

An Internet project to achieve curricula harmonisation

Maria João Martins¹, Michel Robert² and Jean-Marc Thiriet³

¹Centro de Electrodinâmica, Instituto Superior Técnico, 1049-001, Lisbon, Portugal. ²CRAN-ESSTIN - Université Henri Poincaré Nancy 1, 2, rue Jean Lamour, FR-54 500 Vandœuvre, France. e-mail: pcjoam@alfa.ist.utl.pt

ABSTRACT. The increase of student mobility in Europe and in other countries, and the recent attempt to harmonise European curricula at the graduation and post-graduation levels lead towards an increasing co-operation among universities to develop educational modules with a common background (Ruffio, 2000). This paper describes a project developed in the framework of a European Thematic Network. The educational modules developed are installed in a WWW server and can be accessed by students and teachers. Results obtained through a pilot course in three different countries are presented and suggestions concerning course improvement are given in order to build a virtual university.

Key words: multimedia courses, computer-aided learning, curricula harmonisation.

RESUMO. Um projeto na Internet para obter uma harmonização dos currículos. O aumento da mobilidade de estudantes entre os países europeus e entre estes e outros, e as tentativas recentes de conseguir uma harmonização dos currículos no nível de graduação e mesmo de pós-graduação, conduziu a um aumento da cooperação entre universidades no desenvolvimento de cursos modulares com uma base comum. Esta comunicação tem por fim a apresentação de um projeto que foi desenvolvido no âmbito de uma rede temática europeia. Os módulos desenvolvidos foram instalados num servidor WWW, e podem ser consultados e utilizados por estudantes e professores. Descrevem-se os resultados obtidos num curso piloto efectuado em três países e apresentam-se sugestões para melhorar os cursos desenvolvidos, tendo como objectivo o desenvolvimento de uma universidade virtual.

Palavras-chave: cursos multimedia, ensino assistido por computador, harmonização dos currículos

The increasing mobility of students and teachers across Europe, which is spreading to other countries as well, requires the harmonisation of university curricula. European Programmes such as Erasmus (Ruffio, 2000), have supported the mobility of thousands of students. Figure 1, reports data concerning the mobility of physics students in the European Union. In most technical curricula students are strongly encouraged to spend at least one semester abroad. Some universities are engaged in tighter forms of co-operation delivering double diplomas¹, which has led to a local harmonisation of curricula. In fact, there is a common diploma project involving the universities of Utrecht (Netherlands), Montpellier (France), Coimbra (Portugal), Tampere (Finland) and Huddersfield (UK).

The benefits acquired by students from this experience are very important since a double

diploma opens a wider employment market, not only in the European area but also in the rest of the world.

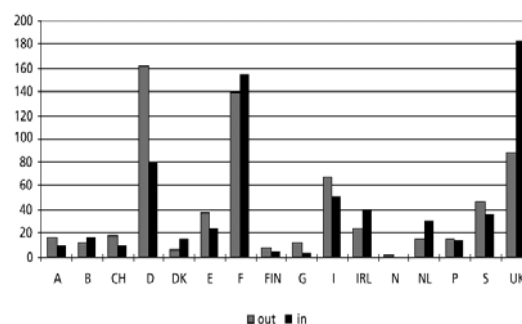


Figure 1. The Physics students' mobility in Europe through Erasmus program (From Socrates International Agency, 1993/1994)

Figure 1 presents student mobility in Europe through the Erasmus programme [see footnote]. The country codes used in this graph are the ones in

¹ White paper: teaching and learning: towards the learning society. [S.I.]: European Commission, 1995.

use by the European Commission and are detailed in Table 1.

Table 1. European country codes used in Figure 1 (From Socrates International Agency, 1993/1994)

Code	Country	Code	Country
A	Austria	G	Greece
B	Belgium	I	Italy
CH	Switzerland	IRL	Ireland
D	Germany	N	Norway
DK	Denmark	NL	Netherlands
E	Spain	P	Portugal
F	France	S	Sweden
FIN	Finland	UK	United Kingdom

Students' movement is not restricted to Europe. Besides migration to USA there is also currently a recent flux to the Asian Pacific Area², especially to Japan and Australia, as shown in Table 2.

Table 2. Students' mobility in the world (data referring to 1995)

Country of origin	Number of students	Increase from 1985
USA	260,000	+ 86%
Japan	50,000	+ 188%
UK	48,000	+ 220%
Australia	18,000	+ 50%
Canada	15,000	-
France	7,000	+ 27%

In the case of Australia the flux of students has increased by 50% from 1985 to 1995, whereas in Japan this increase attains 220% in the same period.

Harmonisation of Curricula

In order to promote convergence between educational systems, some European countries adopted in the Sorbonne meeting in 1998 and in the Bologna meeting in 1999 a declaration for a common effort to obtain a curricular harmonisation². The proposal, commonly referred to as the **"3-5-8 Model"**, contemplates two main common levels, Bachelor and Master, corresponding more or less to the classical "undergraduate" and "post graduate" degrees used in most countries in the world. The Bologna convention also adopted a common regime of credits, designated by ECTS (European Credit Transfer System).

The implementation of this document is not easy owing to the different levels and curricular structures of higher education in Europe (Martins *et al.*, 2000). One essential step is the definition of the basic knowledge that every engineer (or equivalent) has to know and be able to use (Martins and Fernandes, 2000).

Due to the wide accessibility of the Internet, a possible way to assure convergence is the following:

A- on a short term basis, in the design and implementation of Internet-based modules, whose content is defined by a group of partners of the same speciality working in close co-operation.

B- on a long term basis, by disseminating and assessing these modules in Europe.

With these objectives a project entitled **Ineit-Mucon** (**IN**novation for **E**ducation in **IN**formation **T**echnology through **MU**ltimedia and **CO**munication **N**etworks) in the framework of the Socrates programme was suggested with the aim of interconnecting courseware modules by using WWW technologies.

This interconnection will allow the end users (teachers and students) to get a wide view on educational resources that are normally sparse.

As far as the teachers are concerned it will allow the retrieval of a special module that can be used with the normal curriculum to enhance some aspects of the presentation in the class, while avoiding the burden of developing specific software themselves.

For the students these pieces of curriculum and pedagogical tools developed in several universities in Europe, easily available through the Internet, will act as pre-requisites. They allow the student to prepare him/herself to mobility exchange programs. The modules are available both in English and in some cases also in his/her native tongue.

Thus, the main objective of the Ineit-Mucon Thematic Network is to start the foundation of a Virtual University in the field of EIE (Electrical and Information Engineering) with a common curriculum around a core of competencies defined by several universities in Europe.

One important aspect of this development is the definition of the physics and mathematical bases, necessary to understand the applications within the various engineering domains.

Especially in physics the existence of these modules allows the display of dynamic phenomena, which facilitates the understanding. In some cases interactive simulations driven by the user are also available, allowing the students to deepen their understanding of a particular subject by modifying parameters and observing the end result (Esteves *et al.*, 1999 and Thiriet *et al.*, 1999).

Course development

The project has run on a three year period (+ 1 year for dissemination) as from September 1996.

² White paper: teaching and learning: towards the learning society. [S.l.]: European Commission, 1995.

Thirty-five universities are included in the project. The various partners were shared into workgroups according to their speciality.

A common curriculum was agreed upon and the various partners from several universities in different countries started developing the basic concepts as well as the respective physics and mathematical bases.

During the first period, a survey of computer tools available and other existing equivalent products gave us the possibility to grasp the most convenient techniques to be used in order to present the pedagogical content of the packages.

The development of Java applets was decided as the most convenient, due to its compatibility with all the browsers.

Each of the courses developed in the Inet-Mucon project is organised in such a way to provide a flexible, yet complete navigation scheme. This allows the use of each module either as a demonstration package in the classroom or as a study element for the students or learners who want to get knowledge in EIE (Electrical and Information Engineering) through Distance Learning applications into Life Long Learning structures. All the courses include the following elements [1]:

- Prerequisites
- Introduction
- Course's main body
- Interactive exercises
- Simulation
- Self-assessment questionnaires for students
- Bibliography
- Glossary of terms
- Final Test

The existence of a common structure and flexible navigation as well as the option of search content available at each screen permit the easy interconnection of course modules developed in different countries. Most of the courses are in English in order to facilitate the exchange of information

Concerning the Telecommunications course, during the navigation the user can switch from the introductory course on signal analysis developed by Lisbon (Portugal) site to the Nancy (France) site where a package on Fourier analysis has been developed.

In Figure 2 the screen structure used in the course is shown. The screen is divided into three frames. The bigger one is the main frame, where the content of the course is displayed. On the left the contents frame allows the user to perform navigation through the course, by accessing the

different chapters of the course. The banner frame is located above the main frame and presents buttons that give easy access to information about the course (button About), Figures reference, bibliographical references (button Bibliography), to a glossary of technical and scientific terms used in the course and also allow text search (button Search). Another example is shown in Figure 3 where the banner frame is absent in order to provide a better visualisation of figures and animations.

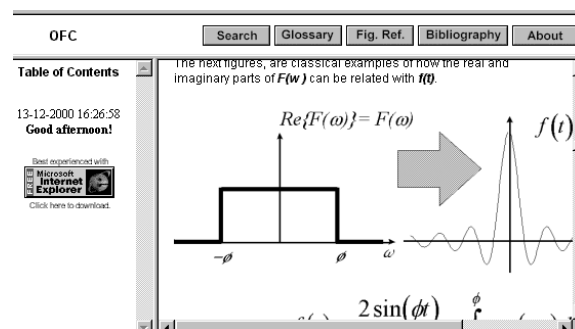


Figure 2. A page of the Telecommunications course

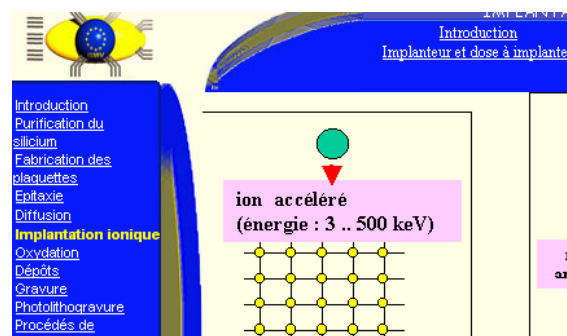


Figure 3. A page of the electronics course describing ion implantation techniques

All the chapters in the courses can be retrieved independently, thereby allowing other teachers to build their own curricula from the available modules.

Other important objectives are:

- To provide tools for dialogues and exchanges (mail, newsgroups, and databases) between teachers themselves and also between teachers and learners, which should allow an improvement of the courses and a comparison of various pedagogical experiences.
- to allow a global assessment, which could help partners to compare students levels, in order also to get a whole view of the teaching in Europe in this domain

The various pieces of curriculum and pedagogical tools available are proposed in a web

server located at <http://www.eaeeie.org/ineit-mucon/>.

The home page of our site proposes some help available in six languages (Portuguese, English, French, Spanish, German, and Esperanto).

The structure of the server is distributed, the tools are proposed on the site where they were developed however some are also proposed in the native mother tongue.

Results

In the 4th year of the project, a complete evaluation of the tools is being done before a general dissemination takes place. The pedagogical tools are tested on some sets of students, preferably from other universities within this network.

A questionnaire was distributed to the students concerning the following aspects:

- facility to use (ergonomics),
- problems of connection,
- interests and difficulties of the courses in HTML,
- role of simulations,
- difficulties in using the English language,
- Suggestions for improvements.

A first dissemination has been developed by IST (Instituto Superior Tecnico), the school of Engineering from Lisbon Technical University (Portugal), by Université Henri Poincaré Nancy 1 (France) and the Universität Ulm (Germany), (Thiriet *et al.*, 1999 and Thiriet and Robert, 2000).

The remarks of the students were as follows:

- They are mostly in favour of using internet-based tools as a complement to classical lectures, either in a deductive or in an inductive manner,
- Concerning the text by itself, some mentioned the difficulty to read on a screen rather than on paper.
- 28% mentioned some difficulties for the connection (availability of machines within their institution, configurations of machines, problems of connection),
- Concerning the use of the English language, the students behave generally positively, arguing that it is interesting in the frame of their education and their future job to know the vocabulary in English.

Other actions of dissemination consist of:

- Presentation of the whole thematic network activity in our own institutions,
- Presentation of our thematic network activity in international conferences

- Writing of a booklet presenting our thematic network.

Discussion

As mentioned previously, the Ineit-Mucon Thematic Network is only a first step. We hope that it will start co-operation between higher education institutions, and contribute to the introduction of the latest innovations in education and learning in the framework of such a Virtual University in EIE (Electrical and Information Engineering).

A new project entitled Theiere (Thematic Harmonisation in Electrical and Information EngineerRing in Europe) was proposed to the Socrates 2 program, and accepted, which will continue the work, developed successfully in Ineit-Mucon. Further concern is the co-operation between the several partner institutions in order to contribute to the harmonisation of curricula at a European level, with the inclusion of a large number of eastern European universities and also some observers: Bogazici university in Istanbul (Turkey), university of Mariupol (Ukraine), and University Abdelmalek Saadi from Tangiers (Morocco)

The work developed within our thematic network can finally be seen as a first phase in the development of a virtual university in Engineering. This development is done in a strong partnership between several teachers and students throughout Europe.

Acknowledgements

The authors wish to thank all the Ineit-Mucon TN partners for their work and the European Commission Directorate-General Education and Culture for grants and help.

The authors also acknowledge the contribution of students from various origins who have worked in the development and evaluation of the courses.

References

- Esteves, J.; Martins, M.J.; Palma, J. The portuguese internet site of the Ineit-Mucon thematic network. In: EUROPEAN CONFERENCE OF THE EAEEIE, 10, 1999, Bolonha. *Proceedings...* Bolonha: EAEEIE, 1999. p.10-14
- European Commission. *White paper: teaching and learning: towards the learning society*. Brussels, Belgium, November 1995.
- Martins, M.J.; Fernandes, A. S. C. Towards an integration of CAL/CBT in the universities: a case study. In: ITHET 2000, Istanbul. *Proceedings...* Istanbul: ITHET/Unesco, 2000. p.23-27, 2000.

- Martins, M.J.; Esteves, J.; Palma, J. Harmonisation of EIE education in europe: Perspectives for the future. In: EUROPEAN CONFERENCE OF THE EAEIE- ISBN 3-00-005965, 11, 2000, Ulm. *Proceedings...* Ulm: EAEIE, 2000. no.2, p.155-160. (invited paper)
- Ruffio, P. Changing the university: the supporting role of the erasmus thematic networks. European Union: Eucen, 2000. (a three-year perspective).
- Thiriet, J.M.; Hoffmann, M.; Garnier, H.; Prutscher, M. Evaluation of internet-based tools to help students in understanding concepts of digital signal processing. In: ANNUAL EAEIE CONFERENCE, 10, 1999, annual EAEIE Conference: Capri. *Proceedings...* Capri: EAEIE, 1999. p.28-31.
- Thiriet, J. M.; Robert, M. Curricula reachable via Internet for teaching intelligent instruments and signal processing: validation and dissemination. In: ANNUAL EAEIE CONFERENCE, 11, 2000, Ulm. *Proceedings...* Ulm: EAEIE, 2000. p.250-254.
- Received on October 09, 2000.*
- Accepted on November 28, 2000.*