Evaluation of the candidates' skills for distance learning study.

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Index Terms: eLearning, tools of distance education, analysis and methodology.

Introduction

The Centre for Distance Education CODE at the Warsaw University of Technology has conducted engineering studies at the B.Sc. level since 2001. The studies were first of the eLearning type at the Warsaw University of Technology and have contributed considerably to the development of subsequent instructions carried out in the above techniques. Currently, the following types of studies are available by the Centre:

B.Sc. Engineer -4 years study at Faculty of Electrical Engineering (specialization at applied computer science), Faculty of Electronics and Information Technology (specializations at computers engineering and multimedia techniques) and Faculty of Mechatronics (specializations at mechatronics, multimedia techniques and at industry computer science)

M. Sc. Engineer – 2 year supplementary studies in computer science (since 2006) for students having B.Sc. in this area, at Faculty of Electronics and Information Technology.

Postgraduate studies

- for secondary school teachers in "Tools and Techniques of Virtual Education " (3 semesters)
- studies in " Computer Science and Internet Techniques" (2 semesters)
- studies in e-Business (information tools and techniques in Business – 2 semesters) and

ad hoc courses on specific subjects taught to individual short-term students (e.g. data bases, computer networks, programming in the .Net environment , etc.), individually chosen by them.

Table 1. Data concerning the number of students on engineering courses in 2001- 2007. [4], [1]

Faculties	Specialization	2001	2002	2003	2004	2005	2006	2007	Total
Electronics & Information Technology	Computer Engineering	103	77	69	55	31	41	54	430
	Multimedia Techniques	33	45	27	26	22	13	48	214
Electrical Engineering	Applied Computer Science	56	11	14	23	38	57	37	236
Mechatronics	Industrial Computer Science							23	23
	Mechatronics	26	9	14	11	0	0	x*)	60
	Multimedia Techniques	38	20	7	5	8	11	x*)	89
CODE **)	"Short term" students	2	54	15	60	45	20	45	241
TOTAL									**1288**

*) specialization closed
**) CODE – Centre for Distance Education at the Warsaw University of Technology

The total number of students beginning their studies in the years 2001-2007 was 1288, while the number of students without the short-term ones is **1047.**

B.Sc. Engineering studies in the form of e-Learning were carried out successfully by about 52% students [1].[4]. A similar effect was achieved at extramural studies taught in the traditional manner (c.60%).

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Abilities and needs analysis of students beginning their distance learning.

In the course of study all available distance learning tools and information technologies are applied. They include: e-textbook , both on CDs and the own education platform, internet communicators, discussion groups, dedicated WWW pages and a special educational web site.

As this short characteristics implies, distance studies require special skills to operate constantly developing and improving e-educational tools. They also require additional skills to read specially encoded knowledge and the ability of encoding it. It concerns, among others, all kinds of algorithms presented, for instance, in the form of flow charts, data and work flows, as well as other notations presenting the relations between variables (e.g. graphs of mathematical functions).

The processes of self-instruction underlying distance education require a specific approach to imparted knowledge, mainly its analysis, understanding or deduction, as well as its implementation in typical and problematic situations. Despite the fact that these abilities are going to be developed in further studies, it seems justified to introduce self-instruction and e-education methods to students before the proper e-Learning. Moreover, it should be noted that the analysis of past routes of engineering instruction at the B.Sc. level has revealed that the students had followed different streams of secondary school education. Non-vocational secondary school graduates constituted 53.6% of our students, secondary technical schools – 28.6% and those of other types of schools – 17.96%. The above relations were shown in Figure 1. In addition, the analysis of students' age showed that they acquired IT knowledge at quite different stages of its development, which means that the oldest students are simply ignorant of some of the IT solutions. The graph showing students' age on the B.Sc. courses is presented in Fig.2.

Table 2. Data concerning students graduated from secondary schools of the profiles as below .[4]

Year of study	Alumni of general secondary schools	Alumni of technical secondary schools	Alumni of other secondary schools
2001/2002	102	65	45
2002/2003	81	46	41
2003/2004	65	40	26
2004/2005	71	39	28
2005/2006	78	22	21
2006/2007	66	40	9
2007/2008	102	42	18
Total	565	294	188
Percentage	53,96%	28,08%	17,96%

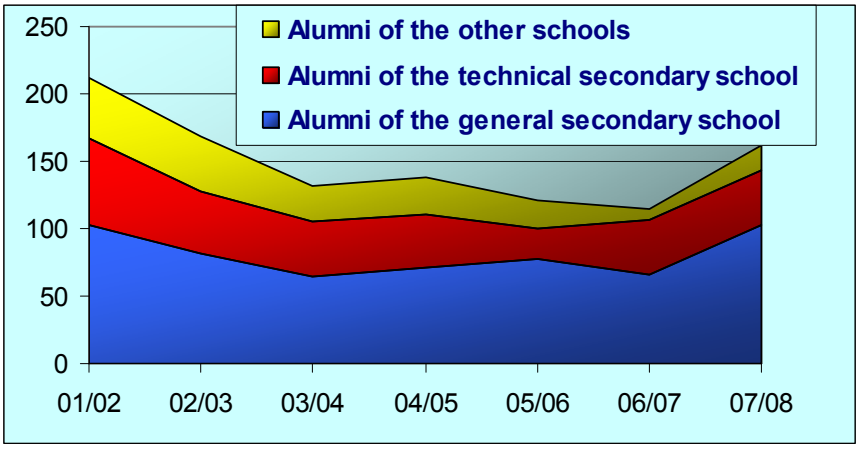

Fig.1. Number of secondary school leavers on B.Sc. courses in the SPRINT model.

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Table 3. Data concerning the age of students in 2001-2007 [4]

Age	20 - 23	23 - 28	28 - 33	33 - 38	38 - 43	43 -48	48 -53	53 - 58
Number of students	67	318	287	195	102	42	27	8

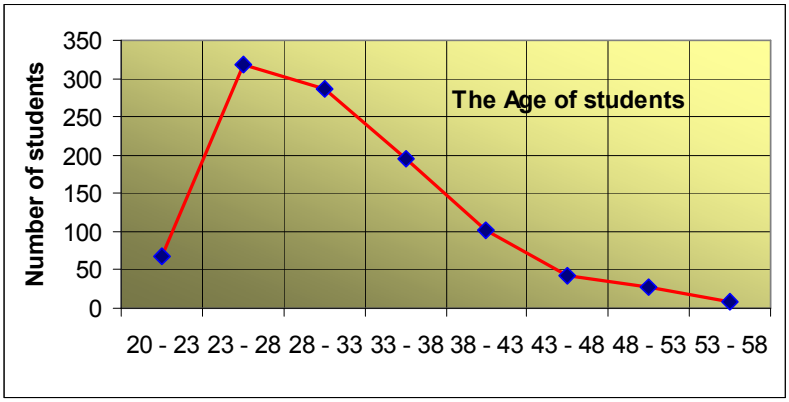

Fig.2. The age curve of students on B.Sc. courses

Bearing the above analyses in mind, a corresponding preliminary Laboratory Meeting programme was devised, the purpose of which was to consolidate the IT knowledge acquired so far, to systematize it or to introduce information tools used in distance learning.
Such a meeting takes place at the Warsaw University of Technology before the proper studies - in the form of a 40-hour Laboratory Meeting lasting one week.
On completion of the above Meeting, the student will have acquired appropriate knowledge and practical skills such as:

- ability to choose the proper equipment and program configuration for simple (typical) applications
- ability to work in the Windows environment and its applications
- ability to work in the Internet and Intranet (finding information, joining discussion groups, subscribing to appropriate groups, exchanging files through the Net, constructing group projects, making available of one's computer resources)
- carrying out any operation/calculation in the spreadsheet environment
- simulating a certain number of mathematical functions (for example such functions as quadratic, sinusoidal functions or acoustic resonance curves)
- fluency in operating some selected tools of the text editor (in our case: Word)
- ability to create algorithms and present them graphically in the form of flow charts
- ability to write basic scripts in the VBA language
- ability to create WWW pages and forms, making use of the Office Environment

and

- ability to use different Internet communicators (MSN Messenger, Skype).

Such a wide scope of knowledge was appropriately prepared in the form of an e-textbook entitled "Basic Computer Techniques" [3], which is our basic material during the Meeting.

Basic computer techniques

The e-book "Basic Computer Techniques" [3] is the basic textbook for the subject "Computer Science 0", for which one must obligatorily get credits.
It has been devised as a set of problems which must be individually tackled. Each task has been appended with ample comments and exemplary solutions, which enables to use the study as a textbook
Figures 3, 4 and 5 show examples of simulations functions to be made in the Excel environment. Another figure, e.g. Fig.6 presents an example of algorithm construction and notation, using the toolbar Draw in the Word text editor environment.

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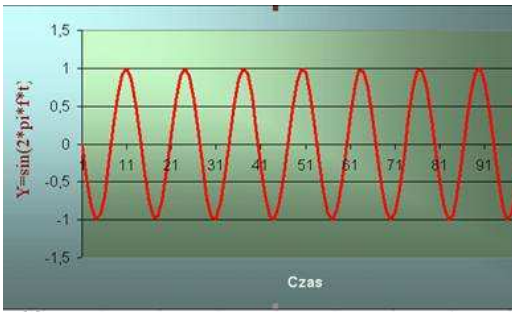

Fig. 3. Sinusoidal function made in the Excel environment for f = 100 Hz

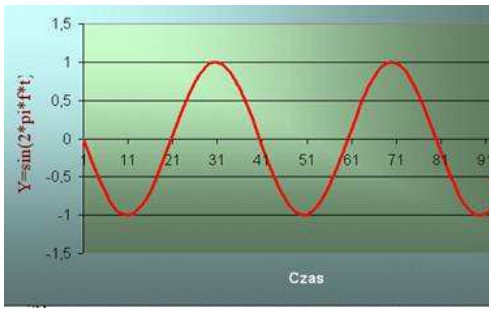

Fig..4. Sinusoidal function made in the Excel environment for f = 50 Hz

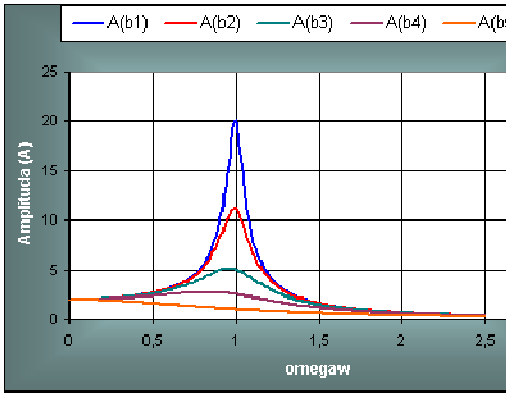

Fig.. 5. Resonance function as an exemplary interpretation of any given formula in the Excel environment

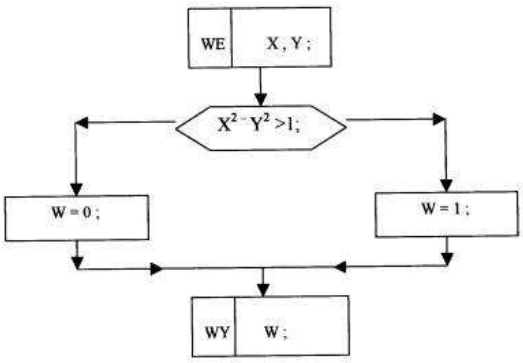

Fig 6. Flow chart of an algorithm made with the Toolbar "Draw"

The subject consists of three modules. It contains text editors, including the production of macros and algorithms, spreadsheets and basic Internet tools. It leads the student through the configuration of the work environment in the Word text editor and basic functions of this tool, on to programming elements in VBA (Visual Basic for Application) and next to creating WWW pages for one's own use with the help of the MS Publisher program. Excel , on the other hand, teaches the user how to create formulas and interpret graphical representation of functional relations. Internet tools systematize and deepen one's knowledge concerning search engine configuration, discussion group management and Internet communicators.

Evaluation of students' abilities getting credits for the preliminary Meeting and Computer Science 0

To verify students' knowledge and abilities at the preliminary Meeting, an evaluation was made. The table below presents the issues which were assessed, their symbolic representation and the percentage of correct answers. In Fig.7 you can see the obtained results.

Table 4. Evaluation of students' knowledge and abilities at the beginning of distance learning

Symbol	Task contents	Correct answers	Incorrect answers
TE	Text editor fluency	91,72 %	8,28%
EE	Equation editor fluency	90,34%	9,66%
GA	Analysis of graphic problem algorithms	78,36%	21,64%
TB	Table fluency	64,14%	35,86%

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CF	Constructing functional relations	57,16%	42,84%
MF	Generalizing application principles of mathematical formulae	51,38%	48,62%
GI	Graphic interpretation of functional relations	53,71%	46,29%
IE	Ability to find any given information in the Internet, operator management	52,93%	47,07%
SE	Ability to configure the search engine IE 7.0	59,22%	40,78%
FI	Ability to filter information coming from the Internet	39,34%	69,66%
ML	Ability to configure and mange e-mail correspondence	61,03%	38,97%
DS	Ability to subscribe to discussion groups and join the discussion forum	43,10%	56,90%
WK	Ability to construct advanced functional relations	10,09%	89,91%

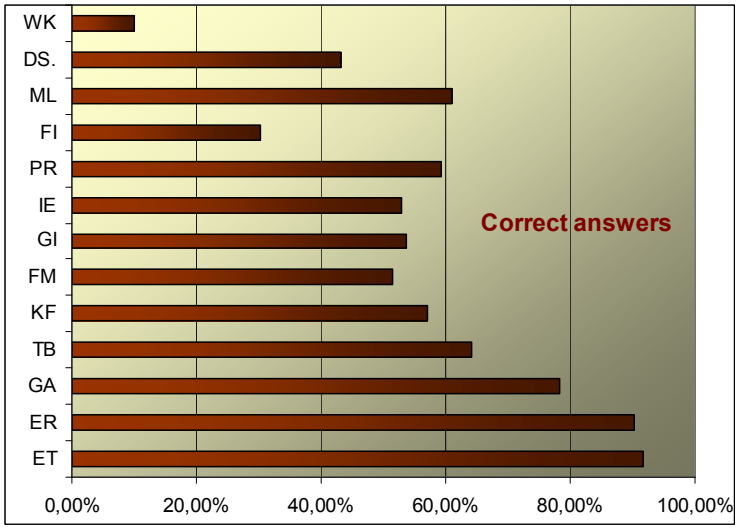

Fig. 7. Percentage of CORRECT answers to the assigned problems

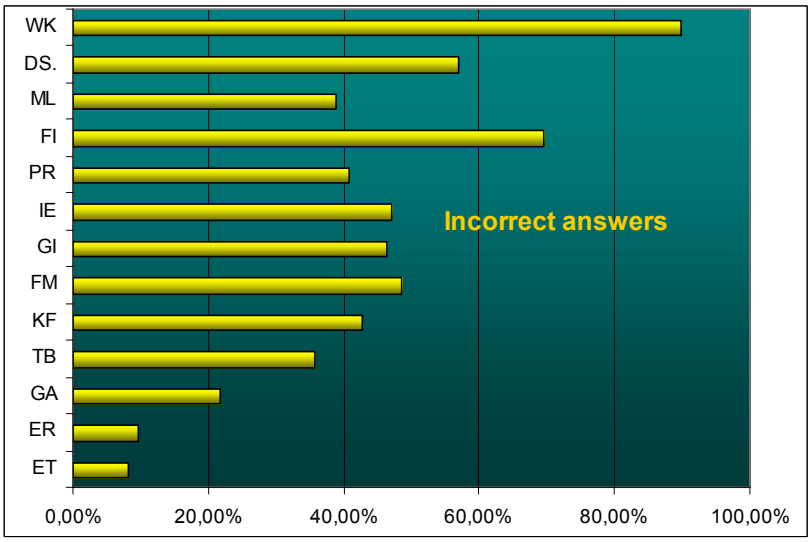

Fig. 8 Percentage of INCORRECT answers to the assigned problems

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Conclusions

As the analyses presented above suggest, the biggest problem was:

- ability to construct advanced functional relations (88.91%)
- Internet management concerning the screening of information accessing the user (69.66%)
- ability to join discussion groups and work in these groups (56.90%)
- generalizing the principles of applying mathematical formulae (48.62%)

The above remarks should serve as a suggestion to people preparing didactic materials on other subjects in the SPRINT studies. One may expect that the deficiencies revealed at the first stage of studies may be an obstacle to correct and prompt solution to the assigned problems at next stages. Only 43% of the assessed students will be able to handle the discussion of a definite problem in the Internet.

The analyses presented above also confirm an intuitive positive assessment of students' abilities to operate text editor (91.72% correct answers) and mathematical equation editor (90.34% correct answers).

The above analyses were fully confirmed by nearly 7-year practice and the resulting conclusions might as well be taken into account by other universities preparing analogous classes.

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