



REVIEW

of the materials submitted for participation in the competition for „Professor“ in the field of higher education 5. Technical sciences, Professional field 5.13 General engineering, scientific specialty „Applied mechanics” in the discipline „Mechanics”

In the competition for professor, published in the State Gazette 101/27.12.2019 and on the site of the University of Forestry with the code WWI-P-1119-28 for the needs of the Department of „Mathematics and Physics” at the Faculty of Forest Industry, as a candidate participates Assoc. Prof. Georgi Yordanov Vukov, PhD., Faculty of Forest Industry, Department of „Mathematics and Physics”

Reviewer: Nencho Stanev Deliiski, Ph.D., D.Sc., Professor in a Professional Field 5.1 Mechanical Engineering, from University of Forestry / retired

1. Brief biographical data for the candidate

Assoc. Prof. Georgi Vukov, PhD, was born on 29.01.1960. He graduated in 1985 with a specialty „Industrial Heat Engineering” at the Technical University (TU) in Sofia with very high grades. From 1986 until 1987 he received a qualification of engineer-mathematic at the Institute for Applied Mathematics in TU-Sofia. From 1988 to 1991 he was a PhD student in the department of „Mechanics” of TU-Sofia and defended his degree at 1997.

From 1985 to 1988 he was an engineer-technologist at TU-Sofia in the field of development of equipment for the teaching process. From 1992 to 1998 he was a teacher in some subjects at the high vocational school „Princess Evdocia” in Sofia.

In 1999 he was an assistant and from 2000 onwards – head assistant and since 2002 up to now he has been an Assoc. Professor in the departments „Machine knowledge”, „Machine knowledge and automation of the production”, and „Mathematics and Physics” at the University of Forestry. During that time he has lectures and tutorials in the subjects „Mechanics”, „Theoretical Mechanics”, and „Strength of Materials”.

Assoc. Prof. Vukov speaks English and Russian. He is married and has 2 daughters.

2. Correspondence of the submitted documents and materials of the applicant according to the Rules of the Development of academic staff at the University of Forestry.

For the participation in the competition for receiving the degree Professor Assoc. Prof. Vukov has presented all required documents and materials according to the Rules of the Development of academic staff at the University of Forestry, i.e. 4 sets of paper documentation and 1 set of electronic files of a total of 26 types of documents and materials totaling 127 pages. Apart from the paper and electronic documents, he has submitted 82 publications for the competition and separately their summaries in Bulgarian and in English, and also proof of all known 63 citations of 30 of his publications.

3. Assessment of the candidate’s educational and pedagogical activities (work with students and PhD students)

The candidate has presented an official notice for his teaching workload during the last 2019/2020 school year, i.e.

a) 60 hours of lectures and 90 hours of tutorials for full-time studies in the subject „Mechanics” for Bachelor degree students;

b) 60 hours of lectures and 30 hours of tutorials for full-time studies, and also 32 hours of lectures and 14 hours of tutorials for part-time studies in the subject „Theoretical mechanics“ for Bachelor degree students;

c) 60 hours of lectures and 30 hours of tutorials for full-time studies, and also 32 hours of lectures and 14 hours of tutorials for part-time studies in the subject „Strength of Materials“ for Bachelor degree students;

In this official notice it can be seen what annual teaching and other activities the candidate has had in the past 10 years, which was between 393 and 566 hours.

It can be seen also that the candidate has had 18 hours lectures and 9 hours tutorials for full-time studies in the subject „Technical diagnostics“ for Master degree students during 2012/2013 and 2013/2014 school years. Besides that from 2009 to 2017 he has had lectures and tutorials for full-time and part-time studies in the subject „Metal knowledge“ for Bachelor degree students. The presented professional notices describe also the developed by the candidate in 2019/2020 school year three academic programs in the following subjects for Bachelor degree students:

- „Mechanics“ for specialty „Engineering design“;
- „Theoretical mechanics“ for specialty „Technology of wood and furniture“;
- „Strength of Materials“ for specialty „Technology of wood and furniture“.

Before that the candidate has developed an academic program in the subject „Technical diagnostics“ for Master degree students.

4. Assessment of candidate’s scientific, scientific-applied and publishing activities

General description of the presented materials

Candidate Assoc. Prof. Georgi Yordanov Vukov, PhD., participated in the competition with:

- Monographs – 1 individual 130 pages published in 2017;
- Textbooks – 4 individual and 2 with one co-author – all of them are for Bachelor studies. Two individual textbooks are with title “Theoretical mechanics”. They have 160 and 216 pages and are published in 2004 and 2011 respectively. The other two individual textbooks are with titles “Mechanics” (180 pages, 2010) and „Strength of Materials“ (122 pages, 2010). The two textbooks with one and the same co-author are: „Strength of Materials“ – brief course” (110 pages, 2010) and “Brief course of theoretical mechanics” (154 pages, 2011);
- Learning materials – 1 individual with solved tasks in the subject of theoretical mechanics, 76 pages published in 2007;
- Books – 0;
- Publications (articles and reports for scientific forums) – 74;
- Projects – 10.

4.1 Participation in scientific, scientific-applied and educational projects

Nine from the listed above 10 projects can be determined as scientific-researched and one of them – as scientific-applied project. Two scientific-researched projects, financed by the University of Forestry, are developed under supervision of the candidate. In the other eight projects he is only participant – two of them are financed by the University of Forestry and the other six – by the Bulgarian Academy of Sciences.

The topics of all ten projects are relevant to the scientific specialty of the present competition for professor.

4.2 Characterization of published scientific results

In the presented for the competition 1 monograph and 6 textbooks, a number of basic scientific results from the wide scientific research work of Assoc. Prof. Vukov during the past 17 years have been included in an appropriate manner.

These works have not been evaluated below because each of them has been reviewed prior to its publishing.

Five articles of the candidate (4 in English and 1 in Bulgarian), which are presented by the candidate but are not included in the Appendix 2 of the National Center for Information and Documentation (NACID) due to lack of ISSN or ISBN, have also not been evaluated below.

The presented by the candidate for participation in the competition of a total of 74 articles and reports in front of science forums in Bulgaria and abroad, have been published after he received the degree Assoc. Prof. and they can be classified as follows:

By type:

- Publications in scientific journals – **43**;
- Publications in proceedings of scientific forums – **31**;
- Scientifically popular publications – **0**.

By significance

- Articles in magazines with Impact Factor – **0**;
- Articles in journals and in proceedings of international scientific forums, which are referenced and indexed in Web of Science (WoS) and SCOPUS – **9**;
 - Articles in journals without Impact Factor, in scientific annals of universities, and in journals, which are not referenced and indexed in WoS and SCOPUS – **41**;
 - Papers in proceedings of scientific forums without Impact Factor and without referencing and indexing in WoS and SCOPUS – **24**;
 - Plenary reports – **0**.

Place of publication:

- Articles in Bulgarian and foreign journals, and in proceedings of scientific forums, which are referenced and indexed in WoS and SCOPUS – **9**. Two of them are published in one scientific journal in Slovakia and the other 7 are in proceedings of scientific forums – 3 in Croatia, 1 in Czech Republic, 1 in Slovakia, 1 in Rumania, and 1 in Bulgaria. All these publications are in English and are co-authored, in 3 of them the candidate is the first co-author, in 4 others he is the second co-author and in 2 he is the third co-author;
 - Articles in Bulgarian and foreign journals, and also in proceedings of scientific forums, which are referenced outside the WoS and SCOPUS – **27**. Nineteen of them are published in journals – 17 in Bulgaria and 2 in Romania; 4 of them are in the scientific annals of one Polish university, and the other 4 – in proceedings of international scientific forums (3 in Bulgaria and 1 in India);
 - Articles in non-referenced Bulgarian and foreign journals – **14**. Eleven of them are published in Bulgaria and 3 abroad – 2 in North Macedonia and 1 in Slovakia;
 - Publications in non-referenced scientific annals of universities and institutes – **0**.
 - Publications in non-referenced proceedings of international scientific forums – **23**. Nine of them are published in Bulgaria and 14 – abroad (9 in North Macedonia, 2 in Slovakia, 1 in Austria, 1 in Serbia, and 1 in Syria);

- Publications in proceedings of national scientific conferences, sessions, and seminars – 1.

Publishing language:

- In Bulgarian – **26**. Seven of them are individual and 19 are co-authored;
- In a foreign (English) language – **48**. Six of them are individual and 42 are co-authored.

Number of co-authors:

- Stand alone – **13**: 6 in English and 7 in Bulgarian;
- With one co-author – **29**: 16 in English and 13 in Bulgarian;
- With two co-authors – **15**: 12 in English and 3 in Bulgarian;
- With three or more co-authors – **17**: 14 in English and 3 in Bulgarian.

The total number of the co-authors of the candidate in the presented 74 articles and reports in the proceedings of scientific forums is 18: 17 Bulgarian citizens and 1 Polish scientist.

The above listed details taken together with the filled out data by Assoc. Prof. Vukov in Appendix 2 of NACID for compliance of the materials with the minimum scientific requirements (MSR) shows, that the scientific, scientific-applied and publication activity of the candidate is impressive both in terms of quantity and quality, namely:

1. In the individual 4 and 2 co-authored textbooks for Bachelor students with a total of 942 pages, as well as in the individual scientific monograph with 130 pages and in the individual learning tool, contemporary knowledge is covered according to the theme of the competition, which has been laid out in appropriate for students and specialists from the practice accessible language. Especially valuable is the circumstance that in these works, numerous results achieved by the candidate during his in-depth scientific research efforts have been reflected.

2. The significant scientific and scientific-applied results achieved by the candidate have been popularized by him in a total of 74 publications in the form of articles in scientific journals and reports in proceedings of scientific forums. From these publications:

a) 33 publications (i.e. 45%) have been published in foreign editions, 9 of which (i.e. 12%) are in journals and proceedings, referenced and indexed by WoS and SCOPUS, and 13 (i.e. 18%) are in referenced outside WoS and SCOPUS editions;

b) 26 publications (i.e. 35%) have been published in Bulgaria – 14 of which (i.e. 19%) in editions referenced outside WoS and SCOPUS;

c) 13 publications (i.e. 18%) out of all the publications are individual, 10 of which are referenced and indexed outside WoS and SCOPUS editions;

d) In 29 publications (i.e. 39%) the candidate is the first and in 28 he is the 2nd co-author;

e) 48 publications (i.e. 65%) out of all 74 publications of the candidate are in English;

f) The candidate has personally presented as reports a significant part of these publications in scientific forums in Bulgaria, Croatia, and North Macedonia.

3. The candidate has participated actively in 9 scientific-researched and 1 scientific-applied projects, 6 of which were in the Bulgarian Academy of Sciences and the other 4 were domestic university projects. He has led 2 of the domestic projects.

4. Assoc. Prof. Vukov was a science consultant of a doctorate student, who in 2015 defended his dissertation on a theme similar to the competition for Professor. Currently the doctorate student is chief assistant in the department “Woodworking machines” at the University of Forestry.

5. The reflected **in Appendix 2 of NACID 74 referenced publications** of the candidate in journals and in the proceedings of scientific forums **form 802.9 points**, which is **4 times more than the minimum national requirements (MNR) for Professor in the professional field 5.13 General engineering.**

6. The reflected **in Appendix 2 of NACID 6 textbooks, 1 learning tool** of the candidate and his participation in **10 project form 340.0 points**, which is **3.4 times more than MNR for Professor in the professional field 5.13 General engineering.**

4.3 Reflection of Candidate's Scientific Publications in Literature (known citations)

- Total – **63 citations.**

The candidate has presented a list and evidence materials of determined by him a total of 63 citations of 30 of his publications, where 37 citations (i.e. 59%) out of all the citations are in publications in English.

By type the citations are, as follows:

- In referenced within WoS and SCOPUS journals and proceedings from scientific forums – **17 citations** (i.e. 27%), including 13 citations in editions with Impact Factor of 2 publications of the candidate;
- In non-referenced editions, teaching aids, monographs, dissertations, etc. – **46 citations** of total 28 publications of the candidate.

These citations gather a total of 262 points in accordance with the point regulation of **Appendix 2 of NACID, which is more than 2.6 times higher than MNR for Professor in the professional field 5.13 General engineering.**

4.4 Contributions to the candidate's work (scientific, scientific-applied, applied)

After careful analysis of the presented results in the accepted for their evaluation total 74 publications of the candidate in my Review and the requested by him claims for scientific, scientific-applied and applied contributions in them, I consider that:

- As a **scientific contribution** it may be accepted the proposed, with the applicant's participation, a new, deductive way of deriving the second part of Hooke's law as a direct consequence of its first part, without the need for any available conditions given in the specialized literature.

- The following can be considered as major **scientific-applied contributions** with significant candidate's participation:

a) Development and application of dynamic models of torsional, free undamped, free damped and forced spatial vibrations of a woodworking shaper and its spindle with 12 and 18 degrees of freedom, of cutting mechanism of a circular machine with different types of

circular saws, of drive mechanism of a horizontal veneer machine, and of transmission of a helicopter and of drive train of a wind turbine with a different number of bodies and degrees of freedom;

b) Development and application of a mechanic-mathematical model of the load on the bearings of the main shaft of the cutting mechanism of a woodworking shaper when it is driven with different types of belt drives; it is taken into account the influence of the number of belts on the functioning of this mechanism, as well as the influence of its wear on accuracy of work and quality of production;

c) Development and application of a model of impulse loads at longitudinal cutting with circular machines and derivation of analytical dependencies for investigation of dangerous work regimes associated with the occurrence of impact loads;

d) Development and application of a mechanic-mathematical model, based on the Finite elements method, for 3D investigation of the natural frequencies and mode shapes of circular saws with hard alloy teethes and compensating and low-noise slots in the computational and graphical environment of the software product Solid Works;

e) Establishing the main factors influencing the cutting force and the cutting power in longitudinal milling of wood details from beech and pine;

f) Offering a concept and development a methodology for building multi-channel systems for monitoring, diagnostics and protection of equipment in the woodworking and furniture production;

g) Establishing scientific-applied facts about the type and characteristics of the factors influencing the dynamic processes and behavior of wind turbines in extreme situations and different operating regimes, as well as in the presence of the most common defects in the elements of their mechanical gears.

• The following can be considered as major *applied contributions*:

a) Establishing the natural frequencies and mode shapes and the forced torsional vibrations of the cutting mechanism of a woodworking shaper depending on the type and degree of wear of the belt drive of the machine and on the blades' number of the cutting tools, which really work;

b) Establishing the free and forced spatial vibrations of the shaper, its spindle and the rotor of the drive electric motor, depending on its work regime and on the unbalance of its cutting tool;

c) Determining the load on the main shaft's bearings of the saw unit of a shaper at different work regimes and different belt drives, as well as the optimum feed rates of the shaper, depending on its power-energy load and its spatial vibrations;

d) Establishing the influence of the cutting speed, feed rate and thickness of the cutting layer in milling on the overall vibrations of a wood shaper and on the quality of the machined surface of the wood details;

e) Establishing the exploitation indicators of cutter heads with hard alloy plates in production conditions and the specific consumption of PCD abrasive when they are sharpened;

f) Drawing up diagrams of natural frequencies and mode shapes, of free damped and forced vibrations of faults in the drive motor of the cutting mechanism of a circular machine, as well as of its amplitude-frequency characteristics;

g) Preparation of a program in the Matlab software package and determination with this program of the torsional vibrations of the cutting mechanism of a circular machine and of the drive mechanism of a veneer machine depending on the influencing factors;

h) Determination of the vibrations of the hull and the drive train of wind turbines under different operating conditions and with the most common defects in their drive's elements;

i) Application of improved methods for vibro-acoustic diagnostics and monitoring of the equipment in woodworking and furniture production and of wind turbines, as well as for optimization of work of wind turbines and increase of their reliability.

5. Assessment of the applicant's personal candidate

From the presented works of the candidate for his participation in the competition for Professor the monograph, 4 textbooks for students, and 13 publications (i.e. 18%) in journals and in proceedings from scientific forums have been created individually. In 1 textbook for students and in 29 publications (i.e. 39%) he is the first co-author, in another 1 textbook and in 28 publications (i.e. 38%) he is the second co-author, and only in the other 4 publications (i.e. 5%) he is the third co-author.

This gives me the ground to accept that the listed above contributions for the competition for Professor are individual contributions of the candidate or have been achieved with his active participation.

6. Critical remarks

In evaluating the works and very-well prepared materials for the competition, I did not find any significant deficiencies. I allow myself to make only a few remarks, which should be accepted as recommendations for the future work of the candidate, namely:

1. The presentation of the claims of the candidate of achieved by him 2 scientific, 36 scientific-applied and 50 applied contributions from the evaluated by me 74 publications in journals and in proceedings from scientific forums has not been arranged particularly well and is very detailed with a number of many recurring definitions and clarifications.

2. The claim on page 1 in the reference of contributions for scientific contribution, concluding in the development of a methodology for vibration diagnostics and monitoring of technical equipment in the forestry industry, has not been supported by the applicant with concrete data showcasing what of the achieved constitutes scientific novelty and why, due to which this claim has been related by me to the contributions with scientific-application nature;

3. More than 1/3 of the articles and reports of Assoc. Prof. Vukov (a total of 28 publications, including 7 from his individual works) are published in editions of the University of Forestry, which have relatively few readers in the area of mechanics.

4. The participation of only 1 co-author from abroad in the publications of the candidate should be considered insufficient for the current capabilities of the European scientific space.

5. It would be good if in the future Assoc. Prof. Vukov increases significantly the number of his presented works in the online scientific database of Research Gate, which includes more than 10 million scientists from around the world.

So far, only 27% of his publications in English are presented there, which greatly limits his international recognition. The available publications in that database are cited by its members only 20 times, which forms his Index of Hirsh, equal to $h = 2$.

6. It would be prestigious for the department, faculty and university to include scientific works of the candidate in publications with Impact Factor.

7. Personal impressions

The presented materials for the competition complement and reinforce my long-standing experience with the activity and development of Assoc. Prof. Vukov as erudite lecturer and scholar with undeniable qualities of a researcher and creative scorer of valuable for the science, higher education, and practice scientific and application solutions.

Demanding of himself, of his colleagues and students, hard-working, energetic and stubborn, he has proven his ability to work in a team and to engage with solution of problems in his area and related scientific areas and to bring them to successful end results.

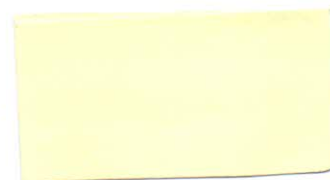
Important merit of Assoc. Prof. Vukov as a lecturer and scientific worker is his ability to use contemporary mathematical methods and computer technologies for scientific research and application of results to the learning process.

8. Conclusion

The proven timeliness of the achieved scientific, scientific-applied and applied achievements of Assoc. Prof. Vukov, their importance for the practice and for the learning process, the reflection of the results with their numerous citations in Bulgaria and abroad, gives me the reason to conclude that all the requirements of the Law for development of academic staff in Bulgaria and of the rule for its application in the University of Forestry for the academic title "Professor" are not only fulfilled, but significantly exceeded.

In connection with the above, I convincingly propose that Assoc. Prof. Georgi Yordanov Vukov, PhD, be elected for „Professor“ in the discipline „Mechanics“ in the Professional field 5.13 General engineering, scientific specialty „Applied mechanics“.

Signature of the reviewer:



Review submitted to: 27.04.2020