Appendix 12c

REVIEW
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	**Senior assistant**	**Doctor, PhD**	**Ilian**	**Stoykov**	**Mitov**	**UCTM**
№	academic position	scientific degree	name	middle name	last name	workplace

Scientific area:

5.0	**Technical Sciences**
code	name

Professional area:

5.6	**Materials and Material Science**
code	name

Scientific specialty:

„Material science and processing of machine-building materials ”

The competition has been announced:

64	**05.08.2025r.**	**„Physical metallurgy and thermal aggregates”**	**Faculty of Metallurgy and Materials Science**
in SG issue	date	for the needs of the Department	Faculty

The review was written by:

Associate professor	**Doctor, PhD**	**Martin**	**Plamenov**	**Ivanov**	**TU – Sofia**
academic position	scientific degree	name	middle name	last name	workplace

1. Review for the candidate:

Senior assistant	**Doctor, PhD**	**Ilian**	**Stoykov**	**Mitov**
academic position	scientific degree	name	middle name	last name

1.1. Completion of the provided documents:

A) The competition documents are in full compliance with the Regulations	3 points	**X**

B) The documents are complete but do not fully comply with the requirements of the Regulations	2 points	-
C) The documents are not completed in accordance with the requirements of the Regulations	0 points	-
		one of the answers given is marked with the sign "X"

Missing documents and violated requirements must be described if response C is marked.
The documents submitted for the competition fully comply with the "Regulations for the Acquisition of Academic Degrees and Occupation of Academic Positions at UCTM", for acquiring the academic position of "Associate Professor."

1.2. 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.
According to the materials submitted for this competition for the position of Associate Professor, it is clear that Senior Assistant Professor Dr. Ilian Stoykov Mitov fully meets the minimum requirements of the "Regulations for the Acquisition of Academic Degrees and Academic Positions at UCTM." In addition, the candidate presents significantly more materials in almost all groups of indicators, with the number of citations presented being particularly impressive. For each indicator, the candidate presents the following scientific production: 1. **Indicator A:** PhD thesis on "Investigation of transfer processes in rotary kilns" – **Candidate's points: 50**. 2. **Indicator Б**: Publications replacing the habilitation thesis – 10 in total. The publications comply with the requirements of the Regulations for the Acquisition of Scientific Degrees and Occupation of Academic Positions at UCTM. – **Candidate's points: 150**, at 100 required. 3. **Indicator Г**: - A total of 18 scientific publications are presented, 5 of which are published in editions that are referenced and indexed in world-renowned databases. **Candidate's points: 221**, at 200 required. 4. **Indicator Д**: A list of an impressive number of citations in scientific publications, referenced and indexed in world-renowned databases, has been submitted. **Candidate's points: 630**, at 100 required. 5. **Indicator Е**: This indicator is not mandatory for obtaining the academic degree of "Associate Professor," but the candidate has submitted a co-authored university textbook. **Candidate's points: 10**. According to the author's report submitted, the candidate's total number of points is **1047**, at **400** required.

1.3. 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)	7 points	-
B) Research is relevant. Results from other authors are known for each of the topics and / or applications studied.	5 points	**X**
C) Most of the research is relevant, but also some results are presented that have no scientific and / or applied value	3 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.
Based on the materials submitted for this competition for the position of Associate Professor, I believe that the research is relevant, significant, and contributes to the development of scientific and engineering practice in the field of materials science, and the processing of machine-building materials. The engineering problems and tasks developed, cover thermal engineering research, to increase the energy efficiency of industrial systems and improve their environmental footprint. Other areas covered, include the utilization of waste materials from metallurgical processes, the wear resistance of various systems and components, as well as the heat treatment and metallography of metals and metal alloys. The works presented are mainly scientific-applied and applied. To a large extent, their contribution can be classified as follows: "Proving, by new means, significant new aspects of existing scientific problems, theories, and hypotheses" and "Creating new classifications, methods, designs, and technologies; obtaining confirmatory facts."

1.4. Knowledge of the problems subject of research:

A) The candidate knows in detail the achievements of other authors on the researched topics and/or applications	6 points	**X**
B) The candidate is partially familiar with the achieved results on the researched topics and / or applications	4 points	-
C) The candidate has no prior knowledge of the status of the researched problems	0 points	-
		one of the answers given is marked with the sign "X"

The evaluation must be substantiated if answer C is marked.
Based on the materials submitted for the competition, I believe that the candidate has a detailed knowledge of the achievements of other authors on the topics and/or applications studied. The significant number of scientific articles published in specialized refereed journals is impressive. These types of articles predominate in the main habilitation work (the substitute publications).

1.5. Type of research:

A) Theoretical	4 points	-
B) Applied	4 points	**X**
C) Theoretical with application elements	4 points	-
D) It does not correspond to the level specified in the Act for the Development of the Academic Staff in the Republic of Bulgaria and the Regulations	0 points	-
		one of the answers given is marked with the sign "X"

The level of research must be substantiated if answer D is marked.
Basically, the presented works are scientific-applied and applied. To a large extent, their contribution can be classified as follows: "Proving, by new means, significant new aspects of existing scientific problems, theories, and hypotheses" and "Creating new classifications, methods, designs, and technologies; obtaining confirmatory facts."

1.6. 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.
In all of the submitted works, the objectives set are realistic and represent scientific and/or applied interest for the field of the competition. The submitted works are scientific-applied and applied. To a large extent, their contribution can be classified as follows: "Proving, by new means, significant new aspects of existing scientific problems, theories, and hypotheses" and "Creating new classifications, methods, designs, and technologies; obtaining confirmatory facts."

1.7. Methods of research:

A) Adequate to research and set scientific objectives and /or applications	8 points	**X**
B) Partially appropriate, enabling part of the scientific objectives and / or applications to be achieved	4 points	-
C) Inappropriate methods	0 points	-

		one of the answers given is marked with the sign "X"

Methods must be specified. The type of methods used is justified.
Based on the materials presented, I believe that all of the proposed works present adequate and modern research methods that correspond to the scientific goals and/or applications set. The research methods are based on both numerical and analytical approaches, as well as purely experimental research in various modes. Some of the research has been conducted jointly with international research groups at leading European universities. The availability of a number of validating experimental studies, conducted in real metallurgical enterprises, is also impressive.

1.8. Candidate research contributions:

A) With lasting scientific and / or applied response, they form the basis for new research and applications	20 points	**-**
B) They are of significant scientific and / or applied interest, complete and / or summarize previous research	16 points	**X**
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.
From the documents submitted, it can be concluded that the research activities of Senior Assistant Professor Dr. Ilian Mitov cover the following areas: 1. Thermal engineering problems and improving the energy and environmental efficiency of industrial facilities. 2. Studies on the transport processes in rotary kilns. 3. Utilization of wastes from metallurgical processes. 4. Wear resistance, heat treatment, and metallography of metals and alloys. Among the main contributions in these areas, the following can be highlighted: 1. Different approaches have been developed, for the technological and thermal integration of flat steel product manufacturing, enabling hot charging of blocks and reducing reheating costs by up to 40%. 2. Mathematical models have been created, for the optimization of cooling, transport, and reheating of steel billets. 3. A comparative analysis of convective and radiative metal recuperators has been carried out, proving the advantages of radiative designs (approximately 30% lighter construction, higher heat transfer efficiency). 4. Dependencies for increasing the emissivity of flue gases and better utilization of the radiation heat transfer component, have been derived. 5. Experimental and computational methods for sizing furnace chambers have been developed, bringing laboratory tests closer to actual production conditions.

6. Solutions are proposed, for reducing greenhouse gas emissions by optimizing the combustion process and introducing combined burners with alternative and secondary fuels.
7. The impact of the microclimate in metallurgical workshops has been examined and measures to improve the working environment (reduction of harmful emissions, noise, vibrations, etc.) have been proposed.
8. Two unique experimental stands for rotary kilns have been designed, manufactured, and put into operation. Proprietary methodologies and measuring instruments have been developed, that allow experimental determination of thermal parameters under controlled changes in rotation speed, filling degree, and physical and mechanical characteristics of the material (quartz sand, glass and copper spheres, etc.). The metrological reliability of the stands has been confirmed by uniform temperature fields and data reproducibility. These results have scientific and applied scientific value, as they provide an experimental basis for the validation of mathematical models and for subsequent practical applications.
9. Two original mathematical models have been developed: a model for the deviations of falling particles in a rotating furnace, and the so-called "total model" for determining the total and active thickness of the layer. The experimental studies show good consistency between theory and practice, which confirms the physical correctness of the models.
10. A systematic experimental analysis of the contact heat transfer between the wall and the solid material layer in indirectly heated furnaces has been performed. It has been shown that existing analytical models often give significantly different results and do not take into account the actual motion regimes. It has been proven that in rolling motion there is good agreement between models and experimental data. In sinking and sliding motion, characteristic of a number of industrial installations, the measured coefficients are 3–5 times lower than predicted. These results are an original scientific contribution, as they change the perception of the reliability of classical models and provide a basis for their calibration against real conditions.
11. The impact of meteorological conditions on the heat losses of outdoor rotary kilns has been analyzed. Calculations based on average annual temperatures and constant wind speeds for Bulgaria have determined the ratios between heat flows from the outer surface of the unit. On this basis, practical recommendations have been formulated for reducing losses and improving energy and environmental efficiency.
12. A new approach has been proposed for transitioning from energy-technological to energy-economic combination, in which the choice of heat utilization scheme is based on a value analysis of the options. This represents a scientific and applied contribution with direct practical relevance.
13. The possibilities for pelletization and metallization of iron-containing residual materials have been investigated. The following have been established: the influence of the size and relative content of the reducer (coal); the effects of different cooling modes (air, water); the negative impact of additives such as water glass on the degree of metallization. Empirical dependencies have been derived and optimal conditions for laboratory and industrial implementation have been proposed. This has an applied contribution to the circular economy and reducing the environmental footprint of metallurgical production.
14. New technological schemes have been developed for the utilization of waste from barite, iron concentrates, and copper oxides. A full cycle from laboratory research to industrial implementation has been achieved – plants for bleached barite and direct reduction of iron-containing pellets, as well as a flotation plant, have been built. Innovative methods (magnetic frying, ETRS) have been introduced, which build on classic technologies.
15. The abrasive wear behavior of M390P powder steel and various high-chromium cast irons has been studied after various heat treatment regimes. Quantitative relationships between temperature and quenching/tempering regime, hardness, and wear resistance parameters (V and E) have been established, showing that higher hardness does not always guarantee better wear resistance. Optimal thermal regimes have been determined, providing a balanced combination of hardness and wear resistance for specific operating conditions.

Overall, I accept the contributions in the presented scientific research papers. From the materials presented in this competition for the position of Associate Professor, I believe that there are significant scientific and applied contributions that contribute to the development of scientific and engineering practice in the field of materials science and the processing of machine-building materials. These

contributions can be classified as follows: "Proving, by new means, significant new aspects of existing scientific problems, theories, and hypotheses" and "Creating new classifications, methods, designs, and technologies; obtaining confirmatory facts."

1.9. 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.
I believe that the candidate has made at least an equal contribution to the scientific works presented in the competition. However, the lack of independent scientific publications, especially in the main habilitation thesis, is striking.

1.10. Pedagogical activity:

A) The candidate has effective and sufficient pedagogical activity at the university. The textbooks issued are modern and useful (they meet the requirements of the Regulations). The work with undergraduate and doctoral students is at a high professional level.	8 points	**X**
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.
Based on the documents presented, I believe that the candidate has effective and sufficient teaching record at UCTM, diligently developed over the past 9 years. The candidate teaches numerous lecture courses and the corresponding exercises. A textbook on "composite metal materials and products" has been co-authored for the purposes of teaching the relevant discipline at the university.

1.11. 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.
I have no significant (fundamental) critical comments on the materials submitted for this competition for the position of Associate Professor. The only thing that bothers me is the small number of independent scientific publications, as well as the lack of information on supervising graduate students, creating teaching curricula, programs, etc. I have no doubt about the candidate's ability to work in a team, but it is inherent in habilitated persons to make independent decisions, independently achieve and analyze specific results, and define and assign research tasks. In this regard, my recommendations to Senior Assistant Professor Dr. Ilian Mitov are to continue developing his independent research activities within the university in the future and to create and motivate a research "school" after himself.

1.12. Conclusion

A) The evaluation of the candidate's activity is **POSITIVE**	This evaluation is assigned to a total number of at least 65 points	**X**
B) The evaluation of the candidate's activity is **NEGATIVE**	This evaluation is assigned to a total number below 65 points	-
		one of the answers given is marked with the sign "X"

To be filled in if requested by the reviewer
Based on the above analysis of the pedagogical and research activities of Assoc. Prof. Dr. Eng. Iliyan Stoykov Mitov, I believe that he is an accomplished scientist who possesses the necessary qualities and experience to lead a research team, as well as to independently conduct and commission high-level scientific research. He fully meets the requirements of the "Regulations for the Acquisition of Scientific Degrees and Occupation of Academic Positions at UCTM" for the position of Associate Professor. I find it reasonable to propose that Senior Assistant Professor Dr. Eng. Ilian Stoykov Mitov be appointed to the academic position of "Associate Professor", in the scientific field of "Materials Science and Technology of Engineering Materials", professional field 5.6. Materials and Materials Science, area of higher education 5. Technical Sciences.

17.11.2025г.	The review was written by:	
date		signature