

# REVIEW

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for participation in a competition for an academic position “Associate professor” posted at DV issue 67/28.07.2020

Scientific field – Technical sciences

Professional field – Mechanical Engineering

Scientific specialty Manufacturing technology

Applicant: **Assist. Professor Eng. Tanya Georgieva Avramova, PhD**

Reviewer: Prof. Mihail Kolev Karshakov, PhD

determined by Order 438/08.10.2020 of the Rector of TU - Varna

## **1. Background and biography data**

The competition was announced by the AC of TU–Varna with a decision of 06.07.2020 for the needs of the Department TMTM at faculty of MET at the proposal of the department from 30.10.2019 and is published on the website of TU. On the announced competition, documents were submitted by only one applicant – Assist. Professor Eng. Tanya Georgieva Avramova, PhD – assistant in the dept.

Assist. Professor Eng. Tanya Georgieva Avramova, PhD was born in Varna in 1985. She received his secondary education at the Atanas Radev Mathematical High School in the town of Yambol, profile - natural and mathematical sciences. She graduated from the Technical University of Varna as a Mechanical Engineer: in 2008 - Bachelor's degree in "Manufacturing Engineering and Technology"; in 2010 - Master's degree in the same specialty. In 2009 she held the competitive position of "assistant" at the dept. TMTM of TU–Varna, where in 2014 she defended her doctoral thesis on the topic "Management of quality parameters of treated surfaces through the application of combined technological impacts” and acquired educational and scientific degree "doctor" in the scientific field 5.1 Mechanical Engineering in specialty Manufacturing technology.

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

The applicant has submitted for participation in the competition a total of 33 scientific works, one textbook, two teaching tutorials, two registered utility models and a list of 7 research developments, of which two educational projects and five scientific research projects. The scientific works include: 1 independent monograph, published in 2019 (ISBN 978-954-760-490-2), 24 scientific publications after the defense of a doctoral thesis and 8 scientific publications before the defense. I accept for review the publications (24 pcs.) outside the dissertation, and for the final evaluation I report, but I do not review the textbook, teaching tutorials, utility models and the monograph.

I do not accept for review the publications (8 pcs.) on the doctoral thesis. Of the publications accepted for review, 16 are in English - 4 of them have been reported at scientific conferences abroad, 8 have been published in international scientific journals abroad and 4 - in international scientific journals in Bulgaria. The other 8 publications are in Bulgaria, of which 3 have been reported at international scientific conferences and 5 have been published in scientific journals. Of the publications in English, 4 are in scientific journals, which are referenced and indexed in world-famous databases of scientific information. All publications are on the topic of the announced competition.

From the analysis of the described, as well as of the other submitted materials, it is established that the applicant fully meets the national requirements according to PPZRASRB, which is illustrated by the table below.

Group of indicators	Content	Minimum requirements for acquisition of academic position "Associate Professor"	Number of points of the applicant
A	Indicator 1	50	50
Б	Indicator 2	—	-
B	Indicator 3 or 4	100	100
Г	Sum of indicators from 5 to 11,	200	378,34
Д	Sum of indicators from 12 to 15	50	66
E	Sum of indicators from 16 to 28,	—	130
Ж	Indicator 29	30	307

The table shows that the minimum required numbers of points, according to PURZAD of TU-Varna, for holding the academic position of "Associate Professor" are met. Moreover, the main activities for a university lecturer are significantly over fulfilled - for lectures (group Ж) 10 times, and for scientific publications (group Г) almost 2 times. In addition, there are (group E - 130 points) design and publishing activities for which for the academic position of "Associate Professor" is no implementation required.

### **3. General characteristics of the research and scientific applications activity of the applicant.**

The presented and accepted for review scientific work of Assistant Professor Avramova, PhD provides an opportunity to establish that her research interests and activities cover the following areas:

- Cutting theory;
- Tools for machining parts with complex configuration;
- Study of the influence of the geometrical parameters of cutting tools by means of modeling in the environment of Solid Works;
- Milling of complex surfaces;
- Surface plastic deformation and its combination with cutting;
- Combined tools for machining holes;

- Application of software products for design and analysis of processes, parts and equipment.

Relevant publications are indicated for each of the areas. From the acquaintance with their content a complex approach is established in solving the technical problems both in terms of shaping and the formation of appropriate characteristics of the quality of the surfaces of the parts, i.e. object of scientific interest are the main aspects of turning the blanks into finished parts. In two thirds of the scientific publications the applicant is an independent author or is the first co-author, which eloquently speaks of a decisive contribution to scientific research.

The scientific applied activity of Assistant Professor Avramova, PhD is realized in two directions. One is the practical implementation of two tools for final machining of hydraulic cylinders in the company "C Pro" Ltd. - Varna (for which there is a confirmation document, but not listed economic effect), registered as utility models, and the other direction is participation in the development of 5 scientific research projects, two of which (2018-2019) she was the head of. This activity may include the monographic work (Finishing operations by sliding friction at the machining of holes), which largely reflects the experience and achieved research results in the final machining of holes with high quality requirements for their surfaces and can be used in engineering practice. The achievements in this activity show that the applicant has built enough knowledge and skills for their practical application and can create and lead a team to solve research and production tasks.

#### **4. Assessment of the pedagogical preparation and activity of the applicant**

The teaching commitment of the applicant is impressive in volume and variety and can hardly be covered in one review, but I will note some quantitative parameters for the period 2009 - 2019.

Conducted lectures:

- For Bachelor's degree – 4 disciplines in 3 specialties II, III and IV course;
- For Master's degree – 6 disciplines in 3 specialties.

Conducted laboratory exercises:

- For Bachelor's degree – 24 disciplines in 6 specialties I, II, III and IV course;
- For Master's degree – 5 disciplines in 2 specialties.

Classes are held with students full-time and part-time.

Developed lecture courses: 7 courses for 3 specialties I, III and IV course.

Developed courses for laboratory exercises: 5 courses and 1 course work on 3 specialties III and IV courses

Participation in curriculum development:

- For Bachelor's degree – 8 disciplines in 4 specialties;
- For Master's degree – 3 disciplines in 1 specialty.

Leadership of graduates:

- For Bachelor's degree (2012-2016) – 26 graduates in 2 specialties;
- For Master's degree (2016-2019) – 14 graduates in 2 specialties.

The applicant has a major contribution to building partnerships and concluding contracts with 5 companies from Varna and the region for conducting practical classes with students outside TU.

In addition to this activity, she has commitments such as: head of master's courses; academic mentor in two educational projects under two EU operational programs; 4 specializations and training of Erasmus students.

Behind these formal indicators is obviously hard and tiring work with students and the young people have adequately assessed the teaching and human qualities of the applicant with a diploma from the Student Council of TU - Varna for "Strict but fair lecturer" for 2016. There are other diplomas in this spirit that I do not intend to comment on.

For the period 2016 - 2019 she is charged (with orders of the Rector of TU - Varna) with the following responsibilities:

- The candidate-student campaign of faculty of MET;
- The academic work in the Master's Degree at the Department of TMTM;
- Person in charge for III and IV course of CTME specialty;
- Doctoral and program accreditations.

Everything so far (and more) is supported by undoubted documents. Considering that Assistant Professor Avramova, PhD is a co-author of educational literature (one textbook and two teaching tutorials for laboratory exercises in the disciplines she teaches), I can confidently say that she has gained the necessary teaching experience and pedagogical skills that allow her to work fruitfully with students studying mechanical engineering and technology.

## **5. Major scientific and applied science contributions**

The contributions in the scientific work of the applicant accepted for review are grouped according to the existing classification and for each of them are indicated the type (**H** – scientific; **HP** – scientific applied; **P** – applied) and the scientific publications (B1 - B24) in which it is formulated, according to the attached reference (documents 7 and 8). The most important of them are:

### **Creation of new classifications, research methods, new designs and technologies.**

1. New methods for high-speed milling have been developed and equations describing the trajectory of the relative working motion of the points from the main cutting edge of the tool have been derived, allowing the determination of the clearance angle for convex and concave surfaces. **HP** (B1,B2)
2. A new approach has been developed in determining the safety factors and strength conditions of combined tools with consistent impact. **HP** (B3)
3. Derived are dependencies for determining the forces acting on the guide-smoothing elements operating in sliding friction, allowing the design of such tools. **H** (B4)

4. A new tool for smoothing the surfaces of cylindrical holes, working in sliding friction conditions, has been created. **НП** (Б4,Б5)
5. A method for selection of tools for machining parts with complex configuration with prediction of surface accuracy has been developed. **НП** (Б8,Б9)
6. A methodology for calculating the working angles of cutting tools with replaceable cutting inserts has been developed, provided by software for automated design of non-monolithic tools. **НП** (Б8, Б10)
7. A theory for analytical determination of chip compression and plastic deformation coefficients for single-edge drills has been developed. **НП** (Б11, Б12)
8. A new approach has been chosen for calculating the coefficient of non-uniformity in face milling, based on modeling of the tool and machining conditions. **НП** (Б14)
9. A strength analysis of elements of the construction of cutting tools is made, which takes into account the change of the physical and mechanical properties of the materials used depending on the operating temperature. **П** (Б16).

**Proving with new means of significant new sides in existing scientific problems and theories.**

10. Mathematical dependences for determination of the system of forces acting on the construction of an annular drill working with support rollers are derived and a methodology for its designing is created. **НП** (Б19)
11. An improved compressor wheel design has been developed in the Solid Works Simulation Flow software environment and has been proven to provide 12% higher efficiency in terms of turbocharger power. **П** (Б20)
12. A methodology for automated design of a portable router machine with CNC has been created, allowing quick and easy production and efficient use in single and small series productions. **П** (Б21)

**Creation of new classifications, methods, designs, technologies.**

13. The necessity of a new standard in determining the parameters of the roughness of surfaces with regular microrelief has been proved, which should take into account the peculiarities of this type of surfaces and to guarantee the reliability of the measurement result. **П** (Б22)
14. A tool for combined machining of holes by boring and surface plastic deformation is designed. **П** (Б7)
15. A dynamometric tool for experimental research has been created, the results of which allow choosing an optimal design variant of a boring tool with guide-smoothing elements. **П** (Б6)
16. A technology for machining holes with forced vibrations of the tool has been developed **Н** (Б18)
17. A tool for machining impassable conical holes by surface plastic deformation is designed. **П** (Б15)

18. A methodology for studying the technological capabilities of the air-plasma cutting and chopping method has been developed. П (Б23)

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

The contributions (H – 2; HП – 8; П – 8) in the scientific works of Assistant Professor Avramova, PhD are relevant and significant and enrich the mechanical engineering science and practice in this direction, which contributes to the improvement of the production environment and are in unison with modern means of applying engineering work. They contribute to the development and improvement of the learning process in the training of engineers needed for both production in mechanical engineering and science research.

Considering that two thirds of the scientific publications are in English, which the applicant uses well enough (see item 2) and have been published in foreign journals or have been reported at international scientific conferences in Bulgaria and abroad, I definitely think that it is well known in the scientific community. The number of cited publications, especially those in which she is the sole author, also gives me grounds for recognition in these circles.

#### **7. Critical remarks and recommendations.**

In the works of the applicant I did not find omissions of a principled or debatable nature. I will mention some often committed by young scientists oversights in view of its future publications.

1. The size of the figures illustrating the text of the publications as well as the designations to them must be chosen so as not to hinder its perception.
2. The conclusions in some of the publications are too concise and sound like findings that repeat the statement - it is necessary to formulate more precisely, summarizing the results of the study.
3. In the concluding part of publication Б11, an inaccurate statement was made about the shortening of the chips, which obviously contradicts the results of the conducted research and is probably an act of negligence.
4. In publication Б19 a force analysis of the load of ring drills is made using a mixed letter designation of the cutting forces - according to the old and the current designation systems.
5. The applicant's scientific publications cover a relatively wide range of technical issues, which is useful and normal in the first habilitation, but it would be good in the future, her scientific interests to find a narrower direction in which, deepening, to achieve even more significant results.

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

My personal impressions of Assistant Professor Avramova, PhD are built mainly from what is contained in the materials of the competition. They are presented with completeness and accuracy, which I have very rarely encountered in my many years of practice as a reviewer. In addition, they reflect a significant volume and content of

scientific and teaching work, combined with a rich public activity. The latter did not go unnoticed by the university management, which can be seen from the diploma awarded by the Rector "excellence and active public work in order to increase the prestige of TU – Varna." All this confirms my opinion that Assistant Professor Avramova, PhD has the human and professional qualities necessary for responsible teaching and deserves to win the competition.

## **CONCLUSION**

I highly appreciate both the educational and pedagogical work of the applicant and her scientific work, in which sufficient contributions of scientific and practical significance have been highlighted. Based on the acquaintance with the presented scientific papers, their significance, the scientific, applied and applied contributions contained in them, I find it reasonable **to propose Tanya Georgieva Avramova, PhD to take the academic position of "Associate Professor"** in the professional field 5.1. Mechanical Engineering in the specialty Manufacturing Technologies.

**Date:**

Ruse

**REVIEWER:**

/Prof. M. Karshakov, PhD/