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MULTIMEDIA AND ELECTRONIC TOOLS SUPPORT OF ELECTRICAL ENGINEERING EDUCATION AT FEEC BUT

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Abstract: *There is widely extended ITC supported education at many of universities today. The paper presents some experiences from the utilizing of the multimedia material, electronic texts and interactive teaching in an education process at the Faculty of Electrical Engineering and Communications Brno University of Technology. There are discussed some possibilities of all modern education tools to increasing the teaching efficiency of electrical engineering subjects.*

Key words: *Education, interactive teaching, multimedia material, electronic text.*

INTRODUCTION

There is a very significant qualitative and quantitative development in computer and information technologies during the last years. This reality offers unbounded possibilities of a widely using of the information technologies in an education process, too. Today it is indispensable.

There were developed lots of various kind of application software for the teaching of electrical engineering courses, which allow realizing

- varied kinds of the circuit simulations (SPICE, Micro Cap, TINA, Electronics Workbench, etc.),
- a numerical modeling (FEMLAB, Ansys, QuickField,)
- an experimental data processing
- a development new algorithms for a specific problems solution (MATLAB toolbox, MAPLE).

It is necessary to mention also new possibilities, which are related with the information transfer during an education process, the software utilization for creating of the static presentation (PowerPoint) and dynamic presentation (software for a creation of animation), furthermore modern tools for interactive teaching or special software for check and assessment student's knowledge and skills.

The creation of the high-quality education tools in accordance with the today's possibilities of information technologies demands the corresponding hardware. Nowadays there is the high-quality support for

application software, which has the high demands to a memory, a processor capacity, and the possibilities of a high-quality graphic data processing. There are also offered components, which allow set up complete experimental workplaces for the measurement, the data transfer, the data control and the subsequent experimental data processing.

The all students have to learn lots of theoretical knowledge's and also they have to get lots of practical skills and qualifications to obtain electrical engineering education. There were developed lots of various kinds of education tools and means based on the utilization of information technologies, which significantly support this effort.

It is imperative to determine the range and kind of teaching supported by information technologies to reach the sated aim and in accordance to this to set the corresponding education tools. Further are discussed the actual education tools, which are used at FEEC BUT.

1 OVERVIEW OF EXPLOITED ICT

It is possible to support the increasing of the education process efficiency by different type of tuition. First it is shown in the table 1 the brief overview of the basic education tools and means based on using of ICT, which are convenient to support the specific type of tuition of the electrical engineering oriented study subjects.

Type of tuition	Suitable tools of ICT
Lecture	Electronic text, presentation, video, multimedia text
Exercise	E-learning
Laboratory exercise	Electronic text, virtual laboratory
Computer exercise	Electronic text,
Language exercise	Electronic text, e-learning

Tab. 1: The overview of recommended tools

We can support also the communication means which are used during the education process. The interactive teaching is one example of them. It is possible to characterize this form of a teaching as using of the combination of a special audiovisual technique, a projection technique and of presentation and control software. The selected seminary room for the digital interactive teaching is equipped with the described means. So, the complex modern equipment allows the teaching on a qualitative higher level corresponding to the actual level of an offered technique.

2 EXAMPLE OF ICT SUPPORTED COURSES

In this part is presented one example of the multimedia support teaching, which is used in the subject Safety electrical engineering [1]. In the past we had for support of the study this subject only the written text.

Now, based on teachers and students experiences and the detail discuss with all teachers the range of syllabus was modified. The teachers created the electronic texts, the multimedia teaching program with the illustrative PowerPoint presentation and the special workbook, which allows very intensive teaching of the safety of the electrical devises and equipments. There is one example of this presentation in Fig. 1.

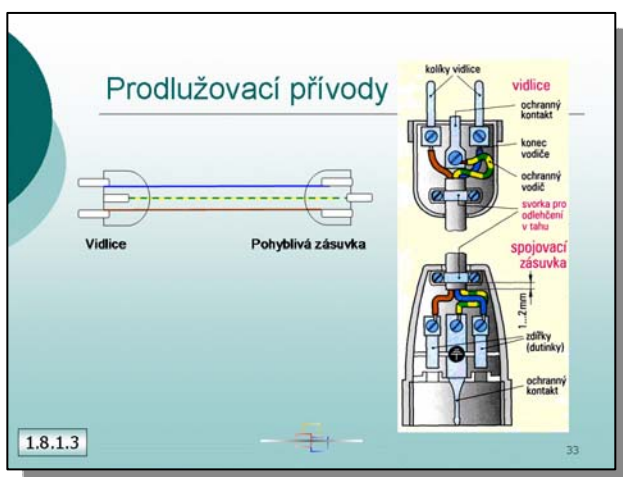


Fig.1: Part of an interactive presentation

Then the next step followed, the fulfillment and enlargement of audiovisual means was realized, because it is very well known that anybody can remember only 20 % from the heard but about 50 % from the heard and from the seen at the same time. This principle was used

for the increasing of teaching efficiency, which was necessary to teach the comprehensive and important field of study. Further the video clips were created. This tool presents highly efficient and for students interesting way, because of very clear contents. There are two example of some previews in Fig. 2 and Fig. 3; which are in accord with theme of study subject.



Fig.2: Preview 1 of a video



Fig.3: Preview 2 of a video

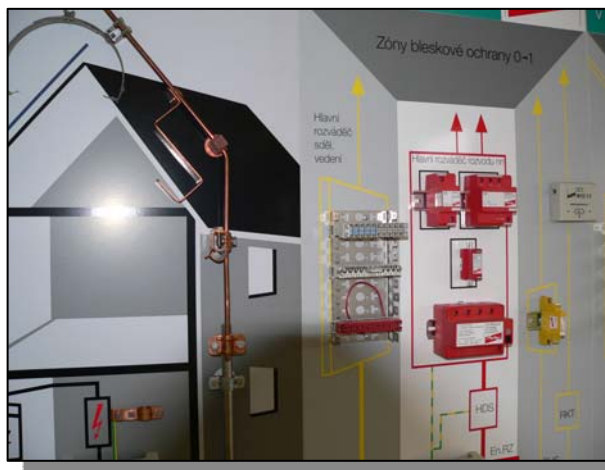


Fig.4: Example 1 of the demonstration board

Another tool for an illustrative teaching of the laboratory exercises is presented in the Fig. 4 and Fig. 5. There are two examples of the demonstration boards. The students can simulate using this board the real situation like for example single-pole short circuit.

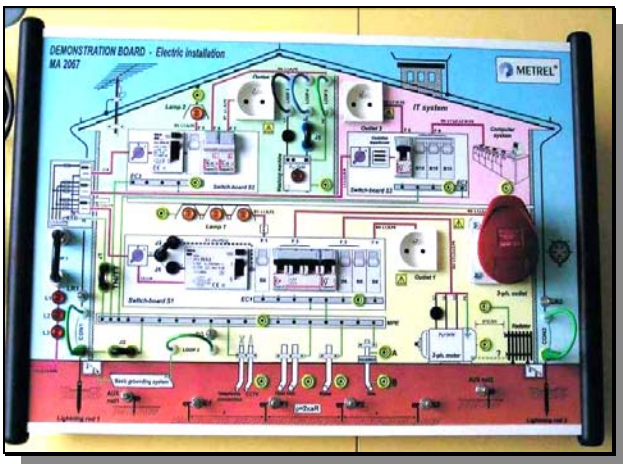


Fig.5: Example 2 of the demonstration board

Finally the test question database was created for a facilitation of the student's knowledge examination.

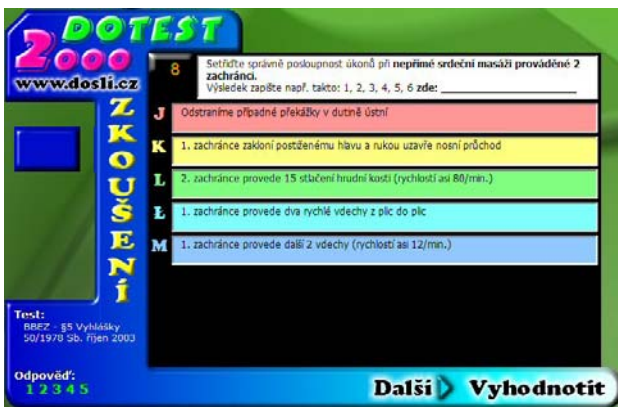


Fig.6: Example of electronic test

The special software called DoTest was used, which allows the generating different variant of tests based on determine criteria. Then the examination can be in the written form or in the electronic form using PC (online).



Fig.7: An automatic assessment of student knowledge

The software DoTest for examination and automatic evaluation of student's knowledge allows set the question configuration in accord with corresponding level of electrical engineering qualification, which is demanded.

3 ELECTRONIC TEXTS AND MULTIMEDIA AT FECC BUT

The Faculty of Electrical Engineering and Communication supports the preparing and creation of electronic texts and multimedia for all subjects of Bachelor's and Master's study programmes. Since 2003 the teachers prepared the electronic study texts for lectures and for numerical and laboratory exercises. They prepared also virtual laboratories to be used as a support for real laboratory exercises. For some subjects, electronic texts were created for self-study on one hand and for computer and laboratory work on the other.

During the following three years there were prepared about 136 electronic texts for lectures and 87 texts for laboratory and numerical exercises of the selected subject of the Bachelor's study program.

In 2004 the new electronic texts for preparing the teaching in Master's degree program were written. Since this time the teachers prepared about 94 texts for lectures, 78 texts for numerical and laboratory exercises and 21 other electronic tools including virtual laboratory and multimedia.

There is a short overview in table 2, which illustrates the numbers of electronic texts and multimedia for selected lectures and exercises, which were prepared as a support of teaching in Bachelor's degree program at FECC BUT.

Subject	Lecture	Exercises	Multimedia
Compulsory	52	39	5
Optional	56	48	10
General knowledge	28		

Tab. 2: The overview for Bachelor program

The short overview in table 3 illustrates the numbers of electronic texts and multimedia for the lectures and exercises, which were prepared as a support of teaching in Master's degree program at FECC BUT.

Subject	Lecture	Exercises	Multimedia
Compulsory	30	23	9
Optional	49	41	12
General knowledge	15	15	

Tab. 3: The overview for Master program

All these electronic texts, virtual laboratory and multimedia are adapted to be ready for use in full-time and part-time study programmes. All created electronic teaching tools are accessible for the students of Bachelor's or Master's study programmes on the websites of FECC BUT.

FECC supports the teaching of the specialized subjects in English too. There were prepared electronic texts in English for 16 selected study subjects for all specialization in Bachelor's degree program.

All these works were partially supported by development fund of Ministry of education of the Czech Republic. We have to add in this place that about 50 % of all students still prefer the classic written study text. Therefore this form of study material is prepared for subjects with several hundred enrolled students, [2], [3] and [4].

4 TOOLS SUPPORTED EDUCATION PROCESS

As was mentioned above we can support also the communication means, which are used during the education process. Here will describe the interactive teaching as one example of these means. The interactive teaching is one modern way to increasing the efficiency of an education process. It is combination of a special audiovisual technique, a projection technique and the presentation and control software. The seminary rooms with modern presentation devices allow the higher level teaching, which are based on greater interaction between the students and teacher using the digital technology, audiovisual and printer techniques.

The main aim is to obtain higher teaching efficiency in small teaching group, which is typical for specialized technical subjects. Here we suppose higher creative activity of students for example team cooperation on project work. The instructor should to be rather the control element then the teacher giving the information. There are installed new systems in the seminary rooms, which consist of following components

- **Schoolboard** is electronic board, which is able in *WhiteBoard* mode to record, to print and to distribute the notes, the pictures, the calculations and all written text. The *Interactive* mode performs the board projection of a presentation. During this projection it is possible to control the cursor using the electronic descriptor. In *Notes* mode you can use interactively all graphic tools for any modifying of the presentation.
- **iPanel** is a combination of the LCD monitor, the electronic pen and the software *InterWrite*. The teacher can use this device like checking monitor of project picture and first of all to control and to graphic modification of multimedia presentations. The tactile LCD panel is used like the control and communication tool mainly with the connection to other didactic technique.
- **SchoolPad** is an electronic pen with wireless graphic tablet. The teacher can using this tool remote the PC, interactively control multimedia presentation from any place in the seminary room as well with an active student's cooperation.
- **PRS** is voting device (Personal Response System), which combines interaction and evaluation of the course teaching to obtain the increasing of its productivity. The students can by using the infrared transmitter answer the question during the testing, revision and so on. The results can be immediately shown in a large-area.

- **Software InterWrite** is software used to control Windows applications and to a graphic notes fulfillment. It is possible to save; to print and electronic distribute on Internet it together with the whole screen contents.

The described system consisted of the above mentioned components will be fulfill by audiovisual techniques, which is already situated in seminary rooms. It is namely the multimedia computer PC Pentium 4 with an operation system Windows XP, a projector XGA, a wireless microphone, a sound system.

So, the teaching is characterized with following elements

- the frontal teaching (Schoolboard),
- the online notes at screen (iPanel),
- the actively co-operation of students (SchoolPad),
- the immediately assessment of the student knowledge (PRS).

The teacher or lecturer will use the multimedia control panel to ensure the following activities

- the straightforward presentation face to students (iPanel),
- the remote control and recording of presentation (software *InterWrite*),
- the presentation from the memory media or from Internet (multimedia computer),
- the presentation from other media (player DVD/VHS),
- the presentation of picture patterns (visualizer),
- the connection on another presentation technique.

The main advantages is the fact that the teacher does not lose the direct contact with students and the communication can aim is to obtain higher teaching efficiency in small teaching group, which is typical for specialized technical subjects.

5 CONCLUSION

There are presented new possibilities of actual information technologies which are used to increasing of a teaching efficiency at FEEC BUT. It is clear that if the all these tools are used rightly and on an adequate level, it is possible to obtain the demanded aim.

6 REFERENCES

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