviewer  
/ Full prof. L. Zashkova /