S T A T E M E N T

on the competition for the academic position of Professor in the professional field 4.5. Mathematics (Computational Mathematics) at the Technical University of Gabrovo, announced in the State Gazette, Issue 48 of June 13, 2025,

prepared by Prof. DSc Nadya Peycheva Zlateva, Faculty of Mathematics and Informatics, Sofia University St. Kliment Ohridski,
member of the scientific jury according to Order No. 3-01-387/19.09.2025 of the Rector of the Technical University - Gabrovo.

The only applicant in the competition is **Assoc. Prof. DSc Milena Radoslavova Racheva** from the Technical University of Gabrovo.

1. Application details

The documents submitted by the candidate meet all requirements of the Law for the Development of the Academic Staff in the Republic of Bulgaria (LDASRB), its regulations, and the internal rules of TU-Gabrovo. Assoc. Prof. Racheva submitted a list of **37 scientific publications**. According to the provided documentation, her application fully satisfies the criteria for the academic position of Professor as defined in the relevant legislation.

2. Biographical data and academic background

Milena Racheva graduated in Mathematics with a specialization in Mathematical Modelling from the Faculty of Mathematics and Informatics, Sofia University St. Kliment Ohridski in 1992. In 2003, she obtained a PhD degree in Computational Mathematics from the Institute for Parallel Processing, Bulgarian Academy of Sciences (BAS), with a dissertation entitled *Numerical Analysis and Applications of Elliptic Spectral Problems of Fourth Order*. In 2014, she defended a DSc thesis in Mathematics at the Institute of Information and Communication Technologies, BAS, on the topic *New Approaches in Finite Element Analysis of Elliptic Problems*. Both theses belong to the field of Computational Mathematics.

Between 1994 and 2006 she held consecutively the positions of Assistant, Senior Assistant, and Chief Assistant, and since 2006 she has been an Associate Professor at TU-Gabrovo. During 2004-2005 she conducted a specialization at *Chalmers University of Technology*, Gothenburg, Sweden.

3. General characteristics of the scientific output and achievements

The submitted publications are entirely within the field of computational mathematics and are directly related to the topic of the competition. No plagiarism has been found. The presented works are original and not overlapping with those used in previous academic procedures. The quantitative indicators exceed the minimum national requirements (Article 2b, Paragraphs 2-3 of LDASRB). The indicative point distribution is as follows: Category B – 120 points (from papers 8.1-8.4, 30 points each) with a required minimum of 100; Category G – 411 points (from papers 8.12, 8.16, 8.17 – 18 points each; papers 8.5, 8.7, 8.8, 8.11, 8.13-8.15 – 30 points each; papers 8.9, 8.10 – 36 points each; and paper 8.6 – 75 points), where 200 points are required; Category D

– 752 points (from 92 citations in WoS and/or Scopus and 4 citations in Zentralblatt), where 100 points are required.

Of the 37 publications, 5 are single-authored, and three papers (8.6, 8.9, 8.10) are published in journals with impact factor. According to the documentation, Assoc. Prof. Racheva has participated in 4 national research projects, has led 4 university research projects, has supervised one successfully defended PhD student, and is author or co-author of two university textbooks. These meet the additional requirements of TU-Gabrovo for the position of Professor.

Assoc. Prof. Racheva has very good international visibility. In Scopus she has 36 indexed papers with 124 independent citations, and in WoS Core Collection – 29 papers with 103 citations. Of particular note is paper 8.6, published in *Computer Methods in Applied Mechanics and Engineering*, a 20 years Q1-ranked journal in WoS for the categories *Engineering, Multidisciplinary* and *Mathematics, Interdisciplinary Applications*, cited more than 50 times.

4. Teaching activity

Assoc. Prof. Racheva teaches a wide range of mathematics courses at TU-Gabrovo. She developed, jointly with Assoc. Prof. Rachev, the course *Modern Mathematical Methods for Electrical Engineers* (taught since 2011 in the MSc programme *Electrical Power Engineering and Equipment*), and together with Prof. Sadinov – the course *Applied Mathematics* (taught since 2018 in two Bachelor programmes). For the latter course she introduced the use of *Wolfram Cloud* in laboratory exercises. She has also successfully co-supervised, with Assoc. Prof. S. Rachev, a PhD student in professional field 5.2, who defended in 2021.

5. Analysis of the scientific and applied research contributions

The submitted scientific works reflect long-term research in computational mathematics, focused on developing numerical methods for solving spectral problems and their engineering and energy applications.

Papers **8.1-8.4** and **8.14** propose a unified approach for linearization of quadratic Sturm-Liouville problems and for reducing the order of approximating polynomials through which it is found the spectra of even-order differential operators.

Papers **8.5-8.11**, **8.13**, **8.18-8.21**, **8.25** and **8.26** develop nonconforming finite element methods. Paper **8.6** applies a discontinuous Galerkin method to a complex integro-differential equation modeling fractional-order dynamic viscoelasticity. Stability and a priori error estimates are proved and confirmed by numerical experiments. This work has received wide recognition and served as a basis for further studies in dynamic and integro-differential modeling. Original algorithms are proposed for obtaining two-sided estimates of eigenvalues that yield both upper and lower bounds without re-solving the spectral problem. The main idea is to use integral rather than pointwise degrees of freedom. It is also shown that through post-processing and interpolation procedures, so-called ultraconvergence can be achieved, significantly improving numerical accuracy. An important contribution is also made in papers **8.16** and **8.17**, which study large-scale linear systems obtained via isoparametric finite element methods in the case of curved boundaries.

Other significant part of the results concerns mathematical modeling and numerical computations in engineering applications. Papers **8.22-8.24** and **8.27** present models of specific mechanical systems, where stability conditions and the influence of geometric and boundary parameters on the spectral characteristics are analyzed. These works

demonstrate the author's ability to effectively apply the developed numerical methods in engineering mechanics and in the analysis of dynamic structures.

Papers **8.12**, **8.15**, **8.28-8.29** and **8.32-8.34** address problems in the field of energy efficiency and renewable energy sources. Mathematical models are developed for evaluating the performance of small hydropower plants, photovoltaic systems and electric mobility, as well as for optimization of operating regimes.

In addition to the theoretical and applied studies, papers **8.30**, **8.31** and **8.35-8.37** are devoted to use of modern mathematical software tools and computer technologies. They explore platforms such as Wolfram Cloud and Wolfram Alpha for teaching, remote assessment, and visualization of mathematical models. Methods for approximation and analysis of harmonic functions via Fourier transforms are presented, emphasizing the importance of computational mathematics in the processing of experimental data and modeling of real processes.

Out of the 37 publications, 5 are single-authored, 18 are co-authored with Prof. A. Andreev (her PhD supervisor), and the rest with various collaborators, which demonstrates Assoc. Prof. Racheva's ability to work both independently and as part of a research team. Her contribution to co-authored works appears to be equivalent and substantial.

6. Personal impressions I do not personally know Assoc. Prof. Racheva. The documentation submitted for the competition was carefully prepared and complete.

7. Conclusion After reviewing all materials submitted for the competition and analyzing the scientific and applied contributions of the works, I confirm that the achievements of Assoc. Prof. DSc. Milena Racheva fully meet the requirements of the Law for the Development of the Academic Staff, its regulations, and the internal rules of TU-Gabrovo for appointment to the academic position of **professor** in professional field 4.5. Mathematics (Computational Mathematics). The candidate meets all national minimum requirements, and no plagiarism has been detected in the submitted works.

I give a positive evaluation of the candidate and I recommend that the scientific jury propose to the competent body for the selection of the Technical University of Gabrovo to elect Assoc. Prof. DSc Milena Radoslavova Racheva to occupy the academic position of Professor in professional field 4.5 Mathematics (Computational Mathematics).

Sofia, October 17, 2025 /Prof. DSc Nadya Zlateva/