

REVIEW

to occupy the academic position:

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

Candidates to occupy the position:

1	Associate professor	PhD	Dimitar	Petrov	Dontchev	UCTM
№	academic position	scientific degree	name	middle name	last name	workplace
2						
	academic position	scientific degree	name	middle name	last name	workplace

Scientific area:

5	Technical sciences
code	name

Professional area:

5.1	Mechanical Engineering Scientific specialty
code	name

Scientific specialty:

(Applied Mechanics with French Language Teaching)

The competition has been announced:

67	13.08.2021	Applied Mechanics	Metallurgy and Materials Science
in SG issue	date	for the needs of the Department	Faculty

The review was written by:

Professor	Doctor	Georgi	Ivanov	Valchev	UFT - Plovdiv
academic position	scientific degree	name	middle name	last name	workplace

1. Review for the candidate:

Associate professor	PhD	Dimitar	Petrov	Dontchev
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 submitted documents fully comply with the agreements of Regulations for acquiring scientific degrees and occupying academic positions at UCTM, Sofia, 2019.

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.

The candidate, Assoc. prof. PhD eng. Dimitar Petrov Dontchev meets the minimum national requirements for the academic position of "professor", specified in the law on RASRB and the Rules of UCTM, Sofia in scientific field 5. Technical sciences, Professional field 5.1 Mechanical Engineering (Applied Mechanics with French language teaching).

With a minimum national required 600 points per group of indicators for the academic position "professor" at UCTM, the personal total number of points of the candidate is 1672.83 points. Number of points on indicator A is 50 with the required 50. Number of points on indicator B (3 or 4) is 164 if necessary 100. The points according to indicators: D (5-11) are 379.83, if necessary 200. The sum of the points according to indicators E (12-15) is a total of 579, if necessary 100. The sum of the points according to indicators E (16 - 26) are a total of 500 with the required 150.

Assoc. Prof. Dr. Eng. Dimitar Petrov Dontchev participated in the competition for the academic position of "professor" with 10 pcs. scientific publications equivalent to a habilitation thesis published in publications that are referenced and indexed in a world-famous database of scientific information. The topic of the publications is "Mechanics and mechanisms of behavior, defects and destruction of structural materials and structures". The total number of scientific publications outside the habilitation is 57. Of them 5. are published in publications that are referenced and indexed in a world-famous database of scientific information, 16 pcs. have been published in unrefereed journals with scientific review or in edited collective volumes and 36 scientific reports presented at international conferences and printed at home and abroad. The publication activity shows the successful work of the candidate in a team. For the period after the first habilitation, 58 were observed. citations in scientific publications.

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	X
B) Research is relevant. Results from other authors are known for each of the topics and / or applications studied.	5 points	-
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.

Assoc. prof. PhD eng. Dimitar Petrov Dontchev presented a list of 14 pcs. research project. He is the leader of 4 pcs. international (2 scientific and 2 educational) projects. Participates in 6 international (4 scientific and 2 educational) projects, as well as 4 national research projects. This is proof of the candidate's ability to lead and work successfully in a team.

The scientific papers proposed for review originate from specific industrial problems related to the use of construction materials: composite materials; metals; alloys; polymeric materials, nanomaterials, structures and their scientific interpretation.

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.

The candidate for the academic position knows in details the achievements of other researchers on scientific topics, analyzes the obtained results and cites them in his scientific publications.

Activities focus on the analysis of the relationship between mechanics, physics, and metallurgy (thermal processes) mainly in structural materials: the mechanisms and mechanics of behavior, defects, and destruction of structural materials and structures..

1.5. Type of research:

A) Theoretical	4 points	-
B) Applied	4 points	-
C) Theoretical with application elements	4 points	X
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.

The research of the candidate have a theoretical character with elements of applications in the practice.

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.

The objectives of the research activities of the candidate are realistic and have a scientific and applied character.

The presented scientific work are related to research, experimental and theoretical, in order to understand better the fundamental aspect, assimilation, and application at the global and local level of the behavior of materials, heterogeneous in nature, different in types and rheological behavior.

The problems cover a range of behaviors (mechanisms and mechanics) of structural materials and structures: elasticity, viscoelasticity, plasticity, reinforcement, external reinforcement (strengthening), damage, and failure. In each of these topics, the aim is to combine physical and mechanical aspects, experimental and theoretical approaches

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"
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Methods must be specified. The type of methods used is justified.
The methods used by Assoc. prof. PhD eng. Dimitar Petrov Dontchev are adequate. The following methods were used in the research work of the candidate: Modeling of behavior of heterogeneous materials, homogenization, behavior of nanomaterials and nanosuspensions: (A.1), (B.1), (B.3), (B1.2), (B1.3) (B1.4), (B1.5), (B1.8), (B1.9), (B1.11) (B1.12),(B1.1), (B1.14), (B1.16), (B2.8), (B2.12), (B2.22),(B2.24), (B2.27), (B2.30), (B2.36); Modeling and simulation of damage and failure of structural materials, hybrid structures, (reinforced concrete reinforced with composite materials): материали (A.5), (A.7), (A.10), (B1.3), (B1.7), (B1.9), (B1.10), (B1.1), (B2.5), (B2.6), (B2.1), (B2.15), (B2.16), (B2.17), (B2.19), (B2.20), (B2.21), (B2.23), (B2.25), (B2.26),(B2.29), (B2.32), (B2.33),(B2.35); Application of composite materials in civil engineering for reinforcement / rehabilitation of reinforced concrete structures: dimensioning, calculation and simulation of the behavior under different load conditions of hybrid structures made of strengthened concrete reinforced with composite materials: (A.2), (A.3), (A.4) (A.5), (A.6), (A.7), (A.8), (A.9), (A.10), (B1.1), (B1.10), (B15),(B2.1), (B2.2), (B2.3), (B2.4), (B2.5), (B2.6), (B2.7), (B2.9), (B2.10), (B2.11), (B2.13), (B2.14-B2.21), (B2.23), (B.2.25),(B26), (B2.29), (B2.31-B2.33). In conclusion, the priority goal of the proposed papers is the development of theoretical, analytical and numerical models, as well as experimental procedures (approaches) to link the microstructural material parameters with the microscopic characteristics of the studied classes of materials (composite materials, reinforced concrete structures, nanostructures and nanomaterials) subjected to different conditions of impact, mechanical and thermal loading. The macroscopic characteristics of the behavior of the studied materials and structures are also identified. Homogenization and large-scale transition are an approach for defining the macroscopic characteristics and offering and putting into practice tools for sizing elements and structures.

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.
I confirm the presented generalized results from the research activity of the candidate with educational and implementation character. 1.Improving the approaches for characterization, homogenization and modeling of construction materials with complex internal architecture: construction materials; nanomaterials and composite materials with various forms of inclusions: *The behaviors have been studied and the areas of application capable of being provided by the studied classes of materials within their technological purpose have been established: {[A.1], (B.1), (B.3), (B1.2),

(B1.3), (B1.4), (B1.5), (B1.8), (B1.9), (B1.11), (B1.12), (B1.13), (B1.14), (B1.16), (B2.8), (B2.12), (B2.22), (B2.24), (B2.27), (B2.30), (B2.36);

*It is possible to improve or adapt the studied materials in order to meet new conditions of application: (A.1), (B.1), (B.3), (B1.2), (B1.3), (B1.4), (B1.5), (B1.8), (B1.9), (B1.11), (B1.12), (B1.13), (B1.14), (B1.16), (B2.8), (B2.12), (B2.22), (B2.24), (B2.27), (B2.30), (B2.36);

2.A proposal has been made to improve/restore the functioning of existing structures and structural elements:

*An approach has been developed for establishing, assessing and forecasting the engineering capacity of structural elements containing different levels of development of damage, able to realize better the relationship between the microstructure and the properties of structural materials under critical (damage, fracture) loads: (A.5), (A.6), (A.7), (A.10), (B.3), (B1.3), (B1.7), (B1.8), (B1.9), (B1.10), (B1.12), (B1.13), (B2.5), (B2.6), (B2.8), (B2.11), (B2.15), (B2.16), (B2.17), (B2.19), (B2.20), (B2.21), (B.23), (B2.25), (B2.26), (B2.29), (B2.32), (B2.33), (B2.34), (B2.35), (B2.36);

*A methodology has been developed, a technology that aims to restore / improve the load-bearing capacity of the considered structures while saving material, energy and reducing costs: (A.2), (A.3), (A.4), (A.5), (A.6), (A.7), (A.8), (A.9), (A.10), (B1.1), (B1.10), (B.15), (B2.1), (B2.2), (B2.3), (B2.4), (B2.5), (B2.6), (B2.7), (B2.9), (B2.10), (B2.11), (B2.13), (B2.14-B2.21), (B2.23), (B2.25), (B2.26), (B2.29), (B2.31-B2.33).

3.Understanding the mechanisms and factors limiting the qualities, reliability and durability of the studied construction materials and structures:

*Improved knowledge of the mechanisms that allow modeling of behavior by accurately reading the microstructure and specifying the conditions of operation of the elements: (A.5), (A.6), (A.7), (A.10), (B.3), (B1.3), (B1.7), (B1.8), (B1.9), (B1.10), (B1.12), (B1.13), (B2.5), (B2.60), (B2.8), (B2.11), (B2.15), (B2.16), (B2.17), (B2.19), (B2.20), (B2.21), (B2.23), (B2.25), (B2.26), (B2.29), (B2.32), (B2.33), (B2.34), (B2.35), (B2.36);

*Characterization of the microstructure involved in the phenomena under consideration: (A1), (B.1), (B.2), (B.3), (B1.2-B1.5), (B1.6), (B1.8), (B1.11), (B1.12), (B1.13), (B1.14), (B1.16), (B2.12), (B2.22), (B2.24), (B2.27), (B2.30);

*Characterization of the mechanisms of damage and failure of the tested materials: (A.5), (A.7), (A.10), (B1.7), (B1.9), (B1.10), (B1.12), (B2.4), (B2.5), (B2.6), (B2.11), (B2.15), (B2.16), (B2.19), (B2.20), (B2.21), (B2.23), (B2.25), (B2.31), (B2.33), (B2.34), (B2.35);

*Connection of physical quantities characterizing the damage with the mechanical characteristics through analytical and numerical models for the purpose of sizing of details and constructions: (A.4), (A.5), (B.15), (B2.4), (B2.16), (B2.17), (B2.18), (B2.19), (B2.20), (B2.21), (B2.26), (B2.29), (B2.31), (B2.32), (B2.33).

I fully accept the contributions of the research indicated in the materials to the documents of Assoc. prof. PhD eng. Dimitar Petrov Dontchev, a candidate in a competition for the academic position of "Professor". The contributions of scientific publications based on the obtained experimental research can be characterized by scientific and applied nature.

Scientific contributions.

1.Systematized, studied, critically analyzed, and further developed are the main theoretical statements:

*The reason for the violation of durability, related to the presence of initial imperfections, the development of the damage associated with creep (maybe partially reversible), and finally with the emergence and development of a highway crack is substantiated;

*Based on the criterion for the critical concentration of damages (cracks), durability is predicted.

*The structure of a composite material with an arbitrary distribution of inclusions during subsequent homogenization is precisely determined;

2.Creation of new classifications, methods, constructions, a summary of theoretical models, etc.:

*A method for studying the damage in solids has been developed. The method is based on a two-phase model for describing the damage processes, taking into account the physically justified presence of initial imperfections. The second phase is related to the matter unaffected by the damage. The parallel connection of the two phases within the model makes it possible to describe the mechanical behavior to failure under cyclic and static loading of different structural materials;

*A procedure for numerical modeling of a reinforced concrete structure, reinforced with composite materials by the finite element method, has been implemented. It is offered with the help of Dynamic-explicit calculation scheme. Comparative analyzes are performed to determine the damage parameters of the constituent materials and to select the best simulation strategy. The modeling procedure allows a reliable simulation to be developed describing the mechanical behavior of a reinforced concrete column-short bracket assembly;

*A numerical model was built by the finite element method for studying the behavior of concrete in the conditions of restriction, damage, and plasticity. The numerical approach makes it possible to propose a numerical model, taking into account the damage and plasticization of concrete with the model "Concrete Damaged Plasticity" (CDP) (A.5). Special finishes are selected for the materials used, excluding the contact elements of the concrete / composite material boundaries, steel reinforcement (bars) / concrete, and at the boundary surface adhesive/carbon fiber. The comparison of the obtained results is very good;

*A model has been developed for the behavior of concrete in the conditions of restriction, elasticity associated with damage, different in the conditions of tension and pressure, and expressed by the equivalent main normal stress (Mazars model) (B2. 31). The model was applied in the study of the behavior of reinforced concrete beams reinforced with different configurations of composite materials;

*A method has been developed that allows to determine the stress fields in the individual layers, as well as to obtain and evaluate the three-dimensional macroscopic behavior of the studied structures, taking into account the interaction and development of different damage mechanisms (microcracks, pores, delamination) (B2. 31, 32);

*A micromechanical scale model of the individual layer in a multilayer composite structure, capable of describing the origin (initiation) of the damage, on the one hand on the filament/matrix interface and on the other hand on the pore surface (damage in the matrix). The correction in the local stress fields is carried out by introducing the concentration tensor in the theory of Mori – Tanaka (B2. 31, 32). The model makes it possible to assess the sensitivity of the various mechanisms of damage to the mechanical conditions under which they occur;

*A method has been developed using the criterion for the accumulation of a critical concentration of microcracks (damages) in rigid deformable bodies, making a bridge between the mechanics of damage and the mechanics of fracture. The related effect of the accumulation of damage and the development of a crack is taken into account (B2. 35).

3. Obtaining and proving new facts. Definitions of basic concepts, principles and approaches in the indicated areas of research are supplemented and summarized:

*The knowledge of the factors, the mechanisms limiting the qualities, the reliability and the durability of the studied construction materials and constructions has been improved. Knowledge of them allows sizing and specifying the conditions of operation of the elements (large-scale transition from micro to macro level, determining the laws of behavior in the conditions of different loads, control and control of damage);

*The various mechanisms related to deformation (elastic, plastic), damage, and fracture observed in experimental and real conditions have been studied and evaluated: tearing and sliding of the composite material, crushing of the concrete, debonding of the composite material with part of the concrete reinforcement coating;

*The reinforcement of the column-short corbel made of reinforced concrete shows a clear improvement of the final load-bearing capacity by up to 207%; the obtained value compared to the non-reinforced structure (reference) and an increase of one-third of the stiffness in the corbel-reinforced with wrapping;

*The study also shows that it is possible to partially repair reinforced concrete corbels damaged to a certain level and then restored and reinforced. Reinforcement with composite materials helps to increase the ultimate load by more than 20%. The study shows that mechanical damage significantly affects the elastic phase of behavior than the failure load on the structure. Damage significantly reduces the elastic phase of the structure. The following failure modes were observed: bending - shearing failure, shear failure, failure when the concrete is subjected to pressure (crushing);

*The destructive fatigue load of a short reinforced concrete corbel is 10% lower than a short reinforced concrete corbel that is loaded monotonically;

*The results do not show a significant difference in the mode of crack formation (non-reinforced corbel subjected to fatigue and one that is not subjected to fatigue);

*The behavior of the studied composite, structural materials of natural origin for reinforcement of structures under different loading conditions is characterized and qualified;

*A methodology for application of modeling in reinforcement/repair of structures by gluing composite biomaterials have been developed and validated;

*Methodology containing recommendations for strengthening/repairing structures by gluing composite biomaterials.

Applied contributions

Contributions for implementation: methods, constructions, schemes, etc.

The technology for reinforcement/rehabilitation through various systems and configurations of composite materials is a new technology for Bulgaria. It is applicable and is offered for restoration and repair of various building structures in the field of land transport, in public and industrial buildings:

*Studying the behavior of reinforced concrete structures and structures reinforced / repaired through the application of various systems of composite materials leads to the creation of means for predicting behavior based on modeling and experimental validation;

*In the field of industrial application - the study of "reproduction of properties" and "durability of materials used" leads to the creation of structures without resizing, providing optimal security and increasing the transmission (transmitted) force by improving their crack resistance; determining the load in a way that excludes the appearance of macrocracks, or slows down / prevents cracking by means of the composite effect of the structure.

Significance of scientific and applied contributions

1.The generality of the developed models and methods and the possibility to solve different tasks with the proposed means.

2.Taking into account new aspects and improving their knowledge in solving various practical (industrial) tasks.

3.The application of the obtained results in the training of students and doctoral students in Bulgaria, Romania, and France on the basis of joint scientific and scientific-educational projects of the cooperation within the Agency of Francophone Universities, Campus France, and NSF:

*Allows students from the Center for French Language Training at UCTM to create, size, produce and experiment multilayer structures, to use the available computational and technical means;

*Enables students from the Center for French Language Training to carry out industrial internships in the Laboratory of Materials Mechanics (Department of Applied Mechanics), as well as in the laboratories of research partners;

*Ensures the implementation of doctoral studies in joint management of topics related to the application of composite materials in the process of strengthening/rehabilitation of building structures (reinforced concrete and hybrid).

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.

Assoc. prof. PhD eng. Dimitar Petrov Dontchev has submitted a declaration of authorship and 1 pc. textbook "Biomechanics", 2021, ISBN 978-954-2940-27-2 presented in the competition. As no separation protocol has been submitted for co-authorship of scientific publications, the reviewer assumes that they are equal for all authors.

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
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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.

The candidate for the academic position "Professor" has submitted a Certificate from the academic department of UCTM that he has taught the following lecture courses in the last five academic years in French for the Master's degree: "Mechanics I-Theoretical Mechanics" with hours per number of hours 30/30; "Mechanics II-Mechanics of continuous media and structures" 30/30; "Biomechanics": 15/20; "Properties and choice of materials" 25/25; "Numerical methods" 20/20 and in Bulgarian "Theoretical mechanics" 30 / 20 for a bachelor's degree.

Assoc. prof. PhD eng. Dimitar Petrov Dontchev is the scientific supervisor of 4 pcs. successfully defended doctoral students on the following topics of doctoral studies: "Study of the mechanical behavior of a joint (assembly) column-short reinforced concrete bracket reinforced or repaired by gluing composite materials" armé renforcé ou réparé par collage de matériaux composites “) - by eng. Veselin Stankov on September 20, 2021 due to the pandemic situation; "Cyclic loads of elastomers in the field of nonlinear viscoelasticity" ("Charges cycliques des élastomères en elasto viscosité nonlinéaire") - PhD student Eng. Tariq HRIMA, Morocco; "Mechanical behavior of short reinforced concrete brackets reinforced or repaired by gluing composite materials" ("COMPORTEMENT MÉCANIQUE DE CONSOLES COURTES EN BÉTON ARME RENFORCÉES OU RÉPARÉES PAR COLLAGE DE MATÉRIAUX COMPOSITES") - by eng. Ivelina Slaveykova Ivanova; "Strengthening of reinforced concrete structures by gluing composite materials" ("Renforcement of structures in concrete arm by collage of material composites") by eng. Todor Atanasov Zhelyazov.

All this is proof of successful work and guidance of doctoral students at a high professional and scientific level by the candidate.

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.
The analysis of the submitted materials for the competition for the academic position "Professor" shows no gaps and the reviewer believes that it is not necessary to make critical remarks.

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	96
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
My assessment of the teaching, research, publishing activities and the full implementation of the minimum requirements for holding the academic position "Professor" of the candidate according to ZRAS in the Republic of Bulgaria and PPNSZAD of UCTM from 2019 is "POSITIVE". I propose to the Scientific council of the Faculty of metallurgy and materials science at UCTM, Sofia to award to assoc. prof. PhD eng. Dimitar Petrov Dontchev the academic position "Professor" 5.Technical sciences Professional field 5.1. Mechanical Engineering Scientific specialty (Applied Mechanics with French Language Teaching).

08.11.2021	The review was written by:	
date	Prof. Dr engineer Georgi Ivanov Valchev	signature