

On the formation of experts in Radiation Protection and Dose Measurements: our Master course experience

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Abstract

The present contribution deals with the major relevant features of the Master's degree course devoted to the formation of experts in radiation protection and dose measurements. The Master course (FERDOS), proposed by the Physics Department of the Calabria University, Italy, has been funded by the 2001-2006 high training European program. This presentation is focused on the following items: our motivation for the institution of such master's degree, major characteristics of the professional figures, either admitted to the course or formed, partners involved to the planning and to the realization of the Master's course, training activities carried out during the master's two-years period (courses, stages, workshops, visits to international research laboratories). The presentation will include the comments on the several acquired results.

1 Motivations for the institution of FERDOS

Qualified experts in radiation protection are needed in many activities, like: safety in using natural and artificial sources, radioactive discharges, management of contaminated areas, decommissioning, nuclear emergencies, transport of radioactive materials. The investigation on the need of qualified graduated experts in the field of the radiation protection in the local territory (Calabria region) has shown that the centres which use ionizing radiations in medicine for diagnosis and therapy are about 150. The centres, distributed uniformly on the territory, require a large number of personnel qualified to monitor the environment and the population. In addition, in Italy two professional experts are qualified to operate in the ionizing radiation context:

- a) Expert in Medical Physics
- b) Qualified Expert in Radiological Protection

The a) profile is involved mainly to provide all the applications related to the patients in the medical structures, primarily to the preventive evaluation, optimization and verification of the doses supplied in

the medical exposures, then to the quality controls of the radiological tools.

The b) profile is involved mainly to guarantee the physical survey for the protection of the workers and of the population. The operators must be qualified in order to have the knowledge and the necessary training to carry out measurements, examinations, verifications or evaluations of either physical, technical or radiotoxic, and to assure the proper operation of the devices of protection.

The formation of a) experts is achieved by 4 years of "Specialization School in Sanitary Physics" after 3 + 2 years of University studies in Physics. On the contrary a specific curriculum to train qualified b) experts is not defined in the high training frame.

Following these considerations we have proposed an educational project finalized to the training of experts of type b) by taking "A Master degree of two years after the first three years of University studies". The project has been approved by the Italian Instruction Ministry (MIUR) and financed with European funds found in the 2001-2006 high training programs. The Master, started in April 2002, will finish in July 2004.

2 Characteristics of the output expert

The expert has received the following competences in the master:

- knowledge of the nuclear and sub-nuclear structure;
- knowledge of the radiation sources;
- knowledge of the biological effects of the ionizing radiations;
- using techniques and tools to reveal and measure ionizing radiations;
- knowledge of the method and the techniques of the protection from natural radiation and from sources;
- project and realization of protective barriers;
- use of tools and of methodology for the environmental monitoring and the control of the population;
- evaluation of risks related to the dangerousness of the ionizing radiation in the health;

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- knowledge of the characteristics of the contamination and of the techniques of containment and filtering;
- knowledge of the techniques for the management of the radioactive refusals;
- perform quality controls of the radioactive sources;
- use of technical ICT in the profession;
- knowledge of principles and of norms on the protection and overseeing of the population, Italian and European;
- Knowledge of the operational reality in the structures where the ionizing radiations are involved.

3 Partners

The master has been projected in the context of a large partnership between the Physics Department of the Calabria University and Structures operating in the local and national territory [Catanzaro Hospital (AO Cz); Cosenza Hospital (AO Cs); National Cancer Institute Roma IFO); National Institute for Matter Physics (INFN); National Institute for Nuclear Physics (INFN); Agency for the decommissioning (SOGIN); Agency for the alternative energy (ENEA)]. The partners have contributed to the project primarily in the design of the curriculum then providing experts working in the ionizing radiation field for the lectures. The most relevant contribution has been done nevertheless in the reception of the students for the stage period.

4 Training activities

The curriculum has been divided in two years. The first year has introduced the participants to the domain of the radioprotection and the dose measurement. It has been dedicated to the applications connected to the ionizing radiation till 400 kV (X rays). The second year has been characterized by the items connected to radioisotopes, accelerators of electrons with energy till 10 MeV and sources of neutrons.

The activities characterizing the master have been: lectures in classroom; laboratory applications; workshops on monographic themes; visits of study to national and international research centres; stage in the structures where ionizing radiation are used or studied.

In the first year the stage activity have been superimposed to the lectures, while in the second year we have concentrated the lectures in classroom in the first half of the second year and last half has been dedicated completely to the stage.

In Table 1 the courses operative in the second year are shown. A total of 475 hours of lectures has been done for 60 formative credits (CF).

Table 1. Modules carried out in the second year

Module	N. hours	CF
• Biology Elements	15	2
• Modern Physics Elements	30	4
• Nuclear and Sub nuclear Physics	40	5
• Detection and measurements of ionizing radiation	40	5
• Radiation sources	45	6
• Particle accelerators	20	2
• Use of the radioactive isotopes in the sanitary sector	15	2
• Inside and outside contamination	15	2
• Inside dose measurement	40	5
• Transport of radioactive material and decommissioning	15	2
• Radiation protection using ionizing radiation sources	30	4
• Quality system	30	4
• Rules in ionizing radiation protection	15	2
• Planning of laboratories and departments	25	3
• Safety on the working area	20	2
• Business Game	40	5
• Laboratory activities	40	5
Total	475	60

The stage activity has been organized through educational contracts among the host structure, the student and the master. Individual themes have been selected taking into account the interest of the students and of the structures.

5 Preliminary considerations

The stage experience in parallel to the lessons in classroom in the first year, has given the possibility to verify immediately, in live, what learned in the theoretical lessons. It is preferable the solution of the second year starting the stage after the full presentation of the material in classroom. Two years of master's degree furnish the possibility to study in detail the aspects of the radiation protection, but only one year would be, all the same, preferred