

**REPORT**  
to occupy the academic position:

"Professor"	<b>X</b>
"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	Ivanov	Pilev	University of Chemical Technology and Metallurgy
№	academic position	scientific degree	name	middle name	last name	workplace

**Scientific area:**

<b>4</b>	<b>Natural Sciences, Informatics and Computer Science</b>
code	Name

**Professional area:**

<b>4.6</b>	<b>Informatics and Computer Science</b>
code	Name

**Scientific specialty:**

<b>Informatics</b>
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**The competition has been announced:**

<b>23</b>	<b>19/03/2024</b>	Informatics	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	Katya	Georgieva	Dishlieva	Technical University of Sofia
academic position	scientific degree	name	middle name	last name	workplace

**1. Report for the candidate:**

Associate Professor	PhD	Dimitar	Ivanov	Pilev
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	

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

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

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

**The evaluation of the relevance of the research must be substantiated.**

1. Optimizing production and achieving higher profitability are essential issues for any company. Fluidized bed vacuum residue hydrocracking and fluid catalytic cracking are proving to be highly profitable processes in modern refining (articles 1 - 3, 10 - 12).
2. Optimizing the results of the training process conducted online is an extremely topical problem (articles 4 – 7). The facial recognition research carried out is being upgraded using neural networks (article 13), which gives better opportunities to provide cyber-physical security.
3. Research on the level of air pollution in urban conditions and in different production cycles is a serious and topical issue (articles 9 and 10).

### 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	

Objectives must be specified. The type of the set objectives must be justified

In articles 1 - 3, some models are developed for predicting the level of conversion of vacuum residues under different operating conditions in the refinery of LUKOIL Neftohim Burgas, where nine different petroleum raw materials are processed. The operating

conditions and the products obtained from the investigated processes are evaluated using intercriteria analysis to determine the variables with statistically significant dependencies. paper 2 evaluates the data using an intercriteria analysis of commercial hydrocracking for vacuum residues when processing mixtures of residues from different crude oil types.

"Refractive index" is an important property for evaluating the structural, thermodynamic, and transport properties of petroleum liquids. In paper 3, empirical correlation and metaheuristic models are developed to predict this index based on density, boiling point, and fractional composition. The results of the methods for accurate prediction of the investigated refractive index are compared with models implemented with an artificial neural network.

articles 4, 5 and 7 explore the main facial emotions divided into three groups. The aim is to discover some corrective teachers' actions to adapt and personalize the teaching material. Two pre-trained facial emotion recognition (FER) CNN models, one based on DeepFace, and the other on VGG are selected. These two models are trained with FER-2013 and CK+ datasets and verified with a dataset collected during the summer poster session at HTMU. To more accurately account for human emotions article 4), a bimodal system is used that accounts for facial emotions in combination with weather conditions, i.e. weather recognition neural network is added to FER facial emotion recognition. In paper 5, the authors build on the results by using a hybrid multimodal model (a combination of a pre-trained BER model and a FER model) that recognizes human emotions based on facial expressions and body language. A comparative analysis of the most frequently used Bulgarian distance learning platforms is developed in article 6.

#### 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	

Contributions must be specified. The type of results achieved must be justified.

The contributions of the scientific articles of Prof. Pilev can be grouped in three directions:  
 1. Research and optimization of the production in refinery of LUKOIL Neftohim Burgas It has been established that: a) the flow reactor model with precisely defined activation energy and reaction order provides the highest vacuum residue conversion accuracy; b) H-Oil yields are dependent on several investigated parameters: vacuum residue conversion level and FCC content (article.1). Presented three new empirical correlation models and three other models implemented with a Maple software product (NLPSolve) using a modified Newton's iterative method to process the three different data sets to test eight empirical correlation predictors of refractive index (article 3).

2. A decision-making module is presented that uses predefined rules and appropriately combines the results of 26 BER and 7 FER emotions (article 5).  
 The proposed bimodal model in paper 4 for facial emotion recognition increases the overall emotion recognition from 69.85% to more than 80-83%, and can be used to adapt learning material, change teaching pace, etc. Facial emotions recognized by the system can be used for early stage detection of certain diseases or for the influence of time on people's emotional state. In article 13 is developed a new cyber-physical security system providing better accuracy, reduced response time, and improved threat detection capabilities. Article 6 defines the qualities that an "ideal" platform for distance learning in an electronic environment should possess.

3. The models developed in article 9 can be used to forecast PM10 concentrations and to develop pollution control and management systems.

**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	

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

**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	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	

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

**1.7. Critical notes:**

A) Lack of critical notes	8 points	X
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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	

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

### 1.8. Conclusion

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

To be filled in if requested by the member of the scientific jury

<b>24.07.2024r.</b>	The report was written by:	
date	<b>Assoc. Prof. Katya Georgieva Dishlieva</b>	signature