

COURSE ON “RADIATION PROTECTION EXPERT. CONVERGENCE TOWARDS THE EUROPEAN STANDARD”

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1. INTRODUCTION

The revision of the Basic Safety Standards of EURATOM has tried to homogenize the figure of the Radiation Protection Expert (RPE) all around Europe.

Although the Directive transposition is scheduled for 2018, measures are being taken in favor of the implementation of new education and training requirements for RP experts, with the funding of projects such as ENETRAP (European Network on Education and Training in Radiological Protection) (6FP and 7FP).

CIEMAT has participated in these projects since the beginning (2005) up to now; and since the eighties is the Spanish organization that traditionally delivers this training course as part of the main **EDUCATION AND TRAINING** programs



In Spain, the figure of the **RADIATION PROTECTION EXPERT (RPE)** is well defined by the CSN.

This document establishes the requirements to be able to obtain the qualification and to be recognized as RPE

The applicant must:

- Have a university degree
- Pass a 300-hour training course
- Have 3 years of experience in the field of RP (six months in the case of RX facilities for diagnostic purposes)
- Certified medical fitness
- Pass the CSN proficiency tests.

In this context, the Course of **“Radiation Protection Expert”** is updated, following the ENETRAP RPE scheme, ensuring compliance with all the criteria established by the Spanish Nuclear Regulatory Body (CSN) and introducing the new educational trends demanded by society.

CONVERGE with European interests in the sense of promoting mutual recognition and promoting mobility.



This presentation shows the new course format and the results of the first editions.

Experto en Protección Radiológica



Ciemat modalidad: online + presencial

Experto en Protección Radiológica



Ciemat modalidad: online + presencial

2. INNOVATIONS PERFORMED

Taking into account that **EDUCATIONAL AND TRAINING NEEDS** are changing and that the society demands a different structure, from the beginning **CIEMAT Training Unit** proposed a type of course completely renovated but maintaining the technical contents that characterize it.

- ❑ The first part of the renovation took place in the first edition of the course during 2014-2015
- ❑ The second part, in the 2016 edition, where some improvements were introduced that were planned as secondary but also necessary and important.



1. MODULATION OF THE PROGRAM

The course has been **MODULATED** according to the **ENETRAPII** scheme for RPE (Radiation Protection Expert), common practice in the new training plans of masters.

It has been structured into **five modules**:

- three of them correspond to a **MANDATORY COMMON PART**:
 - Basic Concepts**
 - Fundamentals of Radiation Protection**
 - Operational Radiation Protection**
- the other two are **PART OF THE SPECIALITY**, one of them is mandatory :
 - Research Laboratories and Medical Facilities**
 - Nuclear Facilities and of Nuclear Fuel Cycle**
- It also include the completion of an **END-OF-COURSE PROJECT**

Modulation of the course

EXPERTO EN PROTECCIÓN RADIOLÓGICA. INSTALACIONES MÉDICAS

Módulo 1. Conceptos básicos

1. Introducción. Justificación
2. Física de las radiaciones
3. Detección y medida de la radiación
4. Tratamiento estadístico de datos experimentales

8 ECTSs

Módulo 2. Fundamentos de PR

1. Efectos biológicos
2. Dosimetría externa.
3. Dosimetría interna
4. PR general
5. Legislación.

8 ECTSs

Módulo 3. Operacional

1. PR operacional
2. PR para el público
3. Emergencias radiológicas
4. Origen y gestión de residuos.
5. Transporte

8 ECTSs

Módulo 4. Inst. médicas y lab. de investigación

1. I. Radiodiagnóstico
2. I. Radioterapia.
3. I. Medicina nuclear y laboratorios de investigación
4. Casos prácticos

7 ECTSs

31 ECTS=300 h

EXPERTO EN PROTECCIÓN RADIOLÓGICA. INSTALACIONES NUCLEARES Y DEL CICLO

Módulo 1. Conceptos básicos

1. Introducción. Justificación
2. Física de las radiaciones
3. Detección y medida de la radiación
4. Tratamiento estadístico de datos experimentales

8 ECTSs

Módulo 2. Fundamentos de PR

1. Efectos biológicos
2. Dosimetría externa.
3. Dosimetría interna
4. PR general
5. Legislación.

8 ECTSs

Módulo 3. Operacional

1. PR operacional
2. PR para el público
3. Emergencias radiológicas
4. Origen y gestión de residuos.
5. Transporte

8 ECTSs

Módulo 5. Inst. nucleares y del ciclo de combustible

1. IINN y del ciclo de comb.
2. PR en IINN y Ciclo comb.
3. Impacto ambiental
4. Gestión de residuos.
6. Desmant. y clausura.
7. Seguridad nuclear y física

8 ECTSs

32 ECTS=308 h

This design of modular system would allow to including, in future editions, up to **three more optional modules**. This, together with the completion of an **end-of-course project** to be developed in a job, would make it possible, in the future, to turn the course into a **MASTER'S DEGREE** if this were of interest.

2. METHODOLOGICAL CHANGES

Perhaps the most relevant change in **Education and Training** in this century has been the incorporation of **new teaching methodologies**, not only consolidation of information and communication technologies (ICTs) but also the way of student-teacher relationship.

BLENDED LEARNING METHODOLOGY

ON LINE LEARNING



FACE TO FACE LEARNING



The chosen learning methodology efficiently combines different teaching methods and learning styles, based on a transparent communication of all the areas involved in the course.

Experto en Protección Radiológica

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modalidad: online + presencial



3. RESULTS

A new format for the Radiation Protection Expert course based on a blended learning methodology (on-line & face to face course) with a teaching load equivalent to 465 hours:

- 365h general part (258h online and 107h face-to-face) and
- 100h per specialty (70h face-to-face and 30h End-of-Course Project)

Structuring the course modularly has allowed us to identify those modules that can be carried out on line, and to bet on the face-to-face methodology for those modules in which the subject is more experimental, operational or must be updated annually.

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modalidad: online + presencial



The screenshot shows a web interface for an online course. At the top, it identifies the user as 'SUSANA FALCON CABRERA' and the language as 'Español - Internacional (es)'. The main header features the Ciemat logo and the course title 'Experto en Protección Radiológica' with a sub-header 'modalidad: online + presencial' and dates 'Del 1 de octubre de 2014 al 14 de marzo de 2015'. A sidebar on the left contains 'Noticias de internet' and 'INFORMACIÓN DE UTILIDAD'. A sidebar on the right lists 'Administración' options like 'Activar edición', 'Editar ajustes', and 'Usuarios'. A 'Usuarios en línea' section shows the current user.

ON LINE MODALITY



Educational tools kit for the first modules has been prepared in multimedia format, to be managed in an educational platform. This phase lasts three months.

In this **PHASE OF LEARNING**, the contents are organized in didactic units of one or two weeks and all the multimedia material have been developed by experts in these subjects and include interactive theoretical content, exercises, animations, videos, etc.



Each module consists of:

- ❑ **Program of the module.** Document in html in which the teaching team makes a recommendation on the study of the corresponding module and that includes the start and end dates of all the activities of the module.
- ❑ **Online content multimedia interactive, self-learning,** (theoretical explanations, flash animations, self-evaluation exercises, graphics, drawings, videos...)
- ❑ **Complementary material,** formed in all cases by a manual in pdf (practical cases, examples, videos, legislation....)
- ❑ **Mandatory exercises.** In all modules there is at least one compulsory exercise proposed by the corresponding teaching staff, which must be delivered and evaluated within the duration of the module.
- ❑ **Forums of contents** where students can ask any questions related which must be answered within a maximum of 24 hours by the teacher or can even be answered by other students.
- ❑ **Evaluation.** The evaluations consist of 10 test questions to answer in 30 minutes. Students are allowed to make a maximum of two evaluations being assigned the best note of the two trials.



Multimedia material through the Virtual Classroom

Ciemat Aula Virtual Experto en protección radiológica

1.6.1 Modos de desintegración. Ejemplo

• Un modo de desintegración: $^{111}_{49}\text{In}$

$^{111}_{49}\text{In}$ (2.81 days) \rightarrow $^{111}_{48}\text{Cd}$ (stable)

> 99% EC

• Varios modos de desintegración: $^{131}_{54}\text{I}$

$^{131}_{54}\text{I}$ (8.0228 d) \rightarrow $^{131}_{54}\text{Xe}$ (stable)

Main Radiations	Branching	E
β^-	0.896	0.606 MeV
γ	0.815	367 keV
β^-	0.0039	0.807 MeV
γ	0.0021	164 keV
β^-	0.0723	0.334 MeV
γ	0.0716	637 keV

<http://psd.chpc.utep.edu/~carolina/NCSS/111In.PDF.pdf>
http://www.nucleide.org/CODR/_3FG/CODR3fg131a.htm

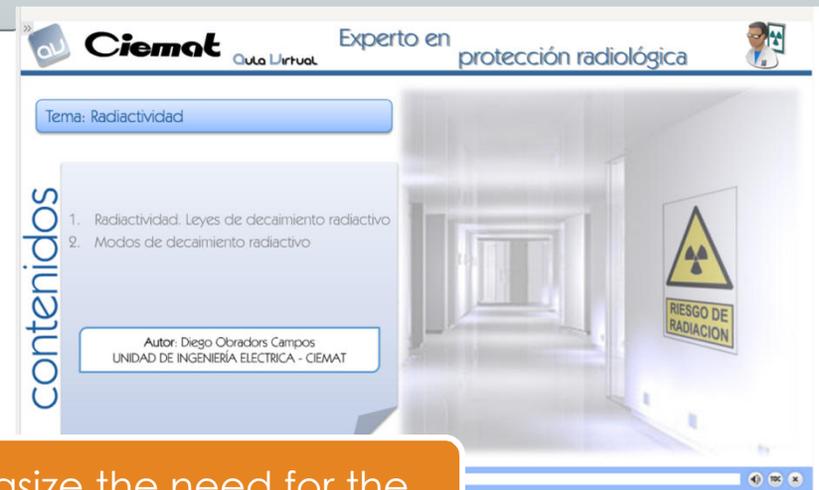


All the multimedia material have been developed by experts in these subjects and include interactive theoretical content, exercises, animations, videos, etc.

This methodology, which uses information and communication technology (ICT):

- ❑ Contributes to the **HARMONIZATION** of the national and international training contents
- ❑ Allows workers to receive continuous **TRAINING** when and where they want
- ❑ **REDUCES** the cost of accommodation outside the place of work or habitual residence.

- Improves the efficiency of the learning process
- The relationship between teachers and students, if done properly, is continuous and more effective than in the traditional way.



OU **Ciemat** Aula Virtual Experto en protección radiológica

Tema: Radiactividad

contenidos

1. Radiactividad. Leyes de decaimiento radiactivo
2. Modos de decaimiento radiactivo

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UNIDAD DE INGENIERÍA ELÉCTRICA - CIEMAT



Although it is necessary to emphasize the need for the student to dedicate the planned time for this methodology to work.

FACE TO FACE MODALITY



THE FACE-TO-FACE CLASSROOM PART lasts one month and a half and includes:

- ❑ the practical sessions (laboratories)
- ❑ discussion and calculation seminars belonging to the first two modules
- ❑ part of module III, and all modules IV & V.

This phase is developed on daily sessions, which are taught in CIEMAT and other facilities and collaborating entities



The improvements have been

- Development of **METHODOLOGICAL GUIDES** to unify and support the tasks of the teachers involved (authors, online tutors and face-to-face teachers) with the aim of achieving greater dynamism.

- INCORPORATION OF TUTORS.** Each module is structured in different teaching units. Each unit has a virtual tutor to support students.

Among its activities have been:

- attention to students and resolution of doubts
- the proposal of exercises to be solved
- their monitoring and evaluation
- the proposal of innovative actions that help the understanding of the contents by other non-standard ways, different from the traditional exercises

- Change in the **EVALUATION SYSTEM**, introducing online exams, practical cases, exercises, etc.



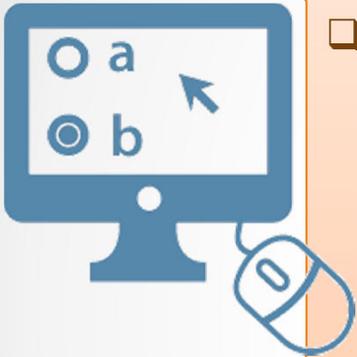
GUÍA PARA TUTORES ONLINE 2016

GUÍA PARA PROFESORES PRESENCIALES 2016

Guía para tutores online 1/16 GUÍA: abierta en PR



EVALUATION SYSTEM



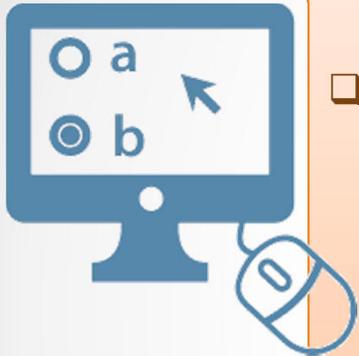
The **EVALUATION** in the course is carried out through elements on both parts:

ONLINE PART:

1. Online content and records on the platform. The platform records all the actions, as well as the time dedicated to each of them. It is mandatory to visualize all multimedia content (SCORM) to pass the modules
2. Activities proposed by teachers, personal or group, compulsory or optional, in order to assist in the learning process. These activities are an integral part of the assessment of learning, accounting for 40% of the module score.
3. Student-tutor communication, through forum, mail, etc., provides an indicator of the progress of the learning process. Participation in the forums is a very positive element in the final assessment.
4. Questionnaires. The student must pass the assessments of all the modules. The minimum mark is five on all questionnaires. There are two attempts for each questionnaire. This represents 60% of the final mark.

The students must surpass 90% of the online content in order to attend the face-to-face part of the course.





EVALUATION SYSTEM



❑ FACE TO FACE PART:

5. Face-to-face classes and practices. They are surpassed attending them and they are registered by means of signature control, being necessary a minimum attendance of 90%.
6. Face-to-face assessments. There are two face-to-face evaluations for the common modules and one more evaluation for each of the specialty modules. The specific weight of each evaluation in the final grade is 35% each one of the common modules and 30% the evaluation of the specialty.
7. End of course project. A project must be completed at the end of each specialty.



Oferta Formativa



Seminarios



Ver

Colaboraciones Educativas



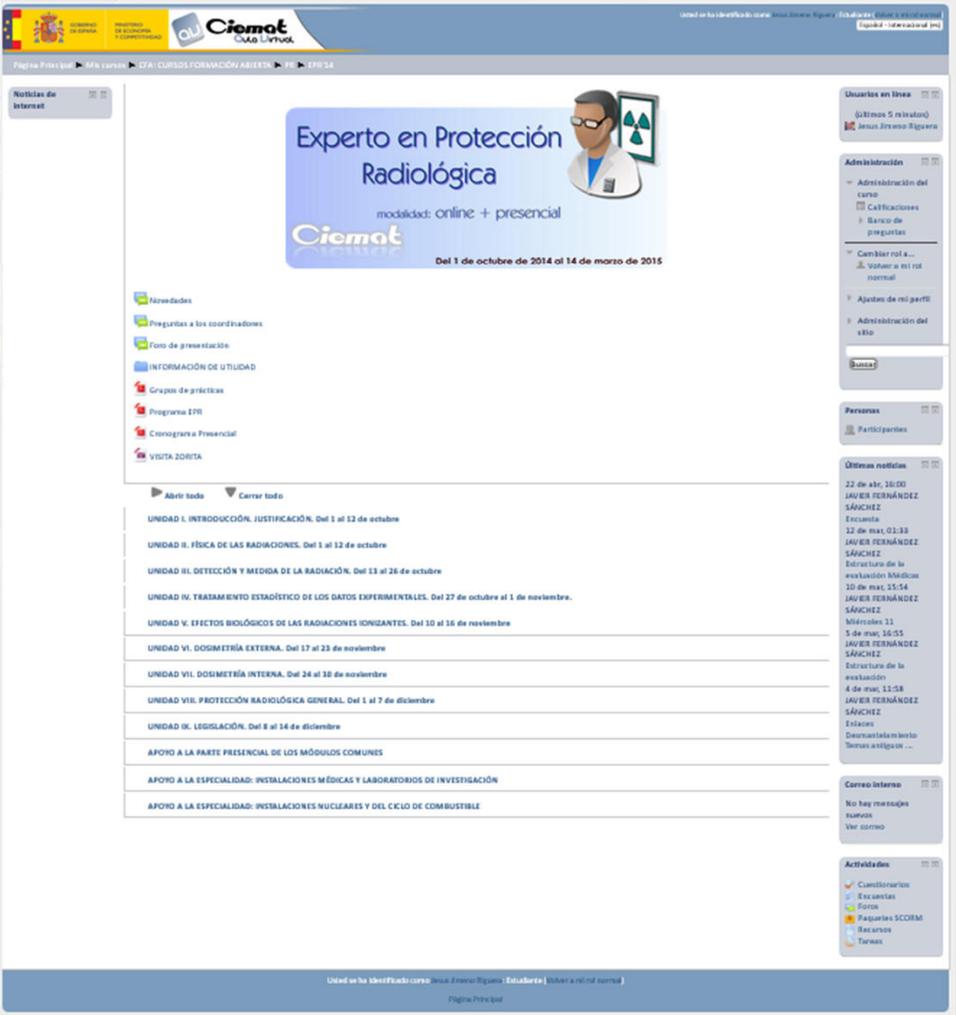
Ver

Aula Virtual



Ver

Web y Virtual Classroom

Experto en Protección Radiológica
modalidad: online + presencial
Del 1 de octubre de 2014 al 14 de marzo de 2015

Noticias de Internet

- Noticias
- Preguntas a los coordinadores
- Foto de presentación
- INFORMACIÓN DE UTILIDAD
- Grupos de prácticas
- Programa ERI
- Cronograma Presencial
- VISITA ZORITA

Unidades del curso:

- UNIDAD I. INTRODUCCIÓN, JUSTIFICACIÓN. Del 1 al 12 de octubre
- UNIDAD II. FÍSICA DE LAS RADIACIONES. Del 1 al 12 de octubre
- UNIDAD III. DETECCIÓN Y MEDIDA DE LA RADIACIÓN. Del 13 al 26 de octubre
- UNIDAD IV. TRATAMIENTO ESTADÍSTICO DE LOS DATOS EXPERIMENTALES. Del 27 de octubre al 1 de noviembre.
- UNIDAD V. EFECTOS BIOLÓGICOS DE LAS RADIACIONES IONIZANTES. Del 10 al 16 de noviembre
- UNIDAD VI. DOSIMETRÍA EXTERNA. Del 17 al 23 de noviembre
- UNIDAD VII. DOSIMETRÍA INTERNA. Del 24 al 30 de noviembre
- UNIDAD VIII. PROTECCIÓN RADIOLÓGICA GENERAL. Del 1 al 7 de diciembre
- UNIDAD IX. LEGISLACIÓN. Del 8 al 14 de diciembre

Apoyo a la parte presencial:

- APOYO A LA PARTE PRESENCIAL DE LOS MÓDULOS COMUNES
- APOYO A LA ESPECIALIDAD: INSTALACIONES MÉDICAS Y LABORATORIOS DE INVESTIGACIÓN
- APOYO A LA ESPECIALIDAD: INSTALACIONES NUCLEARES Y DEL CICLO DE COMBUSTIBLE

Últimas noticias:

- 22 deabr, 16:00 JAVIER FERNÁNDEZ SÁNCHEZ Encuentro
- 12 de may, 01:38 JAVIER FERNÁNDEZ SÁNCHEZ Estructura de la evaluación Médica
- 30 de may, 25:54 JAVIER FERNÁNDEZ SÁNCHEZ Miércoles 23
- 5 de may, 14:55 JAVIER FERNÁNDEZ SÁNCHEZ Estructura de la evaluación
- 4 de may, 11:58 JAVIER FERNÁNDEZ SÁNCHEZ Enlaces
- Desmantelamiento Termas antiguas ...

Correo interno:

No hay mensajes nuevos
Ver correo

Actividades:

- Comentarios
- Evaluación
- Foros
- Papelajes SCORM
- Recursos
- Temas

4. CONCLUSIONS



This new version of the Course “Radiation Protection Expert” is the result of the evolution of any training action driven by the current educational, social and technological situation: **ADAPTATION AND MODERNIZATION**



It aims to further evolve into the Common European Training Space without forgetting compliance with the requirements and conditions established and enforced of the CSN.



The choice of a blended learning format for this course (on line & face to face) it has been successfully proven with a good reception by the students and their results comparable to those of previous editions.



Following the ENETRAP RPE scheme, changing the learning format, reviewing contents, offering on-line and in face-to-face mode, consolidating both parts in a more inclusive course format, avoiding redundancies and investing in improving the pedagogical and methodological skills of our teachers



IV. CONCLUSIONES



Finally, guarantee a friendlier environment of the course in which its own development, relation with the tutors and other participants as well as the resolution of exercises and problems act in themselves as catalysts of the motivation to obtain a calmer learning



The experience acquired in this new format allows to persevere in its development, with the objective of maintaining the HIGH QUALITY already demonstrated but adapting it to the new forms that society demands today.



ANNUAL EDITIONS

