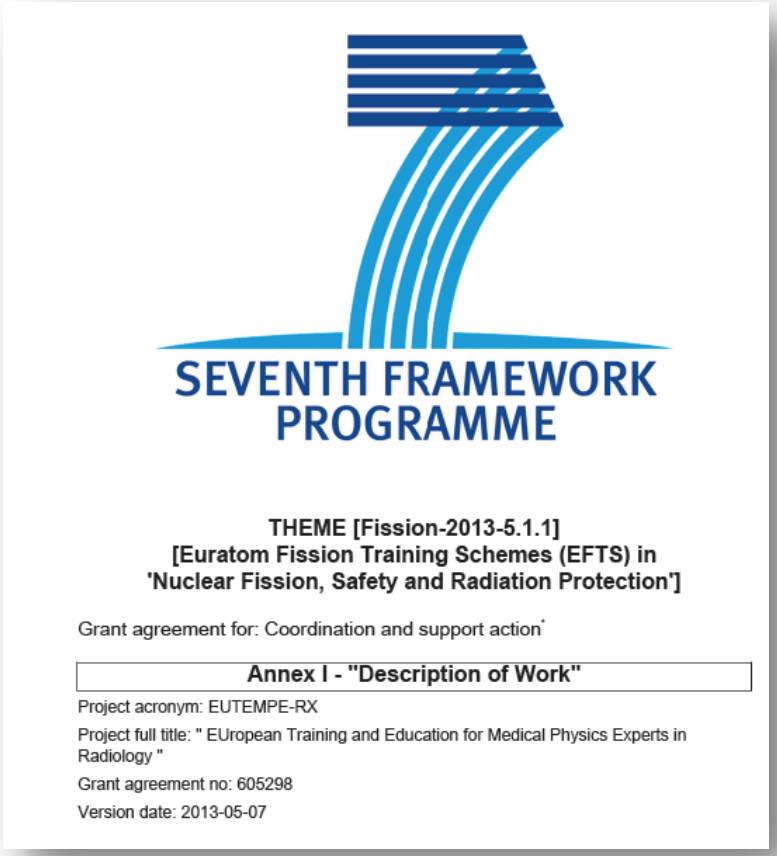
The Medical Physics Expert Project

Virginia Tsapaki

For Hilde Bosmans
on behalf of 14 EC project partners

EUTEMPE-RX


SEVENTH FRAMEWORK PROGRAMME

THEME [Fission-2013-5.1.1]
[Euratom Fission Training Schemes (EFTS) in 'Nuclear Fission, Safety and Radiation Protection']

Grant agreement for: Coordination and support action*

Annex I - "Description of Work"

Project acronym: EUTEMPE-RX

Project full title: " EUropean Training and Education for Medical Physics Experts in Radiology "

Grant agreement no: 605298

Version date: 2013-05-07

- Succesful application to the 2012 FP7 EC call for Euratom Fission Training Schemes (EFTS) in 'Nuclear Fission, Safety and Radiation Protection' (score of 14.5/15)
- EU support: € 1,658,000
- Timing: 3 year project: 01/08/2013 – 31/07/2016

EUTEMPE-RX

EUropean Training & Education
to become a
Medical Physics Expert
in Radiology

Motto:

Medical Physics Experts: driving technology to advance healthcare – proactively protecting patients from ionising radiation and other physical agents

Motivation

- Patient doses increase
- Medical physicists (MP) face enormous challenges in a rapidly changing environment:
  - New modalities, new regulations, sofisticated software tools, etc.
- European Guidelines on the MPE:
  - The MPE is defined as a MP who has reached the expert level: EQF level 8
  - EFOMP: ‘We urgently need to set up an agreed programme of education and training that could develop an MP to an MPE’

Qualification Framework for the Medical Physics Expert (MPE) in Europe

MPE: "An individual having the knowledge, training and experience to act or give advice on matters relating to radiation physics applied to medical exposure, whose competence to act is recognized by the Competent Authorities" (Revised BSS)

The Qualifications Framework is based on the European Qualifications Framework (EQF). In the EQF learning outcomes are defined in terms of Knowledge, Skills, Competences (KSC) (European Parliament and Council 2008/C 111/01)

EDUCATION

EQF Level 6
(e.g., Bachelor with 180 - 240 ECTS)
(i)

Physics or equivalent
(ii)

EQF Level 7
(e.g., Master with 90 - 120 ECTS)
(iii)

Medical Physics* or equivalent
(iv)

CLINICAL TRAINING

Clinical Certification in Medical Physics Specialty
(v)

Structured accredited clinical training residency in the specialty of Medical Physics in which the candidate seeks clinical certification. The duration should be typically two full-time year equivalents**
(vi)

ADVANCED EXPERIENCE and CPD

EQF Level 8 in Medical Physics Specialty
(vii)

Structured accredited advanced experience and CPD in the specialty of Medical Physics in which the candidate seeks certification as MPE. The duration would be an additional *minimum* of two full-time year equivalents***
(viii)

RECOGNITION

By Competent Authorities as MPE in Medical Physics specialty
(ix)

RE-CERTIFICATION

5 year CPD cycle
(x)

* Should include, as a minimum, the educational components of the Core KSC of Medical Physics and the educational components of the KSC of the specialty of Medical Physics (i.e., Diagnostic & Interventional Radiology or Nuclear Medicine or Radiation Oncology) for which the candidate seeks clinical certification. When this element of specialization is not included it must be included in the residency.

** The EQF level of the residency is intermediate between EQF levels 7 and 8.

*** In countries where the MPE is required to be certified in more than one specialty of Medical Physics the number of years would need to be extended such that the MPE will achieve level 8 in each Specialty.

EUTEMPE-RX solution

- Most EC member states may not have the capability to provide such a high-level course
- Expertise is spread all over Europe
- A proper environment is needed:
  - Access to high end software, systems and applications
  - Access to prototypes and pre-clinical systems
  - Teachers
- Cherry picking !!

-> 12 Course Modules developed by a European network of experts

Objectives

1. To provide a modular training scheme for the MP in Radiology to reach EQF level 8
2. To set up a multicampus Education combining online with face-to-face learning
3. To serve as a model for harmonised courses across Europe and get accredited (by EFOMP)
4. To achieve excellence in:
   - module content and organization
   - fulfillment of participant supported quality objectives
   - participant and stakeholder satisfaction

Participants

- Target group:
  - Applicants:
    - The MP in hospitals (D&IR)
    - The MP, engineers & scientists in industry
    - The MP, … in regulatory authorities
    - PhD students in physics for radiology
    - Medical Engineers
  - From all Member States of the EC
  - Resulting in a gender-balanced group
  - Entrance requirements:
    - EQF level 7 = master + 2 years experience (in D&IR)
    - CV and letter of recommendation

Project Partners

- Hilde Bosmans, Nick Marshall, Federica Zanca
  Katholieke Universiteit Leuven
- Carmel Caruana, Stelios Christofides, Virginia Tsapaki, Stephen Evans & Peter Sharp
  European Federation of Organisations for Medical Physics
- Eliseo Vano & Jose Miguel Fernandez
  Servicio Madrileno de Salud
- Andrea Ottolenghi, Vere Smyth & Klaus Trott
  Universita Degli Studi Di Pavia
- Josep Sempau
  Universitat Politècnica de Catalunya
- Mauro Gambaccini & Angelo Taibi
  Universta Degli Studi di Ferrara
- Kristina Bliznakova, Zhivko Bliznakov & Ivan Buliev
  Technical University of Varna

Project Partners

- Kenneth Young & Allistair Mackenzie
  Royal Surrey County Hospital NHS Foundation Trust
- Francis Verdun & Pascal Monnin
  Hospices Cantonaux CHUV
- Ruben van Engen & Wouter Veldkamp
  Stichting Landelijk Referentie Centrum voor Bevolkingsonderzoek
- John Damilakis
  University of Crete
- Renato Padovani & Analisa Trianna
  Azienda Ospedaliero Universitaria S. Maria della Misericordia
- Markus Borowski & Martin Fiebich
  Klinikum Braunschweig & Technische Hochschule Mittelhessen

Course Modules

Number	Title	Lead
1	Development of the profession and the challenges for the MPE (D&IR) in Europe	C. Caruana & E. Vano
2	Radiation biology for medical physicists in radiology	A. Ottolenghi
3	Monte Carlo simulation of X-ray imaging and dosimetry	J. Sempau
4	Advanced X-ray physics for imaging devices and user protocol innovation in D&IR	M. Gambaccini, A. Taibi
5	The use of physical and virtual anthropomorphic phantoms for image quality and patient dose optimization	K. Bliznakova
6	The development of advanced QA protocols for optimized use of radiological devices	H. Bosmans & E. Vano

Course Modules

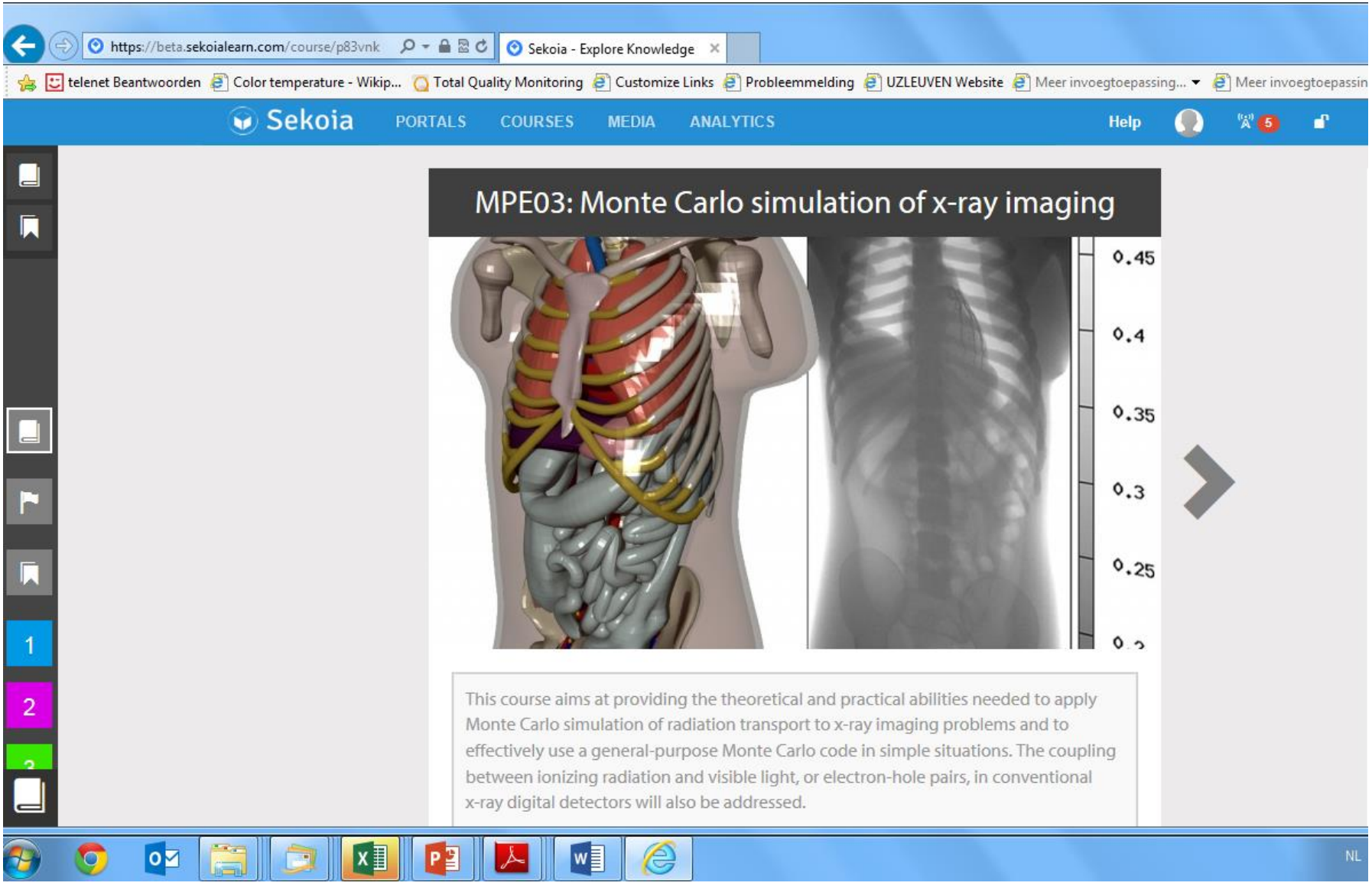
Number	Title	Lead
7	Optimisation of X-ray imaging using standard and innovative techniques	K. Young & A. McKenzie
8	Role of the medical physicist in CT imaging and patient dose optimization: CT imaging and patient dose optimized with objective means	F. Verdun
9	Achieving quality in diagnostic and screening mammography	R. van Engen & W. Veldkamp
10	High dose X-ray procedures in Interventional Radiology and Cardiology: establishment of a robust quality assurance programme for patient and staff	R. Padovani & E. Vano
11	Radiation dose management of pregnant patients, pregnant staff and paediatric patients in diagnostic and interventional radiology	J. Damilakis
12	Personnel dosimetry, including techniques to communicate practical results to the users (RPE)	M. Borowski & M. Fiebich

Course Module Timing

Module nr	Date	Module nr	Date
1	09-13/02/2015	7	20-23/10/2015
2	13-18/04/2015	8	14-18/03/2016
3	15-19/06/2015	9	18-22/01/2016
4	13-17/07/2015	10	13-18/02/2016
5	07-13/09/2015	11	16-20/05/2016
6	09-13/11/2015	12	17-22/04/2016

Course Modules

- Part 1: Online phase
  - e-learning platform
  - Web lectures, with ppt organized in a book structure; suggested reading; movies; audiofiles;
  - Interactive sessions: exercises, self-assessment, teacher feedback, discussion fora, etc.
  - ~40 hours of active participation over a longer period
  - Done from home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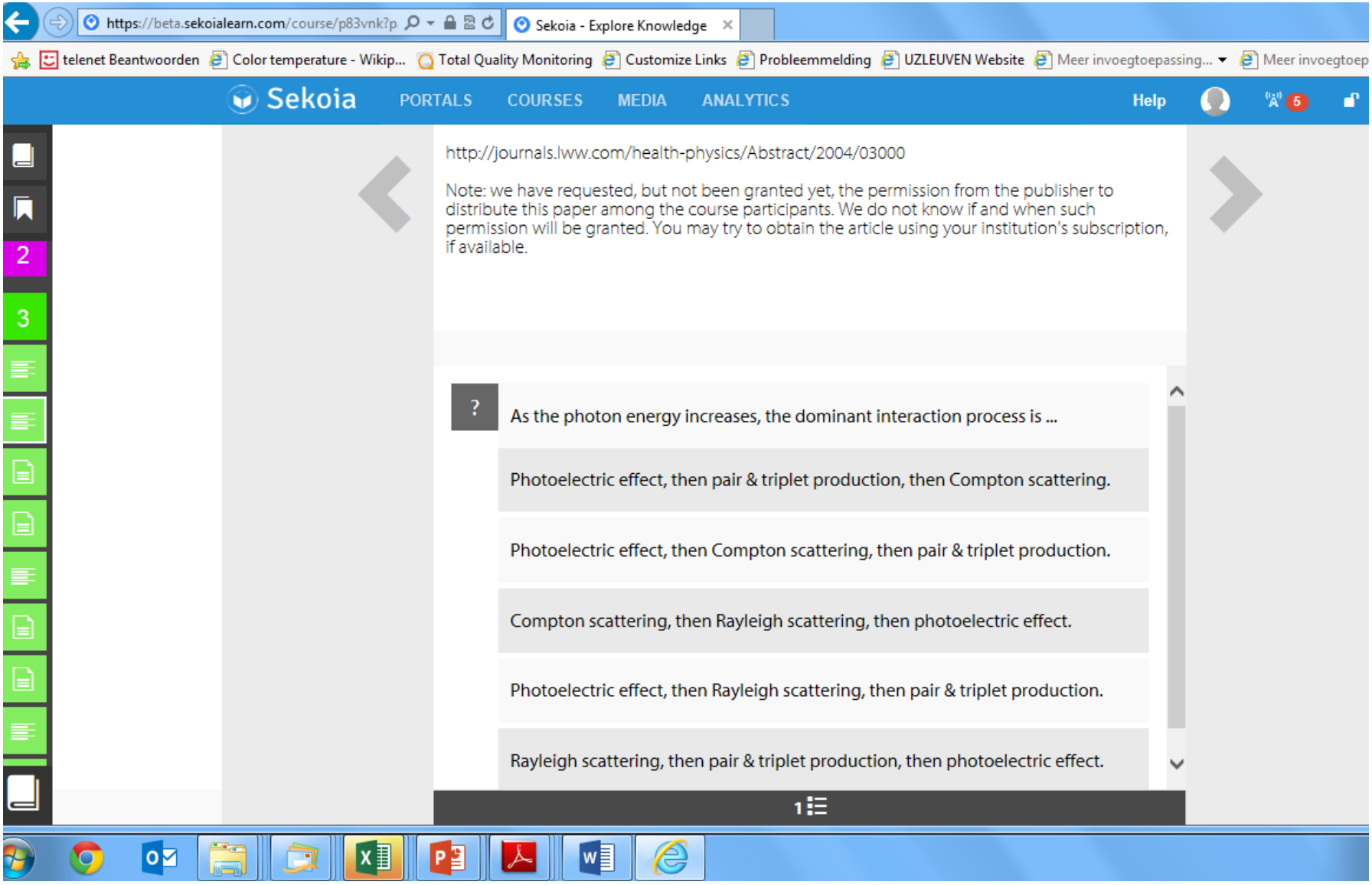
MPE03: Monte Carlo simulation of x-ray imaging
0.45
0.4
0.35
0.3
0.25
This course aims at providing the theoretical and practical abilities needed to apply Monte Carlo simulation of radiation transport to x-ray imaging problems and to effectively use a general-purpose Monte Carlo code in simple situations. The coupling between ionizing radiation and visible light, or electron-hole pairs, in conventional x-ray digital detectors will also be addressed.
NL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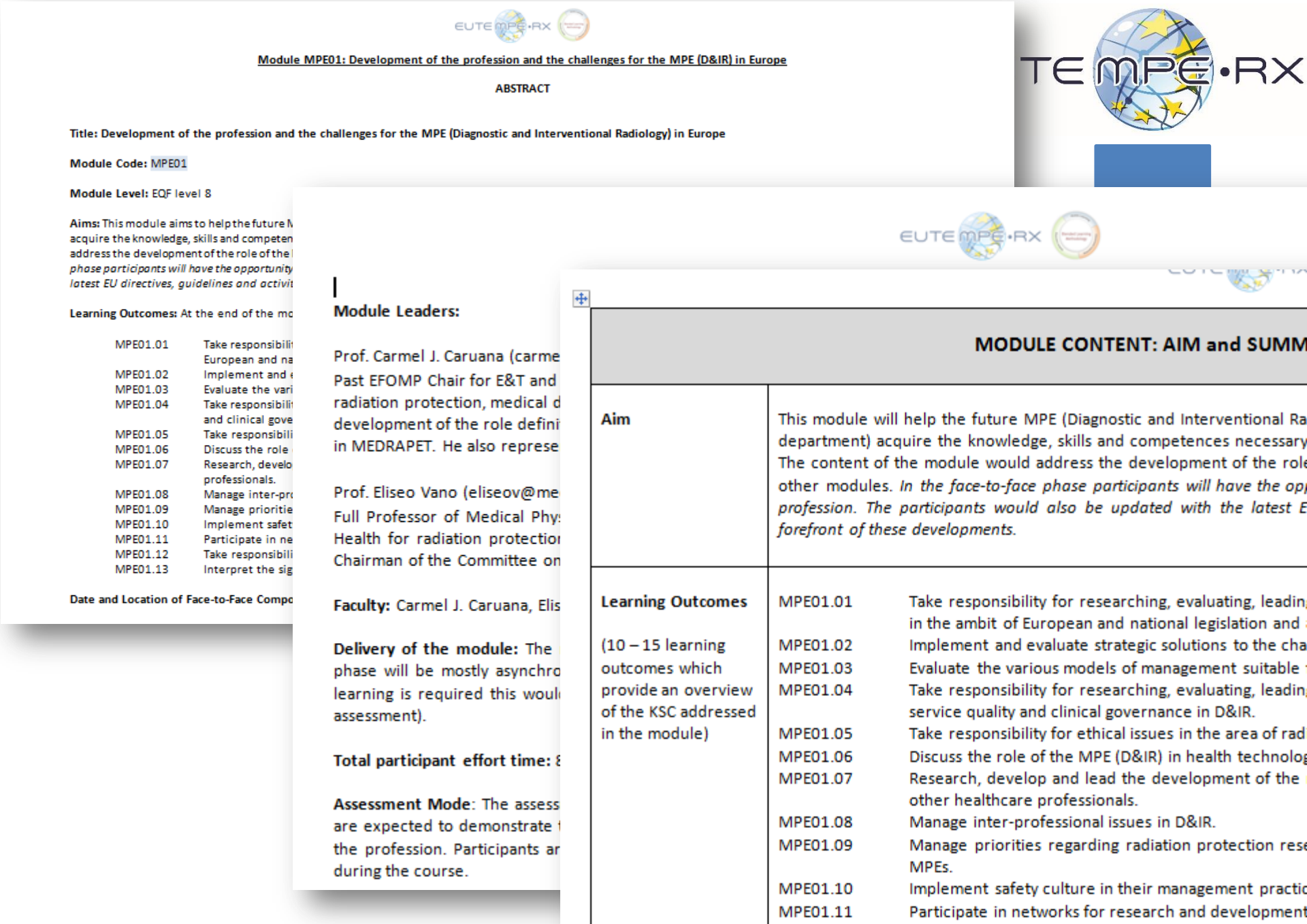
http://journals.lww.com/health-physics/Abstract/2004/03000
Note: we have requested, but not been granted yet, the permission from the publisher to distribute this paper among the course participants. We do not know if and when such permission will be granted. You may try to obtain the article using your institution's subscription, if available.
?
As the photon energy increases, the dominant interaction process is ...
Photoelectric effect, then pair & triplet production, then Compton scattering.
Photoelectric effect, then Compton scattering, then pair & triplet production.
Compton scattering, then Rayleigh scattering, then photoelectric effect.
Photoelectric effect, then Rayleigh scattering, then pair & triplet production.
Rayleigh scattering, then pair & triplet production, then photoelectric effect.
1

Course Modules

- Part 2: Face-to-face phase
  - (Lectures), demonstrations, exercises, discussions, hands-on workshops, practical sessions, etc.
  - ~40 hours of active participation over approximately 5 days
  - On location
  - Review of the course & Evaluation

High Quality courses

- General QA principles (Quality Manual)
- Procedures have described
- Structures & Responsibilities have been distributed
- All Modules are described by:
  - Title
  - Learning objectives & prerequisites
  - Content
  - Knowledge-skills-competences, covering a maximum of KSCs of the MPE guidelines document
  - Evaluation method
  - Teacher's CV
  - …



Module MPE01: Development of the profession and the challenges for the MPE (D&IR) in Europe

ABSTRACT

Title: Development of the profession and the challenges for the MPE (Diagnostic and Interventional Radiology) in Europe

Module Code: MPE01

Module Level: EQF level 8

Aims: This module aims to help the future M
acquire the knowledge, skills and competen
address the development of the role of the
phase participants will have the opportunity
latest EU directives, guidelines and activit

Learning Outcomes: At the end of the mo

MPE01.01	Take responsibilit European and na
MPE01.02	Implement and e
MPE01.03	Evaluate the vari
MPE01.04	Take responsibilit and clinical gove
MPE01.05	Take responsibili
MPE01.06	Discuss the role
MPE01.07	Research, develo professionals.
MPE01.08	Manage inter-pr
MPE01.09	Manage prioritie
MPE01.10	Implement safet
MPE01.11	Participate in ne
MPE01.12	Take responsibili
MPE01.13	Interpret the sig

Date and Location of Face-to-Face Compo

Module Leaders:

Prof. Carmel J. Caruana (carme
Past EFOMP Chair for E&T and
radiation protection, medical d
development of the role defini
in MEDRAPET. He also represe

Prof. Eliseo Vano (eliseov@me
Full Professor of Medical Phys
Health for radiation protectio
Chairman of the Committee on

Faculty: Carmel J. Caruana, Elis

Delivery of the module: The
phase will be mostly asynchro
learning is required this woul
assessment).

Total participant effort time: 8

Assessment Mode: The assess
are expected to demonstrate
the profession. Participants ar
during the course.

MODULE CONTENT: AIM and SUMM	
Aim	This module will help the future MPE (Diagnostic and Interventional Ra department) acquire the knowledge, skills and competences necessary The content of the module would address the development of the role other modules. *In the face-to-face phase participants will have the op profession. The participants would also be updated with the latest E forefront of these developments.*
Learning Outcomes (10 – 15 learning outcomes which provide an overview of the KSC addressed in the module)	MPE01.01 Take responsibility for researching, evaluating, leadin in the ambit of European and national legislation and MPE01.02 Implement and evaluate strategic solutions to the cha MPE01.03 Evaluate the various models of management suitable MPE01.04 Take responsibility for researching, evaluating, leadin service quality and clinical governance in D&IR. MPE01.05 Take responsibility for ethical issues in the area of rad MPE01.06 Discuss the role of the MPE (D&IR) in health technolog MPE01.07 Research, develop and lead the development of the other healthcare professionals. MPE01.08 Manage inter-professional issues in D&IR. MPE01.09 Manage priorities regarding radiation protection rese MPEs. MPE01.10 Implement safety culture in their management practic MPE01.11 Participate in networks for research and development

Course Module subscription

- Registration:
  - No registration fee
  - Module leaders select their participants from the applications
  - Each module is independent and can be followed separately
  - All modules together cover the majority of the KSC as stipulated in the RP174 document

First results (Module 1)

- Nice coverage over the whole of Europe

Module 1

"Development of the profession and the challenges for the MPE"

was held in Prague in February 2015

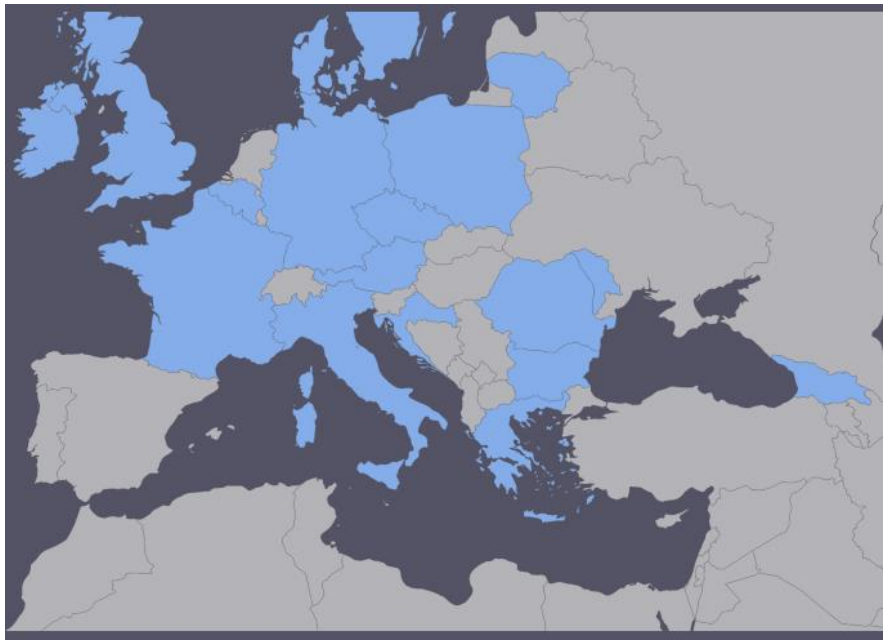
- 3 Main topics:

1) *role of MPE and the profession today and tomorrow*
2) *introduction to management and management issues in Diagnostic & Interventional Radiology*
3) *development of the professional profile of the MPE.*

- 17 chapters in on line phase
- 5 days for on site course

First results (Module 2)

- Nice coverage over the whole of Europe



Module 2

“Radiation biology for medical physicists in radiology” was held in Pavia in April 2015

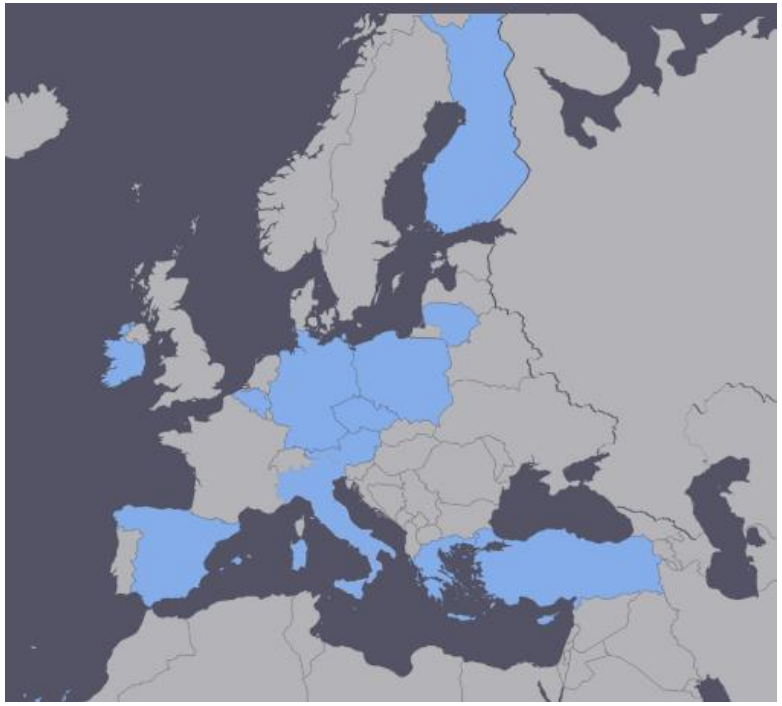
- Provide advice on:

1. *the risks to individual patients from planned and unplanned exposures*
2. *to patients who have been exposed to ionizing radiation*
3. *the optimization of medical exposures so as to minimize the risk to the patient*
4. *the occupational risks from the use of ionizing radiation in interventional procedures*

- Participate as part of a multidisciplinary team planning research into the risks from exposures
- Provide training to medical staff on the radiobiological basis of the risks from the use of ionizing radiation

First results (Module 3)

- Nice coverage over the whole of Europe

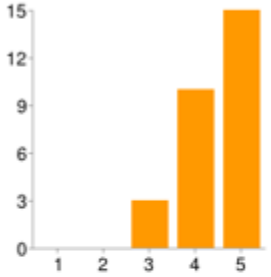


First results (Module 4)

- Nice coverage over the whole of Europe

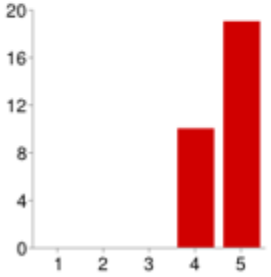
First results (Module 1)

2. This level of the module helped me achieve EQF level 8 in the areas covered by the module



1	**0**	0%
2	**0**	0%
3	**3**	10%
4	**10**	34%
5	**15**	52%

3. Participation in this module enabled me to develop learning goals relevant to my professional objectives.



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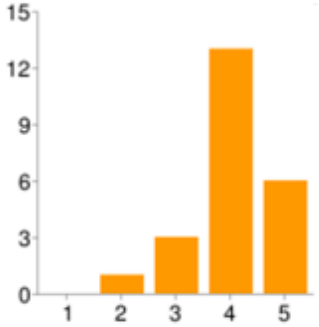
2	**0**	0%
3	**0**	0%
4	**10**	34%
5	**19**	66%

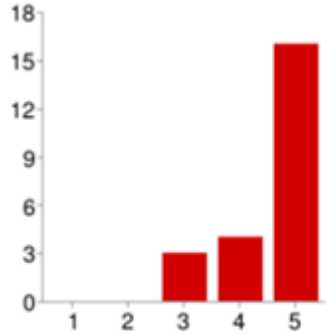
First results (Module 2)

2. This level of the module helped me achieve EQF level 8 in the areas covered by the module



1	**0**	0%
2	**1**	4.3%
3	**3**	13%
4	**13**	56.5%
5	**6**	26.1%

3. Participation in this module enabled me to develop learning goals relevant to my professional objectives.



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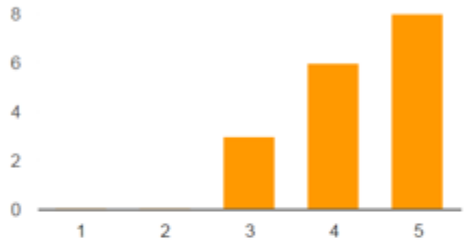
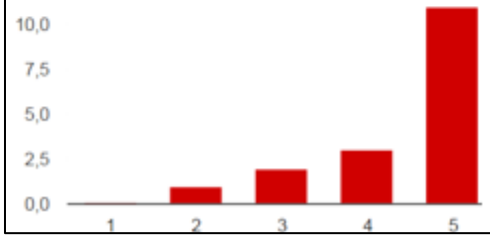
2	**0**	0%
3	**3**	13%
4	**4**	17.4%
5	**16**	69.6%

First results (Module 3)

2. This level of the module helped me achieve EQF level 8 in the areas covered by the module

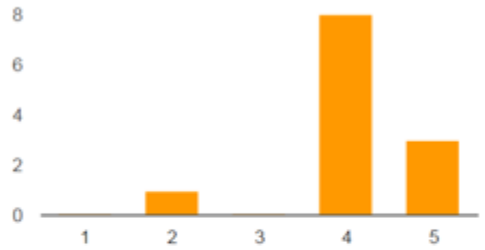


3. Participation in this module enabled me to develop learning goals relevant to my professional objectives.

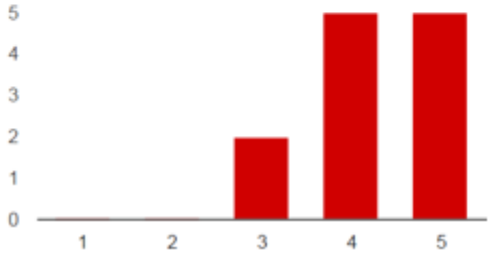


First results (Module 4)

2. This level of the module helped me achieve EQF level 8 in the areas covered by the module



3. Participation in this module enabled me to develop learning goals relevant to my professional objectives.



Module 11:

Radiation dose management of pregnant patients, pregnant staff and paediatric patients in diagnostic and interventional radiology”

Radiation dose management of pregnant patients, pregnant staff and paediatric patients in diagnostic and interventional radiology

EUTEMPE-RX

Teaching method:
Blended learning
(online and face-to-face learning)

Module duration: approx. 10 working days online teaching + 5 working days face-to-face teaching

Venue (face-to-face teaching): University of Crete, Faculty of Medicine, Heraklion, Crete, Greece

16-20 May 2016, Iraklion (Crete), Greece

Teaching objectives: By the end of this module the participants would be able to:

1. Assess and evaluate conceptus doses and radiogenic risks associated with diagnostic and interventional examinations performed on the mother
2. Assess, evaluate and minimize conceptus dose for pregnant staff working in an interventional suite
3. Assess and evaluate paediatric patient doses and radiogenic risks from diagnostic and interventional radiology procedures
4. Manage exposure of pregnant patients requiring diagnostic and interventional procedures
5. Develop new optimized diagnostic and interventional radiology protocols for pregnant patients
6. Develop new optimized diagnostic and interventional radiology protocols for paediatric patients
7. Develop research protocols focused on conceptus and paediatric dosimetry using TLDs and anthropomorphic physical phantoms or Monte Carlo simulation and mathematical phantoms

Teaching staff: John Damilakis, Kostas Perisinakis, John Stratakis, Antonios Papadakis, Virginia Tsapaki, Georgia Solomou, invited speakers (tba)

LEADER OF THE MODULE

John Damilakis, A full professor and chairman in the Department of Medical Physics of the University of Crete, Greece, John Damilakis has focused his research interests on radiation protection in diagnostic and interventional radiology. He has published more than 200 publications in leading peer-reviewed journals and conference proceedings. He is a leader in the application of medical radiation protection in clinical everyday practice with about 30 years of clinical experience. John Damilakis is vice president and president elect of EFOMP and chairman of the Education and Training Committee of IOMP

John Stratakis, received his BSc in Physics from the University of Crete in 1997, his MSc in Medical Physics from the University of Surrey, UK, in 1998 and his PhD in Medical Physics from the Medical School of the University of Crete. He is a research associate of the Laboratory of Medical Physics at University of Crete. His research interests include Monte Carlo dosimetry applied to radiographic and interventional procedures.

Kostas Perisinakis, BSc, MSc, PhD joined the Medical Physics Department, Medical School, University of Crete in 1996 where he serves ever since. He is author in more than 85 scientific papers published in peer-review journals, which have received more than 1350 citations. He was invited speaker in more than 50 international and domestic congresses. His main research interests relate to quantification of radiogenic risks from medical radiation procedures.

Antonios Papadakis has been a medical physicist and radiation protection consultant with the Medical Physics Department of the University Hospital of Heraklion, Greece, since 2004. He received the PhD degree in medical physics in 2003 from the University of Patras, Greece. From 2003 to 2004 he had been a research fellow with the Massachusetts General Hospital, Boston, USA. He has published several articles in peer-reviewed scientific journals and conference proceedings.

Georgia Solomou received her B.Sc. in Applied Mathematics and Physics from National Technical University of Athens and M.Sc in Medical Physics from the Aristotle University of Thessaloniki. Since 2012 she has been a PhD candidate in Medical Physics with the University of Crete and has been working as a Medical Physicist in the research project entitled "Conceptus Radiation Doses and Risks from Imaging with Ionizing Radiation".

Virginia Tsapaki, large experience in Diagnostic and Interventional Radiology, Computed Tomography and Nuclear Medicine. Involved several missions organised by the IAEA and in multiple European and IAEA research projects. More than 100 publications in various national and international journals and conference proceedings and more than 150 presentations and posters in national and international conferences. President of the Hellenic Association of Medical Physicists. Actively involved in the board of EFOMP and IOMP.

info:john.damilakis@med.uoc.gr.

EUTEMPE-RX

Course enrollment is FREE

Minimum entrance requirements are:
EQF level 7 = master + 2 years of experience in medical physics for radiological applications

www.eutempe-rx.eu

Global remarks

- Upfront learning with an e-learning tool is new (an experiment)
- Teaching & Discussion in small groups highly appreciated
- The participants are and remain a team after the course (users' groups, lists)
- many of the participants subscribed to several modules

Upcoming Events

- Mid-Term Workshop:
  - Sept 25, 2015 in Sofia
  - Open meeting
  - Report on results of the first course modules
  - Promote upcoming courses
  - Discuss future of the EUTEMPE-RX project

Sustainability

- Project deliverable
- Beyond the actual project
- Expansion to other domains
  - Nuclear medicine, radiotherapy, …
- ‘Eutempe’ network being created

EUTEMPE-RX

- For more information, please visit our website and subscribe to our mailing list

www.eutempe-rx.eu

Thank you for your attention