

**УНИВЕРЗИТЕТ „ГОЦЕ ДЕЛЧЕВ“ - ШТИП
ФАКУЛТЕТ ЗА ИНФОРМАТИКА**

ISSN 1857- 8691

**ГОДИШЕН ЗБОРНИК
2012
YEARBOOK
2012**

ГОДИНА 1

VOLUME I

**GOCE DELCEV UNIVERSITY - STIP
FACULTY OF COMPUTER SCIENCE**

УНИВЕРЗИТЕТ „ГОЦЕ ДЕЛЧЕВ“ – ШТИП
ФАКУЛТЕТ ЗА ИНФОРМАТИКА



ГОДИШЕН ЗБОРНИК
2012
YEARBOOK
2012

ГОДИНА 1

МАРТ, 2013

VOLUME I

GOCE DELCEV UNIVERSITY – STIP
FACULTY OF COMPUTER SCIENCE

**ГОДИШЕН ЗБОРНИК
ФАКУЛТЕТ ЗА ИНФОРМАТИКА
YEARBOOK
FACULTY OF COMPUTER SCIENCE**

За издавачот:

Проф д-р Владо Гичев

Издавачки совет

Проф. д-р Саша Митрев
Проф. д-р Лилјана Колева - Гудева
Проф. д-р Владо Гичев
Проф. д-р Цвета Мартиновска
Проф. д-р Татајана Атанасова - Пачемска
Доц. д-р Зоран Здравев
Доц. д-р Александра Милева
Доц. д-р Сашо Коцески
Доц. д-р Наташа Коцеска
Доц. д-р Зоран Утковски
Доц. д-р Игор Стојановиќ
Доц. д-р Благој Делипетров

Редакциски одбор

Проф. д-р Цвета Мартиновска
Проф. д-р Татајана Атанасова - Пачемска
Доц. д-р Наташа Коцеска
Доц. д-р Зоран Утковски
Доц. д-р Игор Стојановиќ
Доц. д-р Александра Милева
Доц. д-р Зоран Здравев

Главен и одговорен уредник

Доц. д-р Зоран Здравев

Јазично уредување

Даница Гавриловска - Атанасовска
(македонски јазик)
Павлинка Павлова-Митева
(англиски јазик)

Техничко уредување

Славе Димитров
Благој Михов

Редакција и администрација
Универзитет „Гоце Делчев“ - Штип
Факултет за информатика
ул. „Крсте Мисирков“ 10-А
п. фах 201, 2000 Штип
Р. Македонија

Editorial board

Prof. Saša Mitrev, Ph.D.
Prof. Liljana Koleva - Gudeva, Ph.D.
Prof. Vlado Gicev, Ph.D.
Prof. Cveta Martinovska, Ph.D.
Prof. Tatjana Atanasova - Pacemska, Ph.D.
Ass. Prof. Zoran Zdravev, Ph.D.
Ass. Prof. Aleksandra Mileva, Ph.D.
Ass. Prof. Saso Koceski, Ph.D.
Ass. Prof. Natasa Koceska, Ph.D.
Ass. Prof. Zoran Utkovski, Ph.D.
Ass. Prof. Igor Stojanovik, Ph.D.
Ass. Prof. Blagoj Delipetrov, Ph.D.

Editorial staff

Prof. Cveta Martinovska, Ph.D.
Prof. Tatjana Atanasova - Pacemska, Ph.D.
Ass. Prof. Natasa Koceska, Ph.D.
Ass. Prof. Zoran Utkovski, Ph.D.
Ass. Prof. Igor Stojanovik, Ph.D.
Ass. Prof. Aleksandra Mileva, Ph.D.
Ass. Prof. Zoran Zdravev, Ph.D.

Managing/ Editor in chief

Ass. Prof. Zoran Zdravev, Ph.D.

Language editor

Danica Gavrilovska-Atanasovska
(macedonian language)
Pavlinka Pavlova-Miteva
(english language)

Technical editor

Slave Dimitrov
Blagoj Mihov

Address of the editorial office

Goce Delcev University – Stip
Faculty of Computer Science
Krstе Misirkov 10-A
PO box 201, 2000 Stip,
R. of Macedonia

СОДРЖИНА
CONTENT

DEVELOPING CLOUD COMPUTING’S NOVEL COMPUTATIONAL METHODS FOR IMPROVING LONG-TERM WEATHER GLOBAL FORECAST Zubov Dmytro	7
PERVASIVE ALERT SYSTEM FOR FALL DETECTION BASED ON MOBILE PHONES Kire Serafimov, Natasa Koceska	17
ESTABLISHMENT OF A HEALTHCARE INFORMATION SYSTEM Alexandar Kostadinovski, Drasko Atanasoski	26
TIME COMPLEXITY IMPROVEMENT OF THE FIRST PROCESSING STAGE OF THE INTELLIGENT CLUSTERING Done Stojanov, Cveta Martinovska	36
MOODLE AS A TEACHING TOOLS IN MATHEMATICS-CASE STUDY IN UNIVERSITY “GOCE DELCEV” STIP Tatjana Atanasova-Pacemska, Sanja Pacemska, Biljana Zlatanovska	45
TOURISM RECOMMENDATION SYSTEMS: ANALYTICAL APPROACH Biljana Petrevska, Marija Pupinoska-Gogova, Zoran Stamenov	57
CLOUD COMPUTING APPLICATION FOR WATER RESOURCES MODELING AND OPTIMIZATION Blagoj Delipetrev	66
IMPROVING THE SECURITY OF CLOUD-BASED ERP SYSTEMS Gjorgji Gicev, Ivana Atanasova, Jovan Pehcevski	77
USING OF THE MOORE-PENROSE INVERSE MATRIX IN IMAGE RESTORATION Igor Stojanovic, Predrag Stanimirovic, Marko Miladinovic	88
THE INFLUENCE OF THE BUSINESS INTELLIGENCE ON THE BUSINESS PERFORMANCE MANAGEMENT Ljupco Davcev, Ana Ljubotenska	99
LINQ TO OBJECTS SUPPORTED JOINING DATA Mariana Goranova	109
GLOBALIZATION, INFORMATION TECHNOLOGY AND NEW DIGITAL ECONOMIC LANDSCAPE Riste Temjanovski	120

WEB БАЗИРАН СОФТВЕР ЗА SCADA АПЛИКАЦИИ INTEGRAXOR Марјан Стоилов, Василија Шарац	130
SECURITY IN COMPUTER NETWORKS FROM THE PERSPECTIVE OF ACCESS CONTROL Saso Gelev, Jasminka Sukarovska-Kostadinovska	139
FREQUENCY DISTRIBUTION OF LETTERS, BIGRAMS AND TRIGRAMS IN THE MACEDONIAN LANGUAGE Aleksandra Mileva, Stojanče Panov, Vesna Dimitrova	149
TOWARDS A GENERIC METADATA MODELING Pavel Saratchev	161
ECONOMIC VALUE OF INFORMATION SYSTEMS IN PRODUCTION PROCESSES Aleksandar Krstev, Zoran Zdravev	175
TUNING PID CONTROLLING PARAMETERS FOR DC MOTOR SPEED REGULATION Done Stojanov	185
COMPARISON OF THE PERFORMANCE OF THE ARTIFICIAL BOUNDARIES P3 AND P4 OF STACEY Zoran Zlatev, Vasko Kokalanov, Aleksandra Risteska	192
CORRESPONDENCE BETWEEN ONE-PARAMETER GROUP OF LINEAR TRANSFORMATIONS AND LINEAR DIFFERENTIAL EQUATIONS THAT DESCRIBE DYNAMICAL SYSTEMS Marija Miteva, Limonka Lazarova	200
THE BLACK-SCHOLES MODEL AND VALUATION OF THE EUROPEAN CALL OPTION Limonka Lazarova, Marija Miteva, Natasa Stojkovic	209
BITCOIN SCHEMES- INOVATION OR A THREAT TO FINANCIAL STABILITY? Violeta Madzova	221
JAVA IDEs FOR EASILY LEARNING AND UNDERSTANDING OBJECT ORIENTED PROGRAMMING Aleksandra Stojanova, Natasha Stojkovic, Dusan Bikov	232
STUDENTS' KNOWLEDGE TEST CONTROL – METHODS AND RESULTS' INTERPRETATION Ludmila Stoyanova, Daniela Minkovska	241

**WEB SERVICE FOR AMBIGUOUS TRANSLITERATION OF FULL
SENTENCES FROM LATIN TO CYRILLIC ALPHABET**

Stojance Spasov, Zoran Zdravev 252

**ON THE APPLICATION OF KEEDWELL CROSS INVERSE
QUASIGROUP TO CRYPTOGRAPHY**

Jaiyéolá Tèmitopé Gboláhàn 264

STUDENTS' KNOWLEDGE TEST CONTROL – METHODS AND RESULTS' INTERPRETATION

Ludmila Stoyanova¹, Daniela Minkovska²

¹ *Technical University of Sofia, Bulgaria, Istoyanova@tu-sofia.bg*

² *Technical University of Sofia, Bulgaria, daniela@tu-sofia.bg*

* *Corresponding author's mail: Istoyanova@tu-sofia.bg, daniela@tu-sofia.bg*

Abstract: This paper reveals some popular methods and types of test approach for students' knowledge and skills assessment that have been used in the machine engineering faculties. The received test results from conducted experiments have been analyzed and interpreted by the means of statistical methods. Definite conclusions have been made concerning the efficiency of appliance of different test approaches.

Keywords: assessment, tests, E-learning, programming

1. Introduction

In the modern forms of education, conducted with the help of multimedia technology, the introduction of e-learning systems, various test control and assessment systems of students' knowledge is exceptionally significant.

Important parameter among the general characteristics in the process of learning is the assessment. For the process of checking the obtained students' knowledge different methods might be used - traditional examination by writing an essay to a definite question, the oral answer to a problem, or the usage of previously drawn test' variants. The test method for assessment offers many advantages over the other methods, such as shortening of the time control, covering larger amount of the material, and the ease of interpretation and analysis of the results.

The goal of the experiment has been to reveal the advantages and disadvantages of the already used methods for one and the same discipline in one and the same direction at the Technical University of Sofia, Bulgaria.

That was necessary when the directions as a number of definite faculties have been introduced where the study of the same discipline have to be on the same level. In order to compare the level of students' knowledge the comparison began from the testing methods.

2. A brief overview of some methods for structuring the test questions

The usage of a test method for control and assessment of students' knowledge involves structuring the entire learning material in an appropriate sequence, selection of appropriate types of test questions and creation of relevant evaluation criteria.

The most convenient tests from the getting a “correct” image of learning process' results point of view are the didactic tests. They measure the received results in the learning process of definite curricula in an organized learning process. The didactic tests are two types:

- Normative – they establish the personal achievements of each tested student by comparison to everyone else who worked on this test. The level of these achievements always ends with an assessment.
- Criteria – they measure the student's achievements according to the standards already set in the curriculum. This type of tests are also standardized tests.

Both types of tests should not be opposed, because they have common characteristics, such as using the same type of test questions, the same properties (validity, reliability, difficulty, etc.), the evaluation requires a sample of test questions and others [1].

The construction of didactic tests requires the following:

- questions must be clearly and concisely written;
- the proposed options for answer must be unambiguous;
- the learners must have limited (but sufficient) time to think over the answer;
- the student have to work almost without need of supplies;
- limited ability for random guess of the correct answer;
- opportunity to receive immediate evaluation after the test.

The didactic tests allow the usage of two main types of test questions - open type and closed type.

- Open type - these are the questions and problems with free response in which students themselves can formulate their answer. In them, the students can apply, analyze and present their knowledge and related skills.
- Closed type - these are the questions and tasks with the so called structured response in which students choose an answer, their ability for response is limited or is one among many alternatives. This type of questions can possess different structure:
 - dichotomous tests (type true-false-items) – these questions consist from one statement or proposition that is offered to the student for assessment whether it is true or not. The advantage of this type is that the tests are composed relatively quickly and require less time. They allow quick processing and analysis of test results. The results are not affected much by the chance that one answer might be selected randomly. Deficiencies are associated primarily with the students possibility to guess 50% of the responses completely random, even without thinking;
 - tasks with multiple response (type multiple-choice items) - the most commonly used type of questions in didactic tests. They have two parts - a base (specific task formulated as a question or incomplete statement) and alternatives (possible answers or statements, only one of which is correct). Alternatives must be not less than three, in the best case, four or five possible answers. Each test question should contain only one accurate, correct and unambiguous answer. The advantage is that by the means of that type of questions complete learning content can be covered and the verification of responses is relatively quick. The disadvantage is that the possibility of guessing the correct answer depends on the number of offered variants for answer;
 - tasks for comparison - allow to assess students' understanding of the interrelationships between words and definitions, events and dates, categories and examples etc. In this case to one set of information is proposed a definite common set of answers. The question usually is given in two columns. The student is required to relate the elements from one column to the elements in the second column. The advantage of this type is that it allows relatively quick checking of the utilization of relatively large amounts of factual information. Assessment is objective and independent and the evaluation can be performed automatically. Disadvantages – questions are hard to understand [2];

The latest trend in education is the application of the so-called adaptive tests (tailored-tests). They implement the strategy whereby questions have been chosen according the appropriate student's level of preparation. At the

beginning, the student undergoes diagnostic test questions, and then depending on his results the proposed test questions are tougher or lighter. The construction of such tests is a complicated and long research process, which is based on the latest theories in the field of testing with probabilistic and informational technique nature, such as probabilistic theory or called. Poisson - D. Raash model, the theory of "Maximum-Likelihood-Shatzung" of RA Fisher, the three parametric model of Birnbaum and some other [3].

The usage of the test method for monitoring and assessment of students' knowledge is an innovative method that enables the increase of the cognitive activity of the students, and self-diagnosis of their achievements. With its help, the lecturer can make a quick and easy statistical and/or probabilistic analysis of the results and reliable conclusions about the quality of the learning process.

3. Description of experiments with different types of tests

In the machine engineering faculties mainly two types of tests have been used.

The first type of test is the one that contains only the short answer type of questions [4]. This type of test has been used without computer, just on paper. The usage of computer assisted testing may be introduced successfully but the checking of students' answers will still remain without computer help. That is so because the short answer questions are similar to essay. The student gives his answer without any kind of hints. The questions have to be constructed in a clear form [2] and they should require a short answer. Still it is a free constructed answer and the computer assisted checking of such answers is not on the appropriate or better to say desired level. From another side their checking would be considered much easier than the essay. As the praxis has proven the checking and proofing of such type of questions is really timesaving if the required answers are short and clear. And depending on the question formulation the spent time for checking and proofing is comparable to the time of the manual checking and proofing of multiple choice type of questions.

Sometimes the short answer questions are neglected because of their general usage to require the exact reproduction of knowledge, e.g. "Define the element of the ..." or "List the elements that..." However, this disadvantage can be overcome by the usage of questions of higher levels

according the Bloom’s theory, e.g. “What is the difference between...”, “Analyze the advantages of the usage of element ...”, “Categorize the elements according...”and so on. In this way, the student has to prove his understanding of knowledge or even more his ability to comprehend, analyze or evaluate (Fig. 1).

Информатика ТФ 2010-2011

Вариант К1АА

1. Кои са основните видове алгоритмични структури?
2. Опишете управлаващата структура **if**. Дајте примери на варианти с блок схеми.
3. Како е механизам за врцање на резултатот од исполнењето на функциите?
4. Да се исчислат изразите:
 - a) $(x > 0) \ || \ (x <= 0)$
 - b) $(x > 0) \ \&\& \ (x <= 0)$
5. Кои са основните операции по редактирање структурата на текстови документи в режим на структурното редактирање (Outline view) в текстообработката?
6. Каково представяват базите данни?
7. Електронни табелици. Напишете формула за изчисление на следниот израз:

$$\frac{b-x}{2 \sin \alpha}$$

каде: "a" се намира в клетка B15 (в радиани),
"b" - в клетка C15
"x" - в клетка D15.
8. Да се определи резултатот од изпълнењето на следната програма:


```
#include <stdio.h> //92
#include <stdlib.h>
int main()
{
    int i=1,m=0, n=3;
    while (i!=4)
        ++i;
    m+=i*m;
    printf("i=%d \n", i);
    printf("S=%d \n", m);
    system("pause");
    return 0;
}
```
9. Да се определи резултатот од изпълнењето на следната програма:


```
#include <stdio.h> //31
#include <stdlib.h>
int main()
{
    float b;
    int i,N=6;
    float Array[N];
    for (i=0;i<N;i++){
        printf("Array[%d] = ",i);
        scanf("%f", &Array[i]);
    }
    for (i=0;i<N/2;i++){
        b=Array[i]; Array[i]=Array[N-1-i]; Array[N-1-i]=b;
    }
    for (i=0;i<N;i++){
        printf("Array[%d]= %.3f\n",i, Array[i]);
    }
    system("pause");
    return 0;
}
```
10. Каково ще изгледа на екрана следната програма:

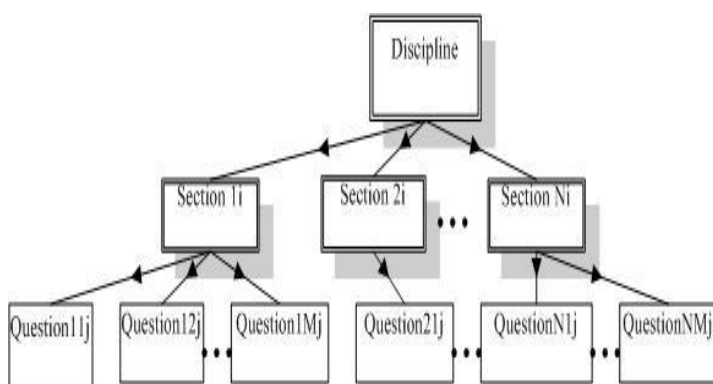

```
#include <stdio.h> //56
#include <stdlib.h>
int Bro (int a, int b);
int main (){
    int m=10,n=6;
    m=Bro(m,n);
    printf("m= %d \n",m);
    system ("pause");
    return 0;
}
int Bro (int a,int b)
{
    a+=2*b;
    return a;
}
```

figure 1 Test with short answer type questions

This method for test construction requires that the discipline or the part of discipline on which a test will be constructed have to be presented as a set of sections (Fig. 2). On figure 2 the sections are named from Section 1i to Section Ni, where i depicts the appropriate cognitive level according to the Bloom’s taxonomy.

Each section includes a number of questions over a part of the curricula. Every section corresponds to a certain cognitive level in Bloom’s taxonomy. The questions to each section may refer to the lowest level in the taxonomy up to the level of the section.

Of course, it depends on the author of the test, but in such way, the students will be tested and assigned to the cognitive level, which correspond to their assessed knowledge and skills. The construction of a definite variant of the test should contain questions at different cognitive levels that are equal or lower than the level of corresponding section.



Legend:

i – cognitive level of the section

N - number of the section

M – number of the question in the section

j – cognitive level of the question

figure 2 Test structure

By this kind of tests, the correct answer to each question brings the student 3 points. Each test variant consists of 10 questions. The distribution of questions over the cognitive levels brings to the correct correlation between the assessed knowledge and skills and the gathered points from the test.

The described test type has been experimented for the knowledge and skills' assessment of one group of 112 students twice per one semester and another group of 182 students also tested twice per one semester.

At the same time another type of testing has been used for control and assessment of another group of students.

The second type of tests consists of questions of multiple choice type. These students have been tested twice per semester with this kind of tests.

During the real implementation in the learning process of this type of test control, the students' answers to the same number of questions, uniformly distributed, at the learner material [5]. All questions are stored in one unified database; the questions are generated according to the basic topics on the

studied material separately, through random method [6]. All generated tests' variants have the same characteristics, for example: united structure of the properties part with the same number for choice, as one of them is true, difficulty, the same points for a correct answer, they have equal time for implementing of the control and one and same predefined grade scale [7]. In that way the students are stationed in equal conditions, because they have possibility decide equal by difficulty, but different by content tests (Fig. 3).

For getting of assessment for mean level (3) on the first and second test' control, it is necessarily the students to obtain 30 percent of correct answers [8]. Evaluation with higher marks is respectively with the criteria of ECTS (European Credit Transfer System) (Fig. 4) [9].

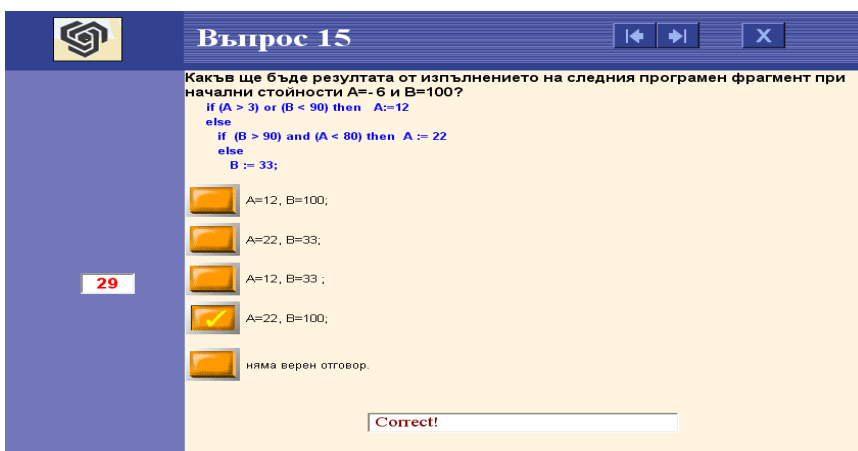


figure 3 Page with a multiply type question

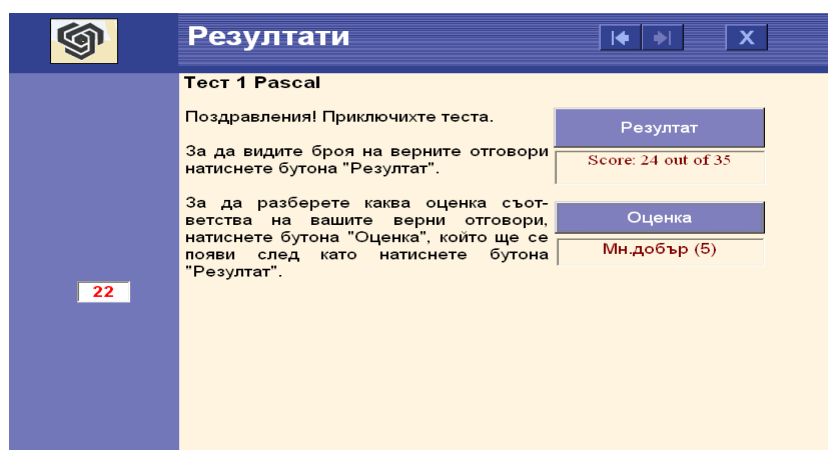


figure 4 Final page from the continue control system

The previous experiments [5, 6, 7, 8] have proved that this type of questions and respectively tests give the most exact correspondence of students' knowledge and skills and the gathered points (or the mark).

The time spent for the checking of these types of tests is quite short.

On the base of the gathered results, some quite useful histograms (bars) could be presented. They allow the comparison of empirical distribution of students' results according the two investigated educational years for each of investigated faculty:

- Faculty of Power Engineering and Power Machines (FPEPM) – (Fig. 5);
- Faculty of Transport (FT) – (Fig. 6).

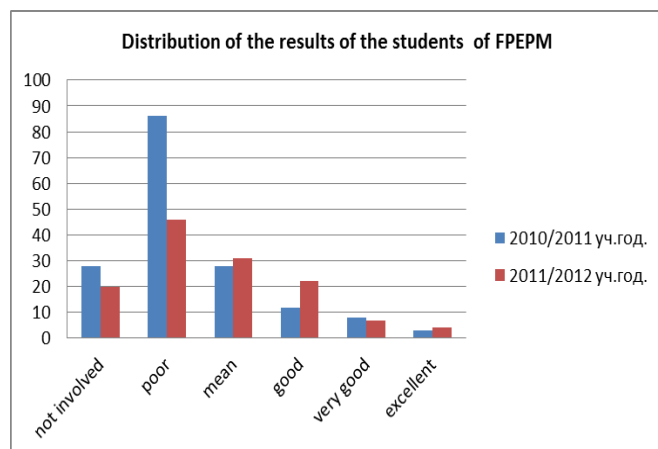


figure 5 Distribution of students' results of Faculty of Power Engineering and Power Machines (FPEPM)

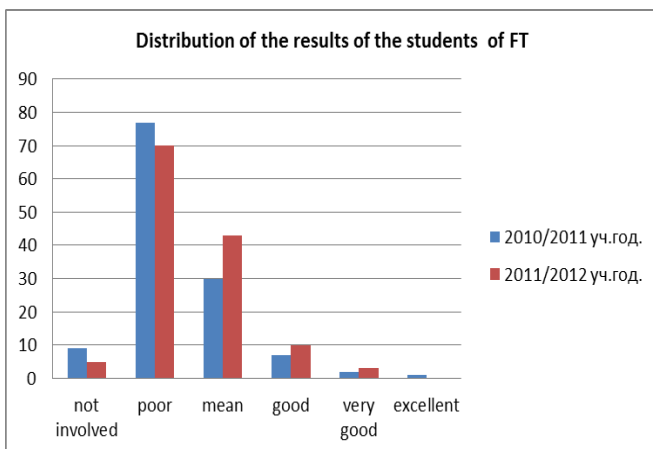


figure 6 Distribution of students' results of Faculty of Transport (FT)

The students' results of Faculty of Power Engineering and Power Machines (FPEPM – fig. 5) have undergone the second test type – multiple choice test type and the students from the Faculty of Transport (FT – fig. 6) have conducted the tests from the first type – the short answer type. The distribution of the students' results is similar for both faculties and this points that both test types measure in equally correct way the received knowledge and skills.

4. Conclusion

The experiments for the two types of testing have been conducted in two successive years during the first semester and for a discipline that have been studied in one semester in both faculties. The chosen faculties are the Faculty of Transport and the Faculty of Power Engineering and Power Machines - both in the machine engineering direction.

The experiments have established that the both types of testing bring to correct correlation between the assessed knowledge and skills and the received marks from the test.

The short answer types of questions develop the students' ability to construct answers, to present ideas and so on, and this is very important in this age of electronic devices.

The second type of tests is much more suitable for the lecturers and instructors because it is timesaving.

From these results, we can draw the conclusion that the usage of the test method for control of the learning or the e-learning processes is an effective instrument for measurement and assessment of the level of the knowledge and skills of the students, being educated. It gives the teachers the opportunity to acquaint themselves with the results during the learning process and in this way allow them to change or adjust the learning material according the students' level. The usage of the two different forms and the test methods themselves have not played significant role for the assessment of the students. Their differences have been much more significant to the teachers in the timesaving aspect.

5. References

1. Тупаров Г., Дурева Д., *Електронно обучение – технологии и модели*, изд. „Неофит Рилски“, Благоевград, 2008, ISBN:978-954-680-533-1
2. Желев Г., *Методи за управление на диалога и адаптацията на потребителите*, PhD thesis, Leningrad, Russia
3. Георги Бижков, *Теория и методика на дидактическите тестове*, Просвета София, 1992
4. Методология и технология електронного обучения, last viewed 09.11.2012, <http://cnit.ssau.ru/do/index.htm>
5. Jelev G., Minkovska D., *Approaches for Definition the Validity of the Results of the Test for Knowledge Mastering.*, Proceedings, International Scientific Conference, Computer Science, FKSU, TU, Sofia, 2004;
6. Jelev G., Minkovska D., *An Approach for Improving of Test Environment for the Knowledge Mastering*, Proceedings, International Scientific Conference “Computer Science’2005”, Chalkidiki, Greece, 2005;
7. Jelev G., Minkova Y., *Determination of Representative Sample Size*, Computer Science conference, FKSU, TU, Sofia, 2004;
8. Jelev G., Minkovska D., *Results Analysis of Test Control on the Knowledge of the Students*, Proceedings, International Scientific Conference “Computer Science’2006”, Istanbul, Turkey, 2006;
9. Practical guide of ECTS, ECTS, 1995