ABSTRACT

In the last two decades, the educational capacity of many European Institutions of Higher Education in the field of Radiological and Nuclear Engineering has decreased, because of the conjunction of less interest among students, academic and political authorities. An increasing cooperation at the international level on the educational efforts in radiological and nuclear science and engineering is necessary. The CHERNE network is an initiative mainly focussed on teaching and learning activities to develop a wide-scope open academic network to enhance cooperation, competence as well as equipment sharing between its partners. Typical activities organized within the network include workshops, intensive courses, seminars and conferences. Student and professor exchanges necessary for these activities are organised when possible in the framework of the ERASMUS program. In this paper, the CHERNE network and its main objectives will be presented and an account of the activities developed since its foundation, or foreseen in the near future, will be given.

1. Introduction

The educational capacity of many European Institutions of Higher Education in the field of Radiological and Nuclear Engineering has decreased in the last two decades, in parallel with the decrease of interest for this domain among students as well as among academic and political authorities. Furthermore, financial restrictions have made it more difficult to maintain and develop facilities, equipment and academic staff needed for practical training of students.

Each university and country presents a different situation, but many departments that were initially able to propose a large panel of orientations in this field had to reduce their offer and to concentrate it on a few specialities.

On the other hand, a significant number of professionals at different levels of education continue to be required for safely operating and managing the nuclear industry and all other activities involving the use of radiations.

In this situation, an increasing cooperation at the international level on the educational efforts in radiological and nuclear science and engineering is considered presently as the only viable solution. For this reason, several networks have been developed, some of them focused on specific domains, others concentrated on high level professional training, some strongly structured and others not.

In particular, the CHERNE network is an initiative mainly focussed on teaching and learning activities to develop a wide-scope open academic network to enhance cooperation, competence as well as equipment sharing between its partners. Typical activities organized within the network include workshops, intensive courses, seminars and conferences on radiation protection and nuclear
measurement, radiochemistry, safety analysis, etc. Student and professor exchanges necessary for these activities are organised when possible in the framework of the ERASMUS program. In this paper, the CHERNE network and its main objectives will be presented and an account of the activities developed since its foundation, or foreseen in the near future, will be given.

2. The CHERNE network

2.1 Members of the network in 2007

The network was created in 2005, involving now 12 European Institutions and one from United States. The list of members in alphabetic order of cities is the following:

- UAS Aachen, University of Applied Sciences Aachen, Campus Jülich (Germany)
- ETSEIB - UPC, Escola Tècnica Superior d'Enginyers Industrials de Barcelona, Universitat Politècnica de Catalunya (Spain)
- Alma Mater Studiorum - Università degli Studi di Bologna (Italia)
- ISIB, Institut Supérieur Industriel de Bruxelles (Belgique)
- Dipartimento di Fisica ed Astronomia, Università di Catania (Italia)
- XIOS, Hogeschool Limburg, Diepenbeek (Belgium)
- KSU, Kansas State University (USA)
- ITN, Instituto Tecnológico e Nuclear, Lisboa (Portugal)
- Dipartimento di Fisica, Università degli Studi di Messina (Italia)
- Dipartimento di Ingegneria Nucleare, Politecnico di Milano (Italia)
- ČVUT, České Vysoké Učení Technické v Praze (Czech Republic)
- DIQN-UPV Departamento de Ingeniería Química y Nuclear, Universidad Politécnica de Valencia (Spain)
- UAS Zittau-Görlitz, University of Applied Sciences Zittau/Görlitz (Germany)

It is a wide-scope open academic network mainly focussed on teaching and learning activities, whose objectives are to enhance cooperation, competence as well as equipment sharing between partners. A declaration, signed by all partners, contains details concerning organisation, membership and activities. This declaration can be consulted at the web site www.upv.es/cherne/

2.2 Origin of the CHERNE network

The CHERNE network has its origin on some ERASMUS Intensive Programmes (IP) organised during last years [1]. The IP “PAN: Practical Approach to Nuclear techniques” was first organised in 2002 in Prague, with the participation of CVUT, DIQN-UPV and ISIB. XIOS and UAS Aachen joined the two next editions, held in Prague (2003) and Mol-Brussels (2004). A second IP (SPERANSA, Stimulation of Practical Expertise in RAdiological and Nuclear SAfety) was first held in Prague in 2005, with no European grant, by the same partners. This project was supported by the Erasmus programme in 2006 (Mol-Jülich), 2007 (Prague) and 2008 (Mol-Brussels).

A larger partnership was considered necessary to extend the scope of this collaboration, and was initiated with the constitution of the CHERNE network in 2005 during a workshop organised by UPV [2].

2.3 CHERNE organisation and membership

CHERNE has a minimal administrative organisation, ensured by the secretary elected at the annual meeting. The secretary manages a Web page through which the activities of the network are communicated. The partners of CHERNE meet once a year to evaluate the activities of the network and discuss any proposal to extend or modify them. For the moment no fee is foreseen for CHERNE membership.

Academic institutions, research institutions, companies or individuals are accepted as members on presentation by two members, including at least one European academic member. Documents for this presentation as well as the list of partners can be found at the official Web site.
3. **CHERNE activities**

3.1 **Description**

Cooperation between the institutions should enhance the mutual support by learning from each other, by exchanging experiences, and by regular mutual reflections on what we can do to counteract the 'less interest among students' and the 'less interest among the academic and political authorities' and also on what we can learn from more successful or from less successful partners.

The scope of **CHERNE** is not limited and any activity related to higher education in radiological and/or nuclear engineering can be proposed. **CHERNE** activities will be organised mostly for students of members, mainly at Master level. They should include at least a one-week/2 ECTS module. It's necessary to include practical training in activities for students, including when possible an access to large facilities. Teaching modules are clearly seen as a possible kind of activity, but other types of cooperation may be also developed such as material for modules conveniently adapted in each university, e-learning, etc. The language used in **CHERNE** activities is English.

The **CHERNE** activities will be organised at no cost, or very low fee, for students coming from other partner institutions. The organising partner will find and propose cheap accommodation for the students coming from abroad. When possible, the organisation of **CHERNE** activities will be included in ERASMUS exchanges. Therefore, the partners are encouraged to sign bilateral ERASMUS agreements.

Research collaborations are not the main goal of the network. However, they are quite naturally developed as a consequence of the frequent exchanges for educational cooperation. [3, 4, 5]

3.2 **CHERNE activities developed or proposed**

Activities already realised or planned for the near future include seminars, courses, intensive courses, and research collaborations.

**Seminar:**
- Simulation of detector calibration using MCNP, by Prof. J. Ródenas (UPV) at ISIB, 2005.

**Workshops and Conferences:**
- Annual workshop of the CHERNE network, Valencia (2005) [2], Valencia (2006) [6], and Prague (2007) [7].
- Participation in ETRAP 2005 [1].
- Participation in the First EUTERP Platform Workshop [8].

**Courses:**
- Gamma spectrometry: simulation, deconvolution, applications, by Prof. J. Kluson (CVUT) at ISIB, 2005.
- Participation of Prof. F. Tondeur (ISIB), Prof. E. Zio (Milano) and Prof. J. Fernández (Bologna) in Doctoral courses at UPV, 2004-2007.

**Intensive courses:**
- Radiation protection and nuclear measurement in non conventional sectors.
  2-week course organised by ISIB Brussels and XIOS Diepenbeek (Belgium), 2007.
- Nuclear Chemistry.
  2-week course organised by UAS Aachen , 2007.
- Low radiation measurements.
  1-week course organised by UAS Aachen, 2007.
• Probabilistic Safety Analysis.
  2-week course organised by UPV and Politecnico di Milano, 2008.
• Radiation protection and nuclear measurement in non conventional sectors (2nd edition)
  ISIB & XIOS, 2008.
• Nuclear Chemistry (2nd edition), UAS Aachen, 2008.

This last course is submitted as an Erasmus IP for the academic year 2008-2010. Another Erasmus IP project will be submitted for 2009-2011, coordinated by Politecnico di Milano for a first organisation proposed to ITN Lisbon.

3.3 Some Statistics.
A resume of the collaborations between the CHERNE partners is schematically presented in table 1.

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Table 1: Summary of collaborations between CHERNE members

IP cooperation in one or several intensive programme(s)
EBA Erasmus bilateral agreement
PE professor exchange
SE student exchange.

4. Conclusions
On the basis of an existing collaboration between some institutions, the creation of the network permitted to enhance the educational cooperation among partners.
The main target of the CHERNE network is to develop teaching activities for the benefit of students of the institutions belonging to the network.
The network is still young and small, and does not yet propose many activities, but already represents a clear added value for the students, in particular with the intensification of Erasmus exchanges between the partners. Consequently, the exchange of students has been clearly increased.
Furthermore, specific activities already developed and those proposed for the future are on the way to enhance the interest of students and academic authorities on Nuclear Engineering and Radiation Protection.
The perspective of the network is to gradually propose more activities, while admitting new partners who can contribute to the network’s life with new activities and more students benefiting of them.
5. References


