

**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	Assistant Professor	PhD	Rumyana	Kirilova	Boeva-Spiridonova	UCTM-Sofia
No	academic position	scientific degree	name	middle name	last name	workplace

**Scientific area:**

5	Technical sciences
code	name

**Professional area:**

5.10	Chemical technologies
code	name

**Scientific specialty:**

Technology of printing production
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**The competition has been announced:**

74	21.08.2020	Pulp, Paper and Printing Art	Chemical technologies
in SG issue	date	for the needs of the Department	Faculty

**The review was written by:**

Professor	PhD	Youlin	Nikolov	Tepeliev	University of Forestry, Sofia
academic position	scientific degree	name	middle name	last name	workplace

**1. Review for the candidate:**

Assistant Professor	PhD	Rumyana	Kirilova	Boeva-Spiridonova
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	<b>X</b>
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 for the competition fully comply with the Regulations for acquiring scientific degrees and holding academic positions at UCTM.

## 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.

### **Implementation of indicators B4, G, D and E of Assistant Prof. Dr. Eng. Rумыana Kirilova Boeva-Spiridonova, participating in a competition for acquiring the academic position of „Associate Professor“**

Assistant Professor Dr. Eng. Rумыana Kirilova Boeva-Spiridonova fully satisfies the minimum requirements for the academic position of "Associate Professor", specified in the Law on RAS and the Rules of UCTM in 2019 in the scientific field 5: Technical Sciences, in Professional field: 5.10: Chemical technologies. The candidate participated in the competition with **34** original scientific publications. **24** pcs of them are in journals referenced in the world databases Web of Science and Scopus with IF or SJR, **10** pcs are in non-refereed journals with a scientific review or in edited collective volumes of conferences. A total number of **45** citations were noticed on them. The H-index is **4** (according to Scopus). She has participated in scientific conferences (with **11** poster presentations).

➤ **Indicator B4 - 128.4 points** and 10 articles (minimum number of 100 points and 10 articles required), in referenced and indexed editions.

➤ **According to indicators G5 - G11 (required minimum number of 200 points)**

**Indicator G7 - 166.4 points**, publications in peer-reviewed and indexed journals.

**Indicator G8 - 73.7 points** in non-referred journals.

For evaluation of indicator G (G7 + G8) a total number of 24 articles are received. For G7 – 14 articles and G8 – 10 articles, with a total number (G7+G8) of **240.1 points** (166.4 + 73.7), with which indicator G is over fulfilled.

➤ **Indicator D - 339 points** (minimum number of 50 points required)

According to indicator D12 in SCOPUS - R. Boeva-Spiridonova has 31 citations. These 31 citations give 310 points (out of a total of 339) on indicator D, and the rest (D14 - 13 citations on 2 points (26 points), D13 - 1 citation on 3 points (3 points)) out of a total of 45 citations in indicators D12-14. All citations are after obtaining the scientific degree "Doctor".

With a minimum requirement of 50 points, indicator D is over fulfilled by more than 6 times.

➤ **According to indicator E15-25** - participation in projects, textbooks, and teaching aids - 20 points are presented (indicator 22).

For all necessary indicators Ass. Prof. Dr. Eng. R. Boeva-Spiridonova exceeds the minimum requirements for the academic position of "Associate Professor". The total points of the candidate are **777.5 points** with a **required minimum of 400 points**.

### 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.

All research activities and scientific papers of the candidate, presented for the acquisition of the academic position "Associate Professor" are in the field of the scientific specialty, for which the competition has been announced.

The author has created and applied as experimental developments - a series of methodologies and scientific approaches to determine the quality of printed images, related to the characteristics of the human perception and technological factors of the printing process, materials, and technologies that have been used. The combination of many studied indicators, that could be measured objectively and their combination with human perception and technological features of different printing conditions, aging images, and others is a novelty and has not been done so far.

In general, the novelties and current developments in the scientific production of the candidate can be systematized in the following areas:

- Investigation of important and up-to-date problems related to several developed mathematical models for establishing the influence of standard light sources on colour inconsistency and print image quality have been studied.
- The influence of the conditions, parameters and technologies for exposure of photopolymer flexographic printing forms on many indicators of printing quality on corrugated cardboard has been studied and established.
- A new approach is proposed for a comprehensive study of the quality indicators of digitally printed images, using electrophotographic and inkjet printing systems.
- A number of scientific researches and optimizations have been made in the field of printing materials including various directions such as research of conventional and biodegradable varnishes and coatings, researches of various printing and optical characteristics of inks, papers, etc.
- It has been performed a big number of researches and analyses in the field of quality and properties of fibrous materials, which are part of various papers and cardboards for the needs of the printing and packaging industry. The effect of lignin-degrading enzymes (produced by the fungus *Phanerochaete chrysosporium*) on wood was studied. Enzymatic treatment leads to the destruction or partial loosening of the connections between the individual components of the wood, facilitates delignification, and leads to the use of less electricity in its erosion.
- The obtained Kinetic studies help to clarify the mechanism of the ageing process of fibrous materials or images and describe it with great accuracy.
- A new approach is proposed for a complex study of the process of artificial ageing of printed images and its influence on many colorimetric, densitometric, spectral, physicomechanical and other indicators.

Undoubtedly, the researches of R. Boeva are actual and up-to-date. The obtained results can be related to the enrichment of the scientific field with new knowledge and they are directly applied in practice.

#### 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.

#### 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.

It cannot be said that researches of R. Boeva-Spiridonova are only theoretical or only applied. The candidate's research has rather an applied aspect, supported by a solid scientific basis.

#### 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 main goals, obtained in the research works of the candidate fully correspond to the theme of the competition and are formulated in general as modern ideas for research of colour inconstancy, colour shifts, changes in colour gamuts through new approaches, optimization of prepress technologies and their impact on print quality, production, properties and testing of materials for printing and packaging production, research in the field of ageing of materials and images and kinetic research of aging processes.

The maintained goals according to the nature of the conducted research are realistic, and the achieved results are distinguished by significant scientific and applied interest.

#### 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.

In all research activities and experimental studies of the candidate - R. Boeva-Spiridonova, the modern methods, techniques and equipment were used, which fully correspond to the goals, which were set. They are fully consistent with the aimed tasks.

#### 1.8. 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.

The presented summaries of the main scientific results and contributions, reflected in the scientific works, can be systematized in the following main directions:

##### 1. Study of colour inconstancy

By this moment, in the specialized literature, there is no large-scale study of the influence of standard lighting conditions on thousands of colour fields printed by offset and digital methods. For the first time, it has been performed a complex study of colour inconstancy and influence of standard light sources (the most commonly used - CIE D50, CIE F2 and CIE A).

From the conducted experiments and the obtained data, many conclusions and practical benefits can be made, for one of the most serious problems in the graphic industry in the reproduction of the originals - the change and distortion of colour characteristics under the different light sources.

The results could be directly used in the production of flexible and cardboard packaging, where it is extremely important to anticipate colour inconsistency and colour deviations in the lighting of products with different light sources in retail chains, outdoor conditions, etc.

## **2. Optimization of the quality of the printed images and increasing the accuracy of the tone and colour reproduction**

For the first time, an original method has been proposed to study and determine the influence of the TAC value and the degree of GCR (together and separately).

The researches and the obtained results have not only scientific value, but also could find great practical application. Implementations and production tests have been performed, and the results show, that after determining and setting the optimal parameters of colour separation (according to the developed methodology), an effect of ink savings between 10-30% (depending on the used printing material) is realized. The obtained results significantly increase the drying speed of inks and printing speed, improves the adhesion of the inks, when printing "wet on wet", etc.

## **3. Optimization of the prepress, plate making technologies, and influence on the quality of the printed production.**

Based on the results of the experiments, the influence of the shape of flexo printing elements with a "flat" top on the elimination of the striping effect was determined. It was defined the influence of the profile of the flexographic printing elements on the most important quality indicators of the printed image. The influence of the type of prepress technology - conventional, digital and digital in a controlled atmosphere, on the degree of appearance of the striping effect, the tone value increase, the gradation of the images, the tonal range, the accuracy of the colour reproduction was proved and determined. It was proven, that the effect is observed, to varying degrees and depending on the type of corrugated cardboard, and is most pronounced in those with the larger wave. The obtained results have a scientific and applied contribution and they are important for the practice. They are directly applicable in all companies that print on corrugated cardboard. The recommendations derived from the research cover all the latest technologies and help to achieve maximum print quality by optimizing the flexographic printing process.

## **4. Research in the field of digital printing**

A series of experiments were performed, which include representatives of the most widely used electrophotographic and inkjet production digital printing presses in the world. Test runs were printed on a wide range of materials, covering the most used, such as – coated and uncoated papers and cardboards, polymer foils and boards, various types of self-adhesive materials, embossed and decorative materials, vacuum metalized polymer materials and cardboards, outdoor advertising materials, etc. Based on the conducted experiments and the obtained results, a new approach is proposed for a complex study of the quality indicators of digitally printed images using electrophotographic and inkjet printing systems.

The developed approach for research claims to be exhaustive and complete in characterizing the quality indicators of printed images. Some of the methods for determining the above parameters, have not been found so far in the literature, and are being implemented for the first time. This research has not only scientific but also practical orientation, and can be used by practitioners to assess the comprehensive information of digital printing quality, and solve specific technological problems.

## **5. Surface finishing and Improvement and barrier properties of the printed production**

The applications, advantages and disadvantages of water-based dispersion coatings and varnishes, as well as those drying by UV drying, were analyzed. It has been established the influence of the type of used inks, the dampening solution, and the anti-copying agents on the quality of different varnishes. A classification is made, which describes in details the influence of the surface characteristics of the material used, the quantity and tone value percentage of inks and varnishes, their migration properties, the ratio of the volume of the package to the surface, type, characteristics and end-use of the packaged product, etc.

The obtained results find practical application in the selection of optimal conditions for the production of packaging and their compliance with European regulations.

After the conducted experiments in real production conditions, the main physical, mechanical and optical characteristics of the currently widely used - conventional water-dispersion varnishes and the biodegradable overprint varnishes, have been established.

It was established, that to use biodegradable varnishes fully and comparably with conventional water dispersion varnishes, it is necessary to improve their optical, adhesion and barrier properties. At present, the printing and packaging industry has a limited number of studies carried out by research teams, that are independent of the companies producing biodegradable varnishes, which makes the current conclusions useful and applicable in practice.

## **6. Obtaining, investigation of properties and testing of materials for printing and packaging production**

With the increasing of the volume of production of cardboard packaging, more attention is paid to the quality and properties of fibrous materials included in various types of paper and cardboard for the needs of the printing and packaging industry.

The effect of lignin-degrading enzymes (produced by the fungus *Phanerochaete chrysosporium*) on wood chips was studied. It has been found that enzyme treatment leads to the destruction or partial loosening of the bonds between the individual components of the wood, facilitates delignification, and leads to the use of less electricity when grinding the wood, which is one of the main disadvantages in obtaining of high yielding fibrous materials. The resulting fibrous material has good physical, mechanical and optical properties, and can be used in the composition of various types of paper or cardboard for printing and packaging industry.

#### **7. Investigation of the kinetic regularities in the processes of thermal ageing of the printing materials**

It has been made investigations, which determine the correlations between the kinetic variables, which show how the ageing process proceeds, monitoring the change in the whiteness of the fibrous material. The obtained results help to clarify the mechanism of the ageing process in fibrous materials. Based on the obtained kinetic characteristics, taking into account the influence of all factors, the ageing process could be described and predicted with great accuracy.

#### **8. Research on the changes in the colorimetric, densitometric and optical characteristics in the ageing process of printed images and materials**

An original methodology has been developed for detailed characterization of the ageing processes not only of printed materials, but also of the images applied on them.

Experiments were conducted, in which specially designed test forms, printed in real production conditions, with over 2000 colour fields and scales were subjected to 2 types of artificial ageing.

The influence of the process of thermal and UV ageing on the spectral and colorimetric characteristics, colour shifts and differences, the change in the limit values and volumes of the colour gamuts of the printed images and materials has been established. Many different materials have been tested. The influence of conservation water treatment (with surfactants) and bleaching (with  $H_2O_2$ ) on the aging processes of the paper and the change of the colour characteristics of the inks in the modern printed editions, printed by offset method, has been established. The obtained results and conclusions can help for a more detailed, complete characterization and knowledge of the studied processes, and increase the ability to predict in advance, what changes would occur in the optical properties of fibrous materials.

By this moment, in specialized literature, there is no conducted comprehensive research in the field of ageing of materials and images, including a detailed study of the influence of the ageing process on thousands of colour fields with different combinations of CMYK, printed by offset, digital, or any other printing method.

➤ Based on the obtained results, colour profiles are modelled and generated, which allow to simulate the ageing processes and vice versa - with an "aged" original to restore the original colours of the printed edition.

➤ According on the results of experiments, a number of predictions and mathematical models can be made for the influence of the ageing process on the changes in colours and their most detailed characteristics, such as colour differences and their components, colour gamuts, etc. Conclusions have been made, about the influence of ageing on different colours and tones, depending on the inks used and printing technology.

It is especially important, and applicable, that by applying the ageing models and colour profiles from the studies performed, the colours can be restored colorimetrically absolutely exactly in the CIE Lab colour system, as they were before ageing. For example, when conducting research and characterizing the ageing processes, according to the developed methodology, to be able to restore the original colours of a work of art, painting, icon, book, mural, etc. It is also possible to simulate the reverse process - what would an image / work of art look like, after ageing in given, previously studied by this methodology - measured colorimetric and densitometric characteristics.

#### **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	
B) The candidate has at least an equal participation in most of the submitted papers	7 points	X

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.

In the scientific papers submitted for participation in the competition, a total of 34, the candidate is the first author in 17 of them, which is proof of active leading and equal participation.

#### 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.

Assistant Professor Dr. R. Boeva-Spiridonova leads a total of 18 lecture courses in the Bachelor's degree (5 courses on full-time students and 5 courses on part-time students) and the Master's degree (4 courses on full-time students and 4 courses on part-time students). She is the author of an e-textbook on "Printing Materials", which is used by the students of UCTM. She is the supervisor of 19 defended graduates.

#### 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.

#### 1.12. Conclusion

A) The evaluation of the candidate's activity is <b>POSITIVE</b>	This evaluation is assigned to a total number of at least 65 points	X
B) The evaluation of the candidate's activity is <b>NEGATIVE</b>	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 comments made on the scientific papers and the accumulated point asset of 99 points, I confidently offer Romyana Kirilova Boeva-Spiridonova, to be awarded the academic position of "Associate Professor" in the Scientific specialty "Technology of printing production" in the Professional area 5.10. Chemical technologies in Scientific area 5. Technical sciences.

<b>30.11.2020</b>	The review was written by:	
date		signature