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	Chief Assistant Professor	PhD	Svetla	Dimitrova	Lekova	UCTM-Sofia
№	academic position	scientific degree	name	middle name	last name	workplace

Scientific area:

	Technical sciences
code	name

Professional area:

	Electrical engineering, electronics and automation
code	name

Scientific specialty:

Automation of engineering work and systems for automated design

The competition has been announced:

67	04.08.2023	Production automation	Faculty of Chemical and System Engineering
in SG issue	date	for the needs of the Department	Faculty

The report was written by:

Associate Professor	PhD	Grigor	Stefanov	Stambolov	TU - Sofia
academic position	scientific degree	name	middle name	last name	workplace

1. Report for the candidate:

Chief Assistant Professor	PhD	Svetla	Dimitrova	Lekova
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.
The candidate has submitted six (6) scientific publications (group B) that are referenced and indexed in the world-renowned SCOPUS databases, one (1) collective monograph and thirty-three (33) scientific publications (group C) that are published in non-refereed peer-reviewed journals. Number of points for indicators for groups B and C - with a minimum of 200 points, the candidate has 93 points for group B and 295 points for group C, making a total of 388 points, which significantly exceeds the minimum requirements for this indicator. A collective monograph is presented, which is worth 100 points, as much as it is according to the minimum requirements for this indicator. Also, the applicant has submitted a reference to citations, which includes a total of twenty-five (25) citations assessed as group D indicators out of a total of 190 points, the minimum for this group being 50 points. It can be concluded that the applicant fully covers and satisfies the minimum requirements of the competition for acquiring the academic position "Associate Professor".

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 scientific research of the candidate is mainly distributed in several scientific areas - methods for analyzing the origin and quality of honey and other products, mathematical modeling and optimization of technological processes, environmental monitoring, energy efficiency and elements of systems for renewable energy sources, and production automation. The presented monograph is related to the research and analysis of possible alternatives of statistical and intelligent techniques, which are used as a decision-making tool in distinguishing the botanical origin of Bulgarian honey. A selection of classical and intelligent methods and techniques for solving classification tasks for determining the authenticity and quality of honey, using spectrometric data and emphasizing model selection, its verification and validation, has been carried out. The most applicable statistical methods are principal component analysis and cluster analysis. Among the intelligent techniques used are methods based on neural networks.   In the field of mathematical modeling and optimization of technological processes, a methodology has been developed for finding a global (constant or time-varying) optimum of a multi-extremal objective function, using classical methods for finding a local optimum in combination with a chaotic forcing component. In this way, the following methods have been successfully modified: gradient method, random search method and simplex method.   In this area, in a series of publications, modeling and optimization of technological processes in the production of wood polymer nano-composite materials, optimization of the production of electrically conductive polyacrylonitrile fibers, textile materials with high microwave absorption properties, and optimization of the influence of alloying ingredients on the hardness of complex alloyed powder metallurgical steels. As a summary, it can be claimed that the scientific research and scientific-applied activity of the candidate covers the solution of important scientific and applied problems both mainly for practice and also for the educational process. The good theoretical knowledge of PhD Svetla Lekova, the research methods used, the rich experimental material obtained, its processing, presentation and creative interpretation speak of a high professional qualification and give both the monographic work and the publications presented in the competition qualities of credible and scientific passed theoretical-experimental studies that have a significant practical focus. On this basis, I consider that the studies are actual and evaluate them to obtain the maximum value of 8 points, defined in Table 1.2.

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 goals in the scientific research, formulated by the candidate are reduced to obtaining new data, studying regularities and offering multiple methods of research and analysis related to the development of different types of models, their verification and validation. The wide range of scientific fields in which the candidate conducts scientific research is impressive, which again speaks of high professional qualifications.

I believe that the goals of the research and scientific-applied activity of Ch. Assist. Prof. Svetla Lekova are realistic and in relevant areas for the Bulgarian and global industry, as she uses modern methods and tools to solve the problems and achieve the relevant goals.

1.4. 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.

The presented monographic work, as well as the publications outside of it, have sufficiently significant scientific-applied and applied contributions. They can be attributed to the groups: proving with new means essential new aspects of already existing scientific fields, problems, theories, hypotheses; creating new classifications, methods, technologies and obtaining corroborating facts. The most important of them can be mentioned as follows:

Scientific and applied contributions in the field of methods for the analysis of the origin and quality of honey and other products

1. Statistical processing was performed using classic methods, including: principal component analysis (PCA); linear and quadratic discriminant analysis (LDA, QDA), Naive Bayes classification (NBC) and k mean clustering (KMC), to distinguish clusters.

2. Honey was distinguished by botanical origin using Vis-NIR and UV-Vis spectroscopy and statistical cluster analysis, which includes the use of the principal components method and two classifiers – a supervised Bayes classifier and an unsupervised k-means classifier.

3. The optical properties of Bulgarian honey and the possibility of recognizing its botanical origin using fluorescence spectroscopy in combination with CIELab colorimetry were investigated, and three types of classifiers for honey were proposed - the first two are based on linear and quadratic discriminant analysis, and the third uses an artificial neural network (NN) implemented as a multilayer perceptron with a back-propagation (BP) learning algorithm.

4. A combination of Mid-FTIR spectra, colorimetry and linear discriminant analysis LDA is proposed to distinguish the botanical origin of honey. Based on the obtained results, it was

proved that Mid-FTIR spectroscopy, combined with colorimetry and hemometry, can be used as an alternative method for the identification of monofloral honey species.

5. Conductivity models of honey have been developed, which can be used as an additional tool for automatic identification and classification of honey according to its origin.

Scientific and applied contributions in the field of mathematical modeling and optimization of technological processes

1. A methodology for finding a global optimum of a multi-extremal objective function is developed, which uses classical techniques for searching for a local extremum in combination with a chaotic forcing component, and by modifying the following methods: gradient method, random search method and simplex method are derived results for finding a global optimum.

2. A hybrid approach is presented to locate the global minimum of a multimodal objective function by a combination of COA for global search and classical GDA for exact local search. A comparison of three different chaotic maps (sine, logistic and cubic) was performed to provide chaotic dynamics.

3. A modification to Zhao & Swamy's method for tracking a time-varying minimum of a convex function is proposed, which extends it to tracking a time-varying minimum of a multi-extreme function by adding a chaotic forcing component.

Applied contribution in the field of mathematical modeling and optimization of technological processes

1. A simulation environment was developed in MATLAB through programming language to study local minimum finding methods (gradient method, simplex method, backward step random search, modified Newton method) which are extended to find global minimum by adding chaotic forcing.

Scientific and applied contributions in the field of static models and optimization of technological processes

1. A method of modification of wood fibers by surface treatment with the two-component system $CuSO_4.5H_2O$ and $Na_2S_2O_3.5H_2O$ was developed at the stages of gluing and forming a wood-fiber carpet.

2. Optimal modification regimes have been developed depending on the special requirements of the various applications of new copper-sulfide modified nanocomposite wood-fiber materials, and the optimization of the process according to individual test parameters enables the selection of ratios of the modifying mixture, wood fibers and parameters to satisfy specified requirements for the resulting composites.

3. Technical and technological parameters of a technology for the production of copper sulfide-modified nanocomposite plates from wood fibers with specific properties for various areas of application in the industry were developed.

4. An experimental plan was developed for modeling physical characteristics of electrically conductive PAN fibers, and the presented optimal technological options ensure low values and temperature stability of the resistance of the PAN fibers in the glassy state, and it was found that the temperature coefficients of the resistance are close to the values, characteristic of metal materials.

5. A planned experiment and subsequent optimization is presented, which allows the determination of suitable compositions and optimal ratios of components of a pigment mixture for obtaining textile materials with microwave absorption properties.

Scientific and applied contributions in the field of dynamic models and optimization of technological processes

1. A first-order model without and with a lag phase of the specific growth rate of the biomass of a fermentation process for the production of wine vinegar is proposed through experimentally determined parameters at different values of the fermentation temperature

and the flow rate of the aeration air, which affect the main technological and microbiological process parameters.

2. A "global" mathematical model of the acetification process was designed, used for management and optimization purposes, which established quantitative relationships between aeration intensity, fermentation temperature, growth phase, the type of 14 substrates and the strain of the acetic acid pure culture bacteria.

3. Research and mathematical modeling of the desorption properties of seven types of wood fiber materials (DVM) in relation to oil pollution during the purification of water from copper ions in a wide range of concentration was carried out.

4. Non-linear exponential mathematical models have been developed that can be used to model the kinetics of extraction of zinc ions from waste and model waters, as well as desorption processes.

Applied contributions to the field of environmental monitoring

1. A system for measuring and analyzing the information from a sensor for fine dust particles, temperature and illuminance has been designed and implemented, and the system is suitable for training and is an open type for the purpose of improvement.

Scientific and applied contributions in the field of energy efficiency and elements of systems for renewable energy sources

1. The operation of LLC resonant DC-DC converters for photovoltaic applications below and above the resonance frequency was investigated, and as a result of the analysis, a methodology was proposed for the design of the considered converter, in which the calculation error is less than 5%.

The presented works are significant for theory and practice with the necessary degree of applicability in industry. I believe that, in terms of volume and quality, the research and applied scientific activities of the candidate fully meet the relevant requirements in the field of competition for the academic position of "Assoc. Prof.".

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"

In the scientific publications that are referenced and indexed in world-renowned databases (SCOPUS), which are six in number, Ch. Assist. Prof. Svetla Lekova is a co-author, and in two of them she is in first place (B3 and B5), in two of them in second place (B1 and B4), and in the others in fifth (B6) and sixth place (B2). In the publications that are in non-refereed peer-reviewed journals or in edited collective volumes, which are thirty-three in number, Svetla Lekova is the independent author of two of them (C16 and C29), and is a

co-author, being in first place in six of them (C4, C7, C15, C21, C24 and C30), in nineteen of them in second place (C1, C2, C3, C5, C6, C8, C9, C10, C11, C13, C14, C19, C22, C23, C25, C26, C27, C31 and C33), and in the rest on third and subsequent place (C12, C17, C18, C20, C28 and C32). It can be concluded that the personal participation of Ch. Assist. Prof. PhD Eng. Svetla Lekova in the achieved scientific and scientific-applied results is significant and it can be claimed that the candidate has equal participation in a larger part of the works presented.

1.6 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	
B) The candidate has sufficient pedagogical activity at the university. The textbooks issued satisfy the requirements of the Regulations.	6 points	X
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 pedagogical preparation of the candidate and his work as a teacher is significant and includes conducting lectures and exercises with students UCTM - Sofia in the disciplines: • Modeling and optimization of technological processes   • Identification   • Parameter estimation and computer control   • Digital signal processing   • Signals and systems   • Statistical methods for data analysis

1.7. Critical notes:

A) Lack of critical notes	8 points	
B) Critical notes of a technical nature	7 points	X
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 critical remarks with which to challenge the candidate's main scientific-applied and applied contributions. Critical remarks can be made regarding the framing of these contributions, and it is advisable to put them in a concise and concrete form. It is desirable to expand the publication activity with some prestigious publications at home and abroad, which are referenced and indexed in world-renowned databases. I make a recommendation to concentrate the candidate's research activity in larger-scale and significant projects within the European Union in the considered scientific areas, in which Svetla Lekova works. I recommend the candidate to activate his activity in the field of developing and publishing educational literature.

1.8. Conclusion

A) The evaluation of the candidate's activity is **POSITIVE**	This evaluation is assigned to a total number of at least 50 points	X (73 p.)
B) The evaluation of the candidate's activity is **NEGATIVE**	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
Based on the acquaintance with the scientific works of the candidate, I believe that they comply with the Law on the Development of Academic Staff in the Republic of Bulgaria, as well as the achieved scientific and applied contributions and results in academic activities I recommend to the esteemed Scientific Jury to award on Ch. Assist. Prof. PhD Eng. Svetla Dimitrova Lekova the academic position "Associate Professor" in the scientific specialty 5.2. Electro technique, electronics and automation, scientific specialty "Automation of engineering work and systems for automated design".

20.11.2023	The report was written by:	/Assoc. Prof. PhD Eng Grigor Stambolov/
date		signature