Education and training activities

Education, training and safety culture are the cornerstones for establishing an effective and sustainable radiation protection system.

The Greek Atomic Energy Commission (EEAE) is the national competent authority for radiation and nuclear safety and security, as well as for the protection of the public, workers and the environment from ionizing and artificially produced non-ionizing radiation. Within this framework EEAE, among its other activities, provides and ensures:

- the education and training of occupationally exposed workers in the fields where ionizing and non-ionizing radiation is used (e.g. medicine, industry, research, telecommunications etc.);
- the enhancement of safety culture in the country.

In order to fulfill its role and to cover all the identified educational and training needs, EEAE implements actions:

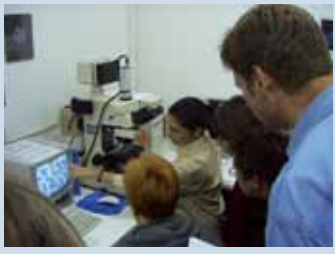
- **at national level,**
  - being a participant and a major contributor to the Inter-University Post-Graduate Course on Medical Radiation Physics;
  - developing and providing training courses on radiation protection, addressed to the needs of the different categories of occupationally exposed workers and
  - organizing and/or participating in workshops concerning the safe use of ionizing radiation.
- **at regional and international level,** fulfilling its role as IAEA's Regional Training Centre (RTC) in Europe in the English language.

In order to ensure a continuous improvement in the quality of the learning services provided and for optimizing the available resources, EEAE has developed and implements a quality management system for the design, development and provision of services of non-formal education and training based on ISO 29990:2010 standard.

The starting point of EEAE's educational work was the establishment of the School of Medical Physics in the early 1960s. After that, hundreds of national and international seminars have been organized for the education and training of occupationally exposed workers.

EEAE has established communication and collaboration channels with national and international educational and research organizations and with professional associations. Its educational role:

- is fully supported by its experienced scientific personnel, its state-of-the-art technical infrastructure and supplementarily by the collaborative educational and research centers;
- is recognized internationally. This is confirmed by the fact that EEAE was recognized by the IAEA as a RTC in the fields of radiation protection and nuclear security and by the fact that its staff are being invited to participate in international working groups and policy making committees in the field of education and training (e.g. IAEA's steering committee on E&T, IAEA missions, Task Force on E&T of the HERCA).



INTER-UNIVERSITY POST-GRADUATE COURSE ON MEDICAL RADIATION PHYSICS

Medical Radiation Physics is an enacted professional specialization for Physicists in the medical sector. Its framework is set by the International and European Basic Safety Standards (IAEA BSS, 96/29 and 97/43 EURATOM Directives) and the national legislation (Greek Radiation Protection Regulations, Ministerial Order No1014, Official Gazette of the Greek Government No 216B).

Medical Physicists' education on issues concerning radiation protection is decisive for the unhindered implementation of the National Radiation Protection Programme, taking into account that in Greece medical applications cover roughly the 90% of all radiation applications. The professional license of Medical Physicists constitutes an essential condition for their employment. This license is issued by the Ministry of Health after succeeding in written examinations.

Within this framework, EEAE has been organizing the Medical Radiation Physics Course at Post-Graduate level, on a regular basis, since 1961. In 1993, this course was upgraded to an Inter-University Post-Graduate Course (IPCMRP) established by law and was re-organized in its present form, in 1998.

Aim of the IPCMRP, in which EEAE participates by providing education, infrastructure and financial support, is **the creation of a sustainable mechanism ensuring the appropriate training of persons who are responsible for the radiation protection of the public, workers and patients during medical exposure and enhancing safety culture in the country.**

IPCMRP graduates have sufficient knowledge on the applications of ionizing and non-ionizing radiation, especially in the medical field. They are able **to contribute to health promotion and protection, focusing inter alia on the radiation protection of patients, workers, local communities and the environment, but also to provide the necessary radiation protection information and training to non-medical staff.** Moreover, they are intended to meet the needs not only in the medical sector but also in the fields of industrial and research applications of ionizing and non-ionizing radiation, regulatory control of ionizing radiation applications, radioactive materials management, etc.

EEAE invests on highly qualified Medical Physicists who can play an important role in the implementation of education and training programmes on radiation protection - locally in hospitals. These Medical Physicists should be capable of acting as Medical Physics Experts in the field of medical exposure, according to article 83 of Directive 2013/59/Euratom, providing high standard services within medical radiation laboratories. In addition, following a specialized training, they can act as Radiation Protection Experts, according to Article 82 of Directive 2013/59/Euratom, in radiation protection and safety of radiation sources in fields other than medical, covering relevant needs of the country. Thus, Medical Physicists have a key role in enhancing the sustainability of the radiation protection system in Greece.

Apart from EEAE, the course is organized by the Universities of Athens, Ioannina, Thessaloniki, Crete and Thrace in collaboration with the National Centre for Scientific Research (NCSR) "Demokritos". It is attended annually by 10 to 15 students, depending on the national needs and leads to a Master's Degree which is one of the prerequisite qualifications for candidates along with the one-year on-the-job training in order to get the relevant professional license, issued by the Ministry of Health. The duration of the course is 3 semesters; within the first two semesters, students are provided with theoretical education and laboratory/practical exercises in the facilities of the EEAE and the University of Athens. Practical exercises are also carried out in the facilities of NCSR "Demokritos" and public hospitals. The third semester is dedicated to the preparation of the students' thesis, which, according to its subject, is performed in the laboratories of participating institutions. Optionally, the Course may lead to a Ph.D. degree in Medical Radiation Physics. The Curriculum of the M.Sc. Course, the stipulated work load in full weeks (including laboratory exercises), the number of class hours and corresponding credit units per topic, are summarized in Table 1 (also available at: http://mpl.med.uoa.gr/).

	COURSES	HOURS	CREDIT UNITS
Semester 1 (Work load of 18 full weeks - 13 teaching weeks - 30 Credit Units)	Atomic Physics	39	3
	Radiation Sources	39	3
	Interaction of ionizing radiation with matter	65	5
	Detection & Measurement of radiation	52	4
	Statistics, Computing & Image processing	39	3
	Parts of Biology, Anatomy, Physiology & Physics of the body	39	3
	Radiation Dosimetry	65	5
	Biological effects of radiation	52	4
	Total	**390**	**30**
Semester 2 (Work load of 18 full weeks - 13 teaching weeks - 30 Credit Units)	Diagnostic & Interventional Radiology	52	4
	Nuclear Medicine (Diagnosis & Treatment)	65	5
	Radiotherapy & Brachytherapy	91	7
	Physical Principals & Applications of non-ionizing radiation	52	4
	Radiation Protection	78	6
	Parts of Nuclear Technology & Nuclear Safety	26	2
	Effects - Protection of non-ionizing radiation	26	2
	Total	**390**	**30**

IPCMRP:

- **provides high level education and training, in response to labor market;**
- **supports research at collaborating institutions;**
- **helps to reduce the number of students going abroad for studies in Medical Physics;**
- **enhances the efforts made at national level for the provision of education and research in the field of Medical Physics.**

EDUCATION AND TRAINING ON RADIATION PROTECTION ADDRESSED TO SPECIFIC GROUPS OF OCCUPATIONALLY EXPOSED PERSONNEL

Response to nuclear/radiological emergencies

EEAE provides education and training to people involved in the national emergency response plans against nuclear and radiological threats. On the occasion of Athens 2004 Olympic Games organization, EEAE provided training on radiation protection, prevention, detection, emergency preparedness and response to more than 3000 persons working for numerous national organizations involved in the national emergency plan (military forces, police, coast guards, fire brigade, first line officers, etc.) and still continues to organize on regular basis seminars addressed to the personnel of these organizations, in order to ensure the sustainability of national operational capability on preparedness and response. In the case of custom officers, training courses and refresher training courses on illicit trafficking have been conducted at custom offices all over the country in order to maintain and strengthen the skills and knowledge of customs officers on detection equipment and relevant procedures.

Radiation Protection

Different education and training courses have been developed for the following groups:

- Taking into account the non-medical personnel related to medical exposures, EEAE organized and accomplished a nationwide extensive education and training project, dealing with several cycles of three day courses on radiation protection in medicine, addressed to medical technologists, which was implemented in collaboration with academic institutions and locally with the Medical Physics Departments of Universities and major General Hospitals. In total, 2425 medical technologists attended these courses, succeeded in the exams and received a certificate of competencein radiation protection.

- The industrial applications account for about 10% (in terms of occupationally exposed personnel) of the applications of ionizing radiation in the country. EEAE through its training activities aims at developing a safety culture in this area as well. To this end, EEAE has designed and conducted a series of two-day seminars on radiation protection in industrial radiography. The seminars were conducted in 3 different cities and were attended by more than 100 radiographers and assistant radiographers.

- Since 2007, EEAE systematically provides training on the safe transport of radioactive materials with the aim to inform and educate stakeholders in radiation protection. The attendance to the 1-day seminars is a prerequisite for the participation in the examinations organized by the Ministry of Infrastructure, Transport and Networks for the advisors for the safe transport of dangerous goods. In this respect, seminars are organized 3-4 times per year.

For the purposes of these courses, special educational material has been developed (textbook and presentations files). This material is available at EEAE website, www.eeae.gr.

EEAE's intention is to extend this type of education, taking into account even more groups of occupationally exposed personnel. Furthermore, it intends to adopt modern methods of training (e.g. e-learning classes), following technological developments and contemporary learning needs.

Within this framework, EEAE took the required initiatives in order to design a 3-year national programme for education and training (Table 1). The programme takes into account all job categories, while is based on data included in the National Radiation Protection Database (NRPD) and estimations for the number of facilities and activities during the next three years. The Database includes, inter alia, information about the personal doses of occupationally exposed workers, as well as information about the radiation facilities and activities in Greece. In this way, the national educational and training needs were determined. The design and the implementation of the programme are based on the developed quality management system. The sustainability of the program is ensured by its continuous evaluation and the involvement of relevant third parties in the phases of design and implementation.

QUALITY MANAGEMENT SYSTEM

EEAE is certified according to the requirements of ISO 29990:2010 standard for the design, development and delivery of non-formal education and training in the fields of radiation protection and nuclear safety. The quality management system focuses on (a) EEAE's education and training activities and (b) the management of EEAE's Division of Research, Development and Education.

Practices /Activities	Category of personnel	Training course	# of Training Courses	Leading to
Medical Physics applications	MPE	Inter – University Postgraduate Course in Medical - Radiation Physics	3	MSc
	RPE	PGEC	1	certificate of participation
Interventional radiology	Radiation Health Professionals	Radiation protection in Interventional Cardiology	3	certificate of competence
Interventional radiology	Technologists	Radiation protection in Interventional Radiology	3	certificate of participation
Transport of radioactive material	Advisors for the transportation of dangerous goods	Transportation of class 7 goods	12 (=3x4)	certificate of participation
Industrial radiography	Radiographers / Assistant radiographers	Radiation protection in Industrial Radiography	3	certificate of participation
Veterinary radiology	Health Professionals	Radiation protection in Veterinary Radiology	3	certificate of competence
Scrap metal industries	Portal Operators	Principles of Radiation Detection (on-the-job-training)	3	certificate of participation
Mineral extraction and processing companies (NORM)	Operators		2	certificate of participation
Research activities: use of sealed and unsealed sources	Operators	Principles of radiation protection	<5	certificate of participation
Security equipment	Operators	Principles of Radiation Detection (on-the-job-training)	for all customs in Greece	certificate of participation

b. Regional / International Level

IAEA'S REGIONAL TRAINING CENTRE

Since 2003, EEAE acts as the IAEA's Regional Training Centre (RTC) for "Radiation, Transport and Waste Safety" in Europe in the English language. Following the successful completion of IAEA Education and Training Appraisal Mission (EduTa) in 2008, a Long Term Agreement (LTA) was signed in 2011 between the Hellenic Government and the IAEA to support EEAE as an RTC in Europe. The LTA was ratified by Law (No. 4085, Official Gazette Folio No.194, First issue) in October 2012. Moreover, since 2013 EEAE has been recognized as IAEA's Regional Training Centre (RTC) in nuclear security in the English language.

The combination of being a regulatory authority and an IAEA RTC makes EEAE the reference point, in terms of education and training at international and national level.

The fulfilment of EEAE's role as an RTC entails mainly:

- hosting the Postgraduate Educational Course on Radiation Protection and the Safety of Radiation Sources (PGEC), co-organized and co-funded by IAEA. The Course provides education and training to young scientists pursuing to acquire a sound basis in radiation protection and knowledge of related safety fundamentals in order to become, in the course of time, Qualified Experts in countries of Eastern Europe. The Course lasts for 22 weeks and is conducted every two years in English. The Course follows the IAEA's Standard Syllabus and is supported by the relevant educational material.

  It is supported in terms of experienced lecturers and technical infrastructure by the Nuclear Engineering Department of the National Technical University of Athens, the Physics Department and the Medical Physics Laboratory of the University of Athens, the Medical Physics Laboratory of the University of Ioannina, the National Centre for Scientific Research "Demokritos" and many hospitals in Athens.

  The participants are European citizens and are chosen by IAEA. The Course is supported by local and external lecturers.

Table 1: The 3-year national programme for education and training on radiation protection.

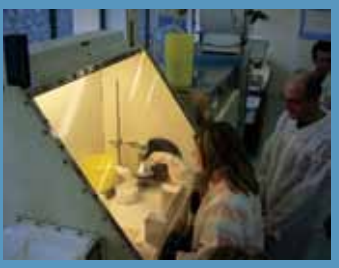
• the organization and hosting of specialized training courses in various thematic areas, such as nuclear security, emergency response, radiation detection techniques, train-the-trainers, etc.

• the provision of several months internships and on-the-job training to scientists coming from various countries (IAEA fellowships) in the fields of radiation protection, regulatory control, dosimetry, calibration of ionizing radiation detectors and environmental radioactivity.

By the end of 2013, EEAE had hosted 4 PGECs and 17 training courses/seminars. A total of 80 students from 30 different countries have attended the PGECs, and more than 200 people have participated in seminars, workshops, scientific visits and internships.

The recognition of EEAE as RTC:

- **is a reward for EEAE, whilst it highlights the high level of its staff and the Greek scientific community, in general;**
- **certifies the expertise and leadership of the country in education and training on radiation protection and nuclear safety;**
- **enhances safety culture at both national and international level and**
- **enhances the prestige of the country internationally.**



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