

Romanian experience in education in nuclear engineering and future developments towards a European integrated approach

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Abstract

The Faculty of Power Engineering from University "Politehnica" of Bucharest has the exclusive program in formation of nuclear engineers. With an experience of more than 30 years, the Department of Nuclear Engineering offers a complete range of educational programmes in the field: engineering (5 years), advanced studies in radiation protection and nuclear safety (1 year), doctoral programmes, and continuous education. Our department is involved in training of the operators and new employers of Cernavoda Nuclear Power Plant with the agreement of National Commission for Nuclear Activities Control. Moreover our department was / is partner in many international programmes carried out in nuclear education field, like TEMPUS SENECA and EPURE, recently ENEN and NEPTUNO. The goals of these international projects were harmonisation and unification of curriculum in nuclear engineering higher education, increasing of professional competence and preservation of trainers skills.

Our objective is to better integrate education and training into occupational Romanian infrastructures. Because of the particularity of Romanian nuclear program (HWR – heavy water reactor), our department plays an important role at the national level, regarding the education in nuclear field. We prepare about 40 students /year. In this moment, about 20 graduates are absorbed by nuclear industry and 10 by nuclear research institutes.

Romania is also an applicant country to European Union. Our department is participating actively to the conservation of nuclear knowledge and expertise and the creation of European higher education space.

1. Introduction

The Romanian nuclear program started in the '60s. The Romanian-Canadian feasibility study for the HWR system was completed in 1976. The location of the first Romanian nuclear power plant comprising 5 units of 700 MW each was chosen in Dobrogea area for several reasons: the Danube river – Black Sea canal represents an important source of cooling water, it provides an easy access route for the heavy and beyond standard equipment and seismicity in the region is reduced as compared to other regions of the country. In 1996 the Unit 1 of Cernavoda NPP is declared in commercial operation. Units 2 and 3 are on different stages of construction (75%, respectively 15% completed). In parallel with the development of Romanian nuclear program, the need of a high-level educational program was very necessary.

Consequently, in 1967 the first Nuclear Power Plants academic course was born and one year later the first post graduate program was carried out. Starting from 1970 Department of Nuclear Power Plants was part of Faculty of Electrical Engineering. Starting from 2001, according with new national university regulations, the name was changed into Department of Nuclear Engineering. From its beginning till today, a total of 920 graduated students have specialization in nuclear engineering (5 years study program) and 58 graduated master students since 1998, as shown in the figure 1.

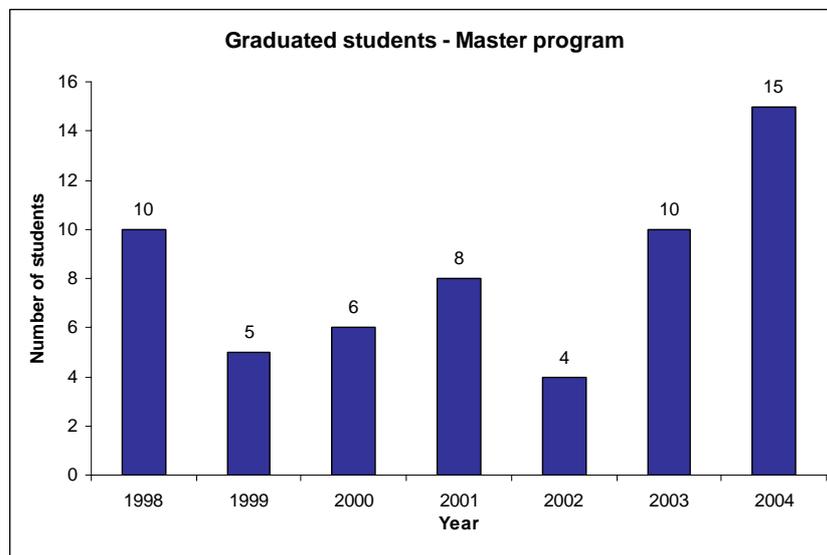
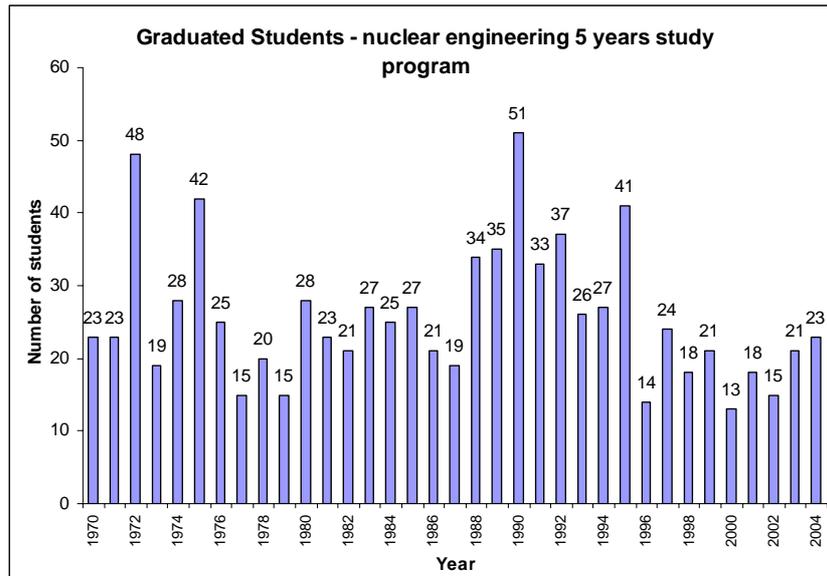


Figure 1: Graduated students of Nuclear engineering program and Master of radiation protection and nuclear safety.

Changes occurring today in Romanian higher education are aiming at the implementation with maximum efficiency of recommendations issued from the Bologna Declaration signed in 1999 by the ministers of education from the European countries. Consequently, our educational scheme in nuclear engineering was adapted at following levels:

- Long-term university education (duration 4 years)
- Post university level studies : 1,5 years for master program and 3 years of doctoral program

Long-term program is divided in two stages. First 2 years, students could choose courses which cover mathematics, physics and material technology basis. The 3rd and 4th years of studying students are familiar with nuclear issues. The main subjects cover topics like nuclear reactors theory, design of nuclear power plants, nuclear reactor systems, dosimetry and radiation protection, thermo-hydraulics processes in nuclear power plants.

Department of Nuclear Engineering offers a high level academic staff accompanying by a modern didactic and research tools. The educational process and the research is concentrated around 4 laboratories:

- Laboratory of simulation of nuclear processes
- Laboratory of radiation measurements and radiation protection

- Laboratory of safety analysis
- Laboratory of non-electric measurements

All these laboratories have a modern measurement instrumentations, up-date computers, and software.

2. International cooperation and European integrated approach

The Department of Nuclear Engineering is actively involved in different international programs, like TEMPUS (Trans – European mobility scheme for universities study), ENEN (European Nuclear Education Network) and NEPTUNO (Nuclear European Platform for Training and University Organisations).

The purpose of all these programs is to modernize and to increase the academic staff competence and on the other hand to uniform the UE nuclear academic programs.

TEMPUS program was the first international cooperation of our department. The main goal of the project was to enable the universities from EU member states to cooperate with those from Eastern Europe, in order to improve and modernize the education process.

ENEN program is creating the UE nuclear master network and giving the diploma of EMSNE (European Master of Science in Nuclear Engineering) based on the reciprocal acknowledgement of the nuclear academic curriculum.

Our department was founder member in this programme and after an amply examination was decided that nuclear curriculum is compatible and competitive with UE and USA requests.

Participation in the NEPTUNO and ENEN programs confirm the international recognize of Department of Nuclear Engineering from University “Politehnica” of Bucharest as a reliable partner.

At the national level, the Department of Nuclear Engineering is collaborating close with Romanian nuclear research centres and other companies which support the Romanian nuclear program. Mainly this collaboration has 2 directions: first, to help our students to prepare their thesis and secondly, our staff is actively involved in national research programs. Most of national programs are focused in the development of CANDU technology and environmental impact of nuclear program.

Moreover this research is accompanied by development of programs in industrial and health applications, such nuclear medicine and radioisotopes, radiochemistry, nuclear facilities decommissioning, radioactive waste management.

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