

REVIEW

on the materials submitted for participation in a competition for „Associate Professor“ in the field of higher education 5. Technical sciences, Professional field 5.13 General engineering, in the study discipline „Engineering methods for modeling and analysis“

In the competition for Associate Professor, published in the State Gazette, 53/20.06.2023 for the needs of the Department of „Engineering technology and metal cutting machines“ (ETMCM) at the Faculty of Mechanical Technology (FMT), Chief Assist. Prof. Maria Ivanova Konsulova-Bakalova, PhD., from Department of ETMCM at FMT participates as a candidate.

1. Brief biographical data for the candidate.

Chief Assist. Prof. Maria Bakalova, PhD, was born on 04.10.1978. She graduated in 2001 as a master engineer a specialty “Electronic engineering and microelectronics” at TU-Varna. From 2003 to 2007, she was a full-time doctoral student in the specialty 02.21.07 "Automated systems for information processing and control" at TU-Varna, and at the beginning of 2008 she received the PhD degree. In 2008, she was a part-time assistant in the discipline "CAE Systems for Thermal Engineering Calculations", and from 2009 to the present she is the Chief Assistant at the Department of "Mechanical Engineering Technology and Metal Cutting Machines" at TU-Varna.

She has taught classes in a number of disciplines in the field of automation of engineering work and systems for automated design. She participated in the training of foreign students and those under the Erasmus+ program. She is fluent in English, German and Russian.

She works excellently or very well with MS Office - Word, Excel, Power Point, and also with software products for 2D and 3D modeling - AutoCAD, SolidWorks, MATLAB and in e-learning environments: MS Teams, Google Classroom, Shkolo, etc. She is a member of the "Mechanical Engineering and Technologies" society at the Federation of Scientific and Technical Unions in Bulgaria.

2. General description of the presented materials.

For participation in the competition for the academic position "Associate Professor" Chief Assist. Prof. M. Konsulova-Bakalova has submitted all the required documents and materials according to the Regulations for the terms and conditions for holding academic positions in TU-Varna from 2022, formatted as 107 separate files in .pdf format, a significant part of which contain several types of scanned documents and materials.

2.1. Characteristics of the published scientific results submitted for participation in the competition.

Chief Assist. Prof. M. Konsulova-Bakalova has submitted the following materials for participation in the competition for the academic position " Associate Professor":

Гл. ас. д-р Мария Консулова-Бакалова е представила за участие в конкурса за академичната длъжност „доцент“ следните материали:

- Monographs – 1 individual 234 pages published in 2021;
- Textbooks – 0;
- Learning materials – 5 pcs.: 2 individual 145 pages from 2014 and 142 pages from 2018, and also 3 pcs. with 1 co-author: 205 pages from 2010, 82 pages from 2010 and 160 pages from 2021;

- Publications (articles and reports at scientific forums) – 44;
- Projects – 11 pcs. (7 research, 3 educational and 1 infrastructural).

The monograph and all 44 articles and reports at scientific forums are accepted for review, as they are entirely or largely relevant to the study discipline of the competition. The study guide issued individually in 2014, as well as the collective one issued in 2021, are also accepted for review.

The remaining 3 pcs. of the above-mentioned study guides are not accepted for evaluation, as they were used during the registration of M. Konsulova-Bakalova at the NACID. With this registration, she also contributed 3 books, 38 journal articles and 11 reports to scientific forums.

The 5 publications related to the PhD Thesis of the candidate are also not evaluated.

In the presented 1 individual monograph with the title "Automation of engineering work. Automated design and analysis" and a volume of 234 pages in a suitable, organically interconnected manner, a number of basic scientific results of the research work of M. Konsulova-Bakalova have been included. This paper is not evaluated by us in detail below, as it was peer-reviewed by two professors before its publication. From the attached scanned copies of the two reviews of the manuscript of the monographic work, it can be seen that the both reviews are entirely positive.

I fully share the conclusions of these reviews, namely that the monograph is a well-formed and fully completed scientific product and that it is of a high theoretical level and has specific practical applicability.

At our request Chief Assist. Prof. M. Konsulova-Bakalova subjected the text of the monograph to a plagiarism check with the help of the powerful software product "AntiPlagiarism.NET". My e-mailed extensive result of this check with marked segments in it shows the presence of 97% uniqueness of the text, which testifies to the practical absence in it of plagiarism and self-plagiarism from own already published articles and reports reflected in the monograph.

A total of 44 articles and reports submitted to scientific forums at home and abroad are classified as follows:

By type:

- Publications in scientific journals and university papers – **31** бр.;
- Publications in proceedings of scientific forums – **13** бр.

By significance:

- Articles in magazines with Impact Factor – **0** бр.;
- Articles in journals and in proceedings of international scientific forums, which are referenced and indexed in Web of Science (WoS) and SCOPUS – **10** бр.;
- Articles in journals without Impact Factor, in scientific annals of universities, and in journals, which are not referenced and indexed in WoS and SCOPUS – **4** бр.;
- Papers in proceedings of scientific forums without Impact Factor and without referencing and indexing in WoS and SCOPUS – **30** бр.

Place of publication:

- All 10 articles and reports referenced in WoS and SCOPUS are collective and published in English abroad. In 1 issue the candidate is the first co-author, in 3 issues she is the second, in 4 issues she is the third, and in 1 issue she is the fourth and fifth co-author;
- Of the 34 articles in Bulgarian and foreign journals and collections of scientific forums, referenced outside of WoS and SCOPUS, 32 were published in Bulgaria and 2 abroad. Of these, 6 are in English and 28 in Bulgarian.

Publishing language:

- In Bulgarian – 27 бр.;
- In a foreign (English) language – 17 бр.

Number of co-authors:

- Stand alone – 4: 2 in English and 2 in Bulgarian;
- With one co-author – 19: 8 in English and 1 in Bulgarian;
- С двама съавтори – 8 бр. От тях 2 е на английски и 6 – на български език;
- With two co-authors – 8: 2 in English and 6 in Bulgarian;
- With three or more co-authors – 13: 6 in English and 7 in Bulgarian.

2.2 Participation in scientific, scientific-applied and educational projects.

Chief Assist. Prof. M. Konsulova-Bakalova has submitted an author reference, scanned copies of her employment contracts with TU-Varna from 2009, 2015, 2017, 2019 (2 copies), 2020 and 2022 and certificates of her participation as a postdoctoral student and contractor in 3 national educational projects financed by the European Social Fund of the EU under OP "Development of Human Resources", namely: project BG 051PO 001 - 4.3.04-0014 with the name "New electronic forms for training at the Technical University-Varna" in 2013; project BG 051PO 001 - 3.1.08-0014 entitled "Development and improvement of the management system of TU-Varna" in 2014 and project No. BG051PO001-3.3.06-0005 "Development of the potential of doctoral students, postdoctoral students, young scientists and graduates of engineering sciences at TU-Varna and their contribution to the development of a knowledge-based economy".

Appropriate documents were also presented, certifying that M. Konsulova-Bakalova was the head of a research project funded by TU-Varna called "Automated system for the study and design of machine-building structures", and she was also a participant in the implementation of 5 similar projects funded by TU-Varna, the topics of which are relevant to the competition. In 2019, she also participated in the implementation of a scientific research project funded by the National Institute of Scientific Research No. KP-06-H37/1/06.12.2019 "Ergonomic study of the working environment through innovative computer models, with the aim of preventing musculoskeletal disorders". In 2021 and 2022, she also participated in 1 infrastructure project to create a center for training and certification of students, doctoral students and teachers in CAD systems.

2.3 Reflection of scientific publications in the literature (known citations).

Chief Assist. Prof. M. Konsulova-Bakalova presented a list and evidentiary material for a total of 52 citations of 24 of her publications. Citations are made as follows:

- In journals and collections of scientific forums referenced in WoS and Scopus – 23 items;
- In monographs and collective volumes with scientific review – 12 items;
- In publications not referred to in WoS and Scopus with scientific review – 17 items.

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

The above, together with those presented by Chief Assistant Professor M. Konsulova-Bakalova, other data on the results of her work shows that her scientific, scientific-applied and publication activity is significant both in terms of quantitative and qualitative characteristics, namely:

1. In the individual scientific monographs in a volume of 234 pages, modern knowledge of the study discipline of the competition is represented in an accessible language for a wide range of scientific specialists, constructors, designers, doctoral students and students. The fact that numerous results achieved by the candidate in her long-term research work are reflected in this work is particularly valuable.

2. The achieved significant scientific and scientific-applied results have been widely promoted in a total of 44 publications in the form of articles in scientific journals and as reports in proceedings of scientific forums. Of these publications, 10 pcs. are in issues referenced and indexed in WoS and Scopus.

3. Chief Assist. Prof. M. Konsulova-Bakalova has actively and fruitfully participated in a total of 11 projects: 3 educational projects funded under the EU OP, 1 research project funded by the National Institute of Scientific Research, 6 research projects funded by TU-Varna, one of which she was the head of, and also 1 infrastructure project.

4. In total 52 citations (23 of which in publications referenced in WoS and Scopus and 12 in monographs and peer-reviewed collective volumes) of a total of 24 of her publications have been identified and documented.

4. Evaluation of the candidate's pedagogical training and activity.

Chief Assist. Prof. M. Konsulova-Bakalova has presented reports on her educational and pedagogical workload in bachelor and master full-time and part-time studies at TU-Varna during the last 3 academic years. Then she gave lectures and practical classes with the students in the following 11 academic disciplines:

- Fundamentals of automated design in mechanical engineering;
- 3D modeling;
- Three-dimensional modeling;
- Information technologies and systems;
- Computer systems for mechanical engineering;
- Visualization modeling of technological objects;
- Visualization modeling and design in mechanical engineering;
- Electrotechnical documentation;
- Computer engineering analyses;
- Engineering methods for modeling and analysis;
- Modeling of elements of the injection molding process.

The specified academic disciplines were taught to students from a total of 13 specialities.

In her report on the implementation of minimum national requirements for the occupation of the academic position "associate professor" for the field of higher education 5. Technical sciences, M. Konsulova-Bakalova has indicated and numerically substantiated for the indicator "Ж.29" a total of 512 hours as a horary of the lectures she led at TU-Varna for the last three years.

For the individual academic years, the number of lecture hours conducted by her is as follows:

- 226 hours in the academic year 2020/2021;
- 183 hours in the academic year 2021/2022;
- 103 hours in the academic year 2022/2023.

An author's reference was also presented by the candidate for 26 modifications of the study programs for a total of 11 disciplines taught by her, which were prepared in co-authorship in the period 2020-2023 in accordance with the current study plans in TU-Varna. Two separate files with the contents of the updated study programs are presented.

Also presented is a file with the names of lecture courses and laboratory exercises on the 26 modifications of the 11 academic disciplines (5 for bachelor and 6 for master degree), as well as 1 term paper, developed by the candidate through the specified period.

Chief Assist. Prof. M. Konsulova-Bakalova was the academic supervisor of the diploma theses of 29 students (24 in the bachelor and 5 in the master degree). She has prepared a total of 40 reviews of diploma theses: 29 in the bachelor and 11 in the master programs. She participated in the state examination commissions for the MTM (2018 and 2019) and TMMM (2019-2023) departments, as well as in the Risk Assessment Commission (2023).

In 2018, she carried out mobility under the Erasmus+ program to study at Gotse Delchev University, Shtip, North Macedonia.

5. Basic scientific and scientific-applied contributions.

After carefully analyzing the results presented in the 1 monograph, 2 teaching materials and all 44 publications presented by the candidate in journals and proceedings of scientific forums accepted for evaluation in my review, I believe that:

- **As a scientific contribution**, the creation of simulation models for the study and analysis of thermal processes in the study of the state and processes of air plasma cutting, welding and nitriding can be considered.

- The following can be accepted as main **scientific-applied contributions** with a significant participation of the candidate in them:

In the presented monograph:

1. Proving and improving new sides and capabilities of existing scientific research methods, consisting in obtaining and applying a new approach for the joint use of procedures for data preparation, clustering and reducing the dimensionality of tasks with known software products for design and simulation analyses.

2. Establishing new facts and approaches for reducing the dimensionality of factor spaces in complex multidimensional objects using singular decomposition and orthogonal transformations of real physical systems and descriptions.

3. Obtaining with the help of CAD/CAE systems and using confirmatory facts in the solution of a wide range of tasks: study of heat distribution during and after welding, design and simulation of the load of a towing device, study of cutting tools, computer analyzes in the design of a reducer, fluid analysis for power unit research, injection molding simulation.

In the presented articles and reports in scientific forums:

1. Development of methods and technologies for obtaining new and confirmatory facts proving the possibilities of applying CAD/CAE systems in designing in a wide range of areas and physical implementations, namely: computer technologies in designing in the SolidWorks environment of engineering products; computer simulations in the analysis of cutting tools; computer technologies in the design of injection products.

2. Development of own software program for processing and recognition of one-dimensional and multi-dimensional signals and application of the same in the study of automated systems for information processing and control in the following areas: intelligent measurement systems,

visualization of data and feedback, assessment of the state of ecosystems and of systems for diagnostics of stationary and transport energy.

• The following can be accepted as **applied contributions** with a significant participation of the candidate in them:

1. Conducting tests on engineering products and technologies in real or laboratory conditions and technological processes such as: cutting zone of tools when making holes; structure and physical-mechanical properties of welding joints; optimization of the mass of the housing of a two-stage reducer; determination of the abrasion resistance of welding layers, as well as the quality of surfaces obtained by thermal cutting.

2. Implementation of modern training methods in engineering specialties and own scientific-applied results obtained during research into educational practice, namely: combining various software products in the learning process, introducing effective electronic and distance learning in automated design and calculations in mechanical engineering and others.

In the total of 47 works evaluated in this review, written only by her, there are 1 monograph, 1 textbook and 4 publications in journals and proceedings of scientific forums. In 16 publications and 1 learning material she is the first co-author and in 16 papers she is the second co-author. This gives me reason to assume that the contributions noted above are her personal work or were achieved with her active participation.

The results of the plagiarism check using the product "AntiPlagiarism.NET" show the presence of 97% uniqueness of the text of the monograph, which testifies to its practical absence of plagiarism and self-plagiarism from own already published by the candidate articles and reports, appropriately reflected in this monograph.

6. Significance of contributions to science and practice.

The above, and especially in item 5 of this review, testifies to the achievement of Chief Assist. Prof. M. Konsulova-Bakalova, for significant contributions to science, practice and modern education of students.

The candidate's scientific publications form 439.82 points in the reference for the fulfillment of minimum national requirements (MNR) for the occupation of the academic position of "associate professor" for the field of higher education 5. Technical sciences, which is **2.2 times more than MNR** for an associate professor in professional field 5.13 General engineering.

The documented 52 citations (23 of which in publications referenced in WoS and Scopus and 12 in monographs and collective volumes with scientific review) **of a total of 24 of her publications form a total of 300 points** in the reference, which is **6 times more than the MNR** for an associate professor in professional field 5.13 General engineering. This testifies to a relatively good recognizability of Chief Assist. Prof. M. Konsulova-Bakalova, in the international scientific space.

In the last 3 academic years, the total number of lecture hours she delivered in 11 academic disciplines (6 in the bachelor and 5 in the master degree) amounts to 512 hours, i.e. an average of **170.7 hours per year. This workload is 5.7 times greater than the minimum required annual hourary of 30 lecture hours.** During this period, **she participated in the development and updating of a total of 26 modifications of 11 study programs** in accordance with the current study plans at TU-Varna, as well as in the development of 1 term paper **and lecture courses and laboratory exercises in 14 study disciplines.**

Chief Assist. Prof. M. Konsulova-Bakalova was the **scientific supervisor of the diploma theses of 29 students**, prepared a total of **40 reviews of diploma theses** and was the **consultant of 1 doctoral student** with a dissertation topic relevant to the study discipline in the competition.

She participated in state examination committees for 2 departments, as well as in the Risk Assessment Committee.

7. Critical notes and recommendations.

In the assessed works and in the well-formed materials presented by Chief Assist. Prof. M. Konsulova-Bakalova, I did not find any significant omissions. All 107 files with documents and materials related to the competition are designed extremely carefully and with completeness, facilitating the analysis and evaluation of the multifaceted fruitful activity of the candidate.

I allow myself to make the recommendation in the future ch. assistant professor Chief Assist. Prof. M. Konsulova-Bakalova to direct more scientific works for publication not only and primarily in publications referenced in WoS and SCOPUS, but also especially in those with an Impact Factor, which would be very prestigious for the department, the faculty and the university. In addition, she should also engage in scientific supervision of dissertation works in the extremely current and promising subject of the competition's academic discipline.

8. Personal impressions and opinion of the review.

I do not personally know Chief Assist. Prof. Maria Konsulova-Bakalova.

CONCLUSION

The proven timelines, relevance and significance of the achieved scientific, pedagogical, scientific-applied and applied results from Chief Assist. Prof. Maria Konsulova-Bakalova, their importance for practice and the educational process, the reflection of these results through citations in numerous scientific publications abroad and in our country gives me reason to consider that all the requirements of the Law on the Development of Academic composition and of the Regulations for the terms and conditions for occupying academic positions at TU-Varna for the academic position of "Associate Professor" are not only fulfilled, but also significantly exceeded.

On the basis of this, I confidently propose Chief Assist. Prof. Maria Konsulova-Bakalova, Ph.D., to be elected as an "Associate Professor" in the study discipline "Engineering Methods for Modeling and Analysis" in Professional field 5.13 General Engineering.

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Prof. Nencho Deliyiski, DSc.

Signed by: Nencho Stanev Deliyiski