

**REPORT**

to occupy the academic position:

"Professor"	
"Associate Professor"	X
	one of the academic positions indicated shall be marked with the sign "X"

**Candidates to occupy the position:**

1	Asst. Prof.	Dr.	Stefan	Mihailov	Filipov	University of Chemical Technology and Metallurgy
No	academic position	scientific degree	name	middle name	last name	workplace

**Scientific area:**

4	Natural sciences, Mathematics and Informatics
code	name

**Professional area:**

4.6	Informatics and Computer Science
code	name

**Scientific specialty:**

Informatics
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**The competition has been announced:**

34	11.04.2023	Informatics	Chemical and Systems Engineering
in SG issue	date	for the needs of the Department	Faculty

**The report was written by:**

Prof.	PhD	Tatiana	Paraskevova	Chernogorova	SU, FMI, (retiree since 01.03.2019)
academic position	scientific degree	name	middle name	last name	workplace

**1. Report for the candidate:**

Asst. Prof.	Dr.	Stefan	Mihailov	Filipov
academic position	scientific degree	name	middle name	last name

**1.1. Meeting the minimum requirements under the Regulations:**

A) The candidate meets the minimum requirements	20 points	X
B) The candidate doesn't meet the minimum requirements	0 points	
		one of the answers given is marked with the sign "X"

It must be filled in if answer B is marked. The publication activity of the candidate is analyzed. The response of the results achieved (quoted) is analyzed.

**1.2. Relevance of scientific and / or applied research:**

A) The research is relevant. Part of the research is pioneering (no results are known on the topic by other authors)	8 points	X
B) Research is relevant. Results from other authors are known for each of the topics and / or applications studied.	6 points	
C) Most of the research is relevant, but also some results are presented that have no scientific and / or applied value	4 points	
D) The smaller part of the research is relevant	2 points	
E) Research is not relevant	0 points	
		one of the answers given is marked with the sign "X"

The evaluation of the relevance of the research must be substantiated.
The candidate's scientific research is in two important areas of mathematics that have wide application in practice, engineering and natural sciences: 1) function approximation and optimization; 2) numerical methods for non-linear second order ODEs and integro-differential equations.

### 1.3. Objectives of the research:

A) Realistic and of scientific and / or applied interest	8 points	X
B) Realistic, but not of scientific and / or applied interest	4 points	
C) Unattainable (unrealistic)	0 points	
		one of the answers given is marked with the sign "X"

Objectives must be specified. The type of the set objectives must be justified
The purpose of research from the first group is mainly focused on the construction and introduction of new metrics for measuring distance between functions of one and two variables and vector functions. The research of the second group, presented by the candidate, shows for the first time that there is a close connection between the finite difference, shooting and linearization methods, which until now were considered unrelated to each other.

### 1.4. Candidate research contributions:

A) With lasting scientific and / or applied response, they form the basis for new research and applications	20 points	X
B) They are of significant scientific and / or applied interest, complete and / or summarize previous research	16 points	
C) They are of scientific and / or applied interest	12 points	
D) Lack of significant contributions	8 points	
E) Lack of contributions	0 points	
		one of the answers given

		is marked with the sign "X"
Contributions must be specified. The type of results achieved must be justified.		
<p>1) The H1 semi-norm is proposed as a measure of closeness in solving optimization problems and approximation of functions. A procedure has been developed to replace the arithmetic difference with a geometric one in the L2-norm and the H1 semi-norm in optimization problems. A new approach has been developed for the numerical solution of the Poisson's and Laplace's PDEs. A new Monte-Carlo type method for predicting fatal events in multicomponent environments is developed.</p> <p>2) It is shown that the linearization of a nonlinear boundary value problem and then application of FDM is equivalent to the application of the FDM to the nonlinear problem and then linearization of the resulting nonlinear problem. An algorithm for replacing FDM with sequential application of the linear shooting method is proposed. It is shown that nonlinear shooting methods can be derived from linearization methods. A linearization method and a new Newton's shooting method are proposed for solving nonlinear boundary value problems. The shooting-projection method has been successfully applied to solve nonlinear integro-differential problems.</p>		

#### 1.5. Participation of the candidate in the achievement of the presented results:

A) The candidate has at least an equal participation in the submitted papers	8 points	X
B) The candidate has at least an equal participation in most of the submitted papers	7 points	
C) The candidate has a secondary participation in most of the submitted papers	4 points	
D) The candidate participation is unnoticeable	0 points	
		one of the answers given is marked with the sign "X"

Critical notes must be provided if one of the items C or D is marked.
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#### 1.6 Pedagogical activity:

A) The candidate has effective and sufficient pedagogical activity at the university. The textbooks issued are modern	8 points	X
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and useful (they meet the requirements of the Regulations). The work with undergraduate and doctoral students is at a high professional level.		
B) The candidate has sufficient pedagogical activity at the university. The textbooks issued satisfy the requirements of the Regulations.	6 points	
C) The pedagogical activity and / or textbooks issued are insufficient (do not meet the requirements of the Regulations)	0 points	
		one of the answers given is marked with the sign "X"

Critical notes must be provided if one of the items B or C is marked.

### 1.7. Critical notes:

A) Lack of critical notes	8 points	X
B) Critical notes of a technical nature	7 points	
C) Critical notes that would partially improve the results achieved in a small part of the research	5 points	
D) Critical notes that would partially improve the results achieved in most of the research	3 points	
E) Significant critical notes	0 points	
		one of the answers given is marked with the sign "X"

Critical notes must be provided if one of the answers C, D or E is marked.

### 1.8. Conclusion

A) The evaluation of the candidate's activity is <b>POSITIVE</b>	This evaluation is assigned to a total number of at least 50 points	X
B) The evaluation of the candidate's activity is <b>NEGATIVE</b>	This evaluation is assigned to a total number below 50 points	
		one of the answers given is marked with the sign "X"

To be filled in if requested by the member of the scientific jury
In my opinion Asst. Prof. Stefan Filipov is a serious researcher and teacher and any University can be proud of him.

<b>05.08.2023</b>	The report was written by:	
date	<b>Prof. PhD Tatiana Chernogorova</b>	signature