EUTEMPE-RX QUALITY ASSURANCE COMMITTEE

Module Approval Form: Content and Organization

Quality Manual: “All modules forming part of the EUTEMPE-RX module catalogue are required to be formally approved by the EUTEMPE-RX **Education Board** in terms of content and organization prior to delivery. The leader/s of the particular module will apply for such approval on the official **Module Approval Form: Content and Organization** provided by the QAC. The request for approval should be sent to the Secretary of the Education Board. In its deliberations the Educational Board will take into consideration the recommendations of the QAC. Records of the results of the review of the QAC and any actions will be maintained by the secretary of the QAC. Approval will be communicated to the module leader in writing by the Secretary of the Education Board”

PRINCIPLES GUIDING MODULE CONTENT

The following quotes from the key documents of the EUTEMPE-RX project should guide module content:

European Qualifications Framework definition of Level 8
Knowledge: "knowledge at the most advanced frontier of a *field of work* or study and at the interface between fields"
Skills: "the most advanced and specialised skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and *to extend and redefine existing* knowledge or *professional practice*"
Competence: "demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research"

European Guidelines on the MPE
"The question arises which of these KSC are expected to be achieved by the medical physics professional at the end of the two years equivalent clinical training following the Masters in Medical Physics (EQF level 7+) and which at the MPE level (EQF level 8). In general most of the knowledge, a substantial number of the skills and some of the competences should be acquired by the end of the initial two year clinical training. The skills and competences to be acquired by the end of the two years equivalent clinical training following the Masters in Medical Physics (EQF level 7+) are those defined by the IAEA training documents (Clinical Training of Medical Physicists Specializing in Diagnostic Radiology. Training Course Series, 47, IAEA, 2010, http://www-pub.iaea.org/MTCD/publications/PDF/TCS-47_web.pdf). However, as Medical Physics is by nature complex it must be emphasized that these skills and competences are developed over a period of years. *The majority of the skills and competences would be acquired to the appropriate effective and safe level only at the MPE level i.e., level 8*"

EUTEMPE-RX Quality Manual
"*EUTEMPE-RX will focus on the development of skills and competences to EQF level 8*. Knowledge learning outcomes will also be included when the knowledge level presently acquired in Level 7 programmes is considered insufficient for the development of skills and competences to level 8"

EUTEMPE-RX Project Description-of-Work:
"Each module should typically include:

- a clearly defined topic
- list of KSC to be achieved in line with the key activities of the MPE as formulated in the 'European Guidelines for the MPE' project and in accordance with interests formulated by MELODI, DOREMI and HLE
- both theoretical and practical training sessions
- a state-of-the-art literature review and collection of educational material on the topic
- an example on how to transfer research results to clinical practice
- an example of innovation
- the use of associated software tools
- a practical challenge to be solved
- a module evaluation method and evaluation moment"

ABSTRACT

The first two pages of the Module Approval Form are dedicated to an ABSTRACT which describes the module content and organization in brief. Please keep to the desired format. This abstract will be presented on the EUTEMPE-RX webpage and used for PR activities. Often potential participants only have time to read the abstract. The abstract must therefore be striking and informative enough to stimulate interest in potential participants.

Notes:

a) The abstract should be 2 pages maximum
b) The module code is *MPEmodulenumber (e.g., MPE01 to MPE12)*
c) Use font calibri size 10
d) Each module is very comprehensive and will address a large number of KSCs from the 'Inventory of Learning Outcomes for the MPE in Europe' (rp174_annex1 of the 'European Guidelines on the MPE). These KSCs will be found in the full module description. The **Summary Learning Outcomes** in the abstract represent a brief summary of these KSCs.
e) The numbering of the Summary Learning Outcomes should be in the form *MPEmodulenumber.summarylearningoutcomenumber (e.g., MPEXX.01, MPEXX.02...)*
f) **Please remember that these are all level 8 modules.** Therefore use **ONLY level 8 action verbs** for the Summary Learning Outcomes e.g., take responsibility for, implement, manage, evaluate, research, lead, design, develop, discuss...

Module MPE11: Radiation dose management of pregnant patients, pregnant staff and paediatric patients in diagnostic and interventional radiology

ABSTRACT

Title: Radiation dose management of pregnant patients, pregnant staff and paediatric patients in diagnostic and interventional radiology
Module Code: MPE11

Module Level: EQF level 8

Aims: The exposure of pregnant patients to medical X-rays is often a complex case and involves emotionally sensitive issues for both prospective parents and physicians. Conceptus dose assessment is not always easy. MPEs should be able to assess conceptus doses and risks from diagnostic and interventional procedures and also to place the risk in a perspective from which an informed decision can be made.

Paediatric patients requiring diagnostic and interventional procedures are exposed to diagnostic and interventional X-rays. Peadiatric patients are more sensitive to radiation than adults and, for this reason, accurate assessment of doses and risks is needed in these cases. MPEs should be able to assess paediatric doses and risks from diagnostic and interventional procedures.

The main objective of this module is to discuss methods to estimate a) conceptus doses and radiogenic risks and b) paediatric doses and radiogenic risks associated with diagnostic and interventional X-ray procedures. By the end of this module the participants should also be able to develop new optimized diagnostic and interventional radiology protocols for pregnant and paediatric patients and develop research protocols focused on conceptus and paediatric dosimetry.

Learning Outcomes: At the end of the module the participants will be able to:

MPE11.01	Assess and evaluate conceptus doses and radiogenic risks associated with diagnostic and interventional examinations performed on the mother.
MPE11.02	Assess, evaluate and minimize conceptus dose for pregnant staff working in an interventional suite.
MPE11.03	Assess and evaluate paediatric patient doses and radiogenic risks from diagnostic and interventional radiology procedures.
MPE11.04	Manage exposure of pregnant patients requiring diagnostic and interventional procedures.
MPE11.05	Develop new optimized diagnostic and interventional radiology protocols for pregnant patients.
MPE11.06	Develop new optimized diagnostic and interventional radiology protocols for paediatric patients.
MPE11.07	Develop research protocols focused on conceptus and paediatric dosimetry using TLDs and anthropomorphic physical phantoms or Monte Carlo simulation and mathematical phantoms.

Date and Location of Face-to-Face Component: **16-20 May 2016**

Module Leader:

Prof. John Damilakis (john.damilakis@med.uoc.gr)
President-Elect of EFOMP (2015-2017), professor at the University of Crete and head of the Medical Physics Department at the University Hospital of Iraklion, John Damilakis combines high level research with daily medical physics practise. He is an active member of several European projects and a popular invited speaker at national and international conferences. He has more than 200 publications in PubMed concerning research topics of radiation protection, CT dosimetry, embryo/fetal dosimetry, quality assurance and dosimetry in bone densitometry.

Faculty: John Damilakis, Kostas Perisinakis, John Stratakis, Antonios Papadakis, Virginia Tsapaki and Georgia Solomou.

Delivery of the module: The module will achieve its learning objectives using a combination of online and face-to-face teaching.

Total participant effort time: 64h

Assessment Mode: Module 11 will combine 3 assessment methods: a) literature review, b) computer exercises and c) final written exams. After completion of on-line phase, participants will be asked to write a short literature review (2-3 A4 pages, instructions about margins, font, font size and spacing will be provided) on a specific topic related to the radiation dose management of pregnant patients, pregnant staff and paediatric patients in diagnostic and interventional radiology. This requires evaluation and interpretation and it will give participants the opportunity to understand how researchers proceed to solve problems in this field. During the phase-to-phase meeting, participants will be asked to do computer exercises. This will encourage students to a) use computer software packages to estimate doses and risks and b) translate and interpret dosimetric concepts learnt. The final written exams will assure that participants have attained the appropriate knowledge and skills.

Grades (scale: 0-100):
Literature review 20%
Computer Exercises: 30%
Final exams: 50%

Pass: We'll set a minimum scaled score of 10, 15 and 25 for literature review, computer exercises and final exams respectively and a combined scaled score of 60 to pass the Module 11 exams. The last 2 assessment methods (computer exercises and final exams) will be time constrained i.e. Computer exercises: 2 exercises, 15 minutes each and Final exams: 4 questions 60 minutes total duration).

MODULE DATA			
Module Code	MPE11		
Module Leader/s Please limit CV to a max of 250 words and to what is relevant to this particular module.	Prof. John Damilakis (john.damilakis@med.uoc.gr) President of EFOMP (2015-2017), professor at the University of Crete and head of the Medical Physics Department at the University Hospital of Iraklion, John Damilakis combines high level research with daily medical physics practise. He is an active member of several European projects and a popular invited speaker at national and international conferences. He has more than 200 publications in PubMed concerning research topics of radiation protection, CT dosimetry, embryo/fetal dosimetry, quality assurance and dosimetry in bone densitometry.		
Teaching Staff Teaching staff should be either recognised MPEs or in possession of a PhD. If not please contact the Secretary of the QAC.	John Damilakis, Kostas Perisinakis, John Stratakis, Antonios Papadakis, Virginia Tsapaki and Georgia Solomou.		
Candidate Assessment (all assessments open book)	**Written Assessment (open book):**		See above (page 5)
	Practical Assessment (open book):		See above (page 5)
Module Duration The TOTAL number of hours of participant effort should be about 80. (including lectures, reading of assigned compulsory texts, participation in	**Online phase** Asynchronous methods should be used so that participants would not need to take time off their clinical duties and there will not be a problem with time zones.	45 days (February 15, 2016 – March 31, 2016)	

<table>
<tr><td>online fora etc)</td><td>Face-to-face phase

Must include 1 day for revision and 1 day for the assessment proper.</td><td colspan="2">5 working days face-to-face teaching, from 09:00-17:00 local time)

All modules: All learning materials including presentations will be sent to the participants 2 weeks before the first day of the face-to-face phase.</td></tr>
<tr><td>Date and location of Face-to-Face</td><td colspan="3">16-20 May 2016</td></tr>
<tr><td>Date of Assessment
Normally last day of face-to-face phase.</td><td colspan="3"></td></tr>
<tr><td rowspan="9">Breakdown of participant effort time</td><td colspan="2">Module Component</td><td>Estimated Time</td></tr>
<tr><td colspan="2">Online lectures, seminars, tutorials, fora</td><td>30h</td></tr>
<tr><td colspan="2">Online compulsory reading</td><td></td></tr>
<tr><td colspan="2">Face-to-face lectures, seminars, tutorials, fora</td><td>17h</td></tr>
<tr><td colspan="2">Face-to-face technical demonstrations</td><td></td></tr>
<tr><td colspan="2">Face-to-face laboratory/clinical exercises/Practical sessions</td><td>17h</td></tr>
<tr><td colspan="2">Total participant effort time</td><td>64h</td></tr>
<tr><td colspan="2">Free day for exam preparation day (same for all modules)</td><td>0h</td></tr>
<tr><td colspan="2">Assessment (same for all modules)</td><td>1.5 h for computer exercises and final written exams + time needed for literature review</td></tr>
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PRE-REQUISITES FOR THE MODULE	
Minimum entry qualifications, training and years of experience for *all* modules Same for all modules	EQF Level 6 in Physics (BSc Physics or equivalent) EQF Level 7 in Medical Physics (MSc Medical Physics or equivalent) 2 year equivalent clinical training in D&IR for clinical Medical Physicists 2 year equivalent Industry/Radiation Authority experience for Industry/Radiation Authority personnel.
Assumed previous KSC for *all* modules from the 'Inventory of Learning Outcomes for the MPE in Europe' (Annex I of the 'European Guidelines on the MPE') Same for all modules	GENERIC SKILLS : Generic Skills Required at EQF level 7 KSC FOR THE MPE AS PHYSICAL SCIENTIST: All Knowledge learning outcomes to EQF level 7 KSC FOR THE MPE AS A HEALTHCARE PROFESSIONAL: All Knowledge learning outcomes to EQF level 7 KSC FOR THE MPE AS EXPERT IN CLINICAL MEDICAL RADIOLOGICAL DEVICES & RADIATION PROTECTION: All Knowledge learning outcomes to EQF level 7 KSC SPECIFIC FOR THE MPE IN DIAGNOSTIC & INTERVENTIONAL RADIOLOGY: All Knowledge learning outcomes to EQF level 7 The Skills and Competences included in the IAEA document 'Clinical Training of Medical Physicists Specializing in Diagnostic Radiology' (IAEA Training Course Series, 47, 2010) to EQF level 7.
Pre-requisite EUTEMPE-RX online summary modules for *all* modules Same for all modules	MPE01 Development of the profession and the challenges for the MPE (D&IR) in Europe (online summary version accessible to all participants in all modules)
Additional pre-requisite EUTEMPE-RX online summary modules for *this* module Different for each module.	None required

MODULE CONTENT: AIM and SUMMARY LEARNING OUTCOMES	
Aim	This module aims to help the future MPE (Diagnostic and Interventional Radiology, including fluoroscopically guided procedures performed outside the imaging department) acquire the knowledge, skills and competences necessary to exercise a leadership role within the profession in his own country and in Europe. The content of the module would address the development of the role of the MPE in D&IR in its entirety and would inform and provide a framework for discussions for all the other modules. *In the face-to-face phase participants will have the opportunity to discuss the major issues directly with the present European leaders of the profession. The participants would also be updated with the latest EU directives, guidelines and activities impacting the role to ensure they are at the forefront of these developments.*
Summary Learning Outcomes (10 – 15 learning outcomes which provide an overview of the KSC addressed in the module)	MPE11.01 Assess and evaluate conceptus doses and radiogenic risks associated with diagnostic and interventional examinations performed on the mother. MPE11.02 Assess, evaluate and minimize conceptus dose for pregnant staff working in an interventional suite. MPE11.03 Assess and evaluate paediatric patient doses and radiogenic risks from diagnostic and interventional radiology procedures. MPE11.04 Manage exposure of pregnant patients requiring diagnostic and interventional procedures. MPE11.05 Develop new optimized diagnostic and interventional radiology protocols for pregnant patients. MPE11.06 Develop new optimized diagnostic and interventional radiology protocols for paediatric patients. MPE11.07 Develop research protocols focused on conceptus and paediatric dosimetry using TLDs and anthropomorphic physical phantoms or Monte Carlo simulation and mathematical phantoms.

MODULE CONTENT: TARGET KSC TO BE DEVELOPED TO EQF LEVEL 8 From the 'Inventory of Learning Outcomes for the MPE in Europe' (Annex I of the 'European Guidelines on the MPE')	
KSC targeted in *all* modules These learning outcomes are common to and permeate *all* modules, although to a varying degree according to the topic of the module.	GENERIC SKILLS : All 'Generic Skills Required at EQF level 8' KSC FOR THE MPE AS PHYSICAL SCIENTIST: All Skills and Competences to EQF level 8 KSC FOR THE MPE AS A HEALTHCARE PROFESSIONAL: All Skills and Competences to EQF level 8 KSC FOR THE MPE AS EXPERT IN CLINICAL MEDICAL RADIOLOGICAL DEVICES & RADIATION PROTECTION (AND OTHER PHYSICAL AGENTS AS APPROPRIATE): All KSC for Scientific Problem Solving Service to EQF level 8 KSC SPECIFIC FOR THE MPE IN DIAGNOSTIC & INTERVENTIONAL RADIOLOGY: All KSC for Scientific Problem Solving Service to EQF level 8
***PRIMARY KSC* targeted in *this* module** These are the KSC which would be developed to Level 8 during this module. These should be mostly Skills and Competences. However, Knowledge learning outcomes should also be included when the knowledge normally acquired during Level 7 programmes is insufficient for the development of the skills and competences to level 8. The KSC codes from the 'European Guidelines on the MPE' should be inserted for easy reference.	Knowledge For each imaging modality define patient safety /dosimetry related indicators/quantities (use both ICRU 74 and commonly used terminology for x-radiation): - projection radiography: photon / energy fluence and fluence rate, absorbed dose, terma, kerma, KAP (PKA, DAP), IAK (Ki), ESAK (Ke),ESD, effective dose, glandular dose in mammography - fluoroscopy: cumulative fluoroscopy time, cumulative fluoroscopy KAP, cumulative fluorography KAP, total cumulative KAP, cumulative air kerma at the international reference point, peak skin dose, organ absorbed dose, effective dose … - CT: CTDIair (Ca,100), CTDIW (CW), CTDIvol (CVOL), KLP (PKL,CT), organ absorbed dose, effective dose … For each imaging modality explain the physical principles underpinning the use of protective barriers, accessories and apparel with regard to patient safety. Discuss in detail ethical issues related to the protection of patients and volunteers in biomedical research. Explain radiobiological dose-effect relationships relevant to Diagnostic and Interventional Radiology with respect to occupational/public safety including discussion of the physical and biological background, response of tissues to radiation on molecular, cellular and macroscopic level, models of radiation induced cancer and hereditary risks and radiation effects on humans in general, children and the conceptus. Explain the special requirements with respect to occupational radiation protection in fluoroscopy (e.g., particularly in paediatrics and interventional procedures). Skills For each imaging modality, identify and carry out appropriate patient / occupational / public safety related dosimetric measurements and calculations. For each imaging modality measure / calculate patient safety /dose related indicators/quantities and wherever possible verify

	independently values supplied by manufacturers. For each imaging modality, select appropriate phantoms/phantom materials for dosimetry. Use specialized dosimetry software / conversion coefficients to calculate effective doses and organ absorbed doses from dosimetry measurements. Calculate risks to the unborn child in the case of exposure to ionizing radiations and other physical agents. For each imaging modality, apply local European laws, regulations, recommendations and standards related to patient safety. Optimize patient radiation protection in high dose or high risk practices: interventional radiology, CT, health screening programmes, irradiation of children, neonates or the foetus, genetic predisposition for detrimental radiation effects. Competences For each imaging modality, take responsibility for the measurement of appropriate patient / occupational / public safety related dosimetric monitoring quantities. Carry out a dose assessment for the foetus in the case of pregnant patients. Take responsibility for the protection of patients by optimization of practices, procedures and acquisition protocols.
***SECONDARY KSC* targeted in *this* module** (EQF Level 8) These are the KSC that are included in the module but would be given less attention owing to time constraints. Please insert the KSC code from the 'European Guidelines on the MPE' project KSC Inventory.	Skills Use radiobiological dose-effect relationships relevant to Diagnostic and Interventional Radiology to estimate patient risk (including adverse incidents involving high exposures). Apply the concepts of justification, optimization and diagnostic reference levels to patient protection. Competences Take responsibility for ensuring that doses in a facility are measured, are consonant with European, national and local diagnostic reference levels and advise management and imaging professionals on means of reducing doses when necessary. Take responsibility for statutory and institutional requirements for Medical Physics Services in Diagnostic and Interventional Radiology with respect to Occupational / Public Safety /Dose Optimization when there is an impact on medical exposure or own safety.
***NEW KSC* which are NOT** INCLUDED in the 'Inventory of Learning Outcomes for the MPE in Europe'.	None Required

OUTLINE TEACHING PLAN **Final detailed teaching plan to be delivered to the QAC electronically 30 days before the start of the online phase of the module**	
Online phase	ON LINE TEACHING ANATOMY-PHYSIOLOGY-PATHOLOGY Introduction Pregnant patients: Anatomy, physiology and pathology for MPs Pediatric patients: Anatomy, physiology and pathology for MPs BIOLOGICAL EFFECTS Biological effects to a conceptus from ionizing radiation Biological effects to a conceptus from ionizing radiation Biological effects to children from ionizing radiation STUDIES PERFORMED ON PREGNANT PATIENTS: PARAMETERS THAT INFLUENCE CONCEPTUS RADIATION DOSE Radiography and fluoroscopy parameters that influence conceptus dose CT parameters that influence conceptus dose CT parameters that influence conceptus dose STUDIES PERFORMED ON PEDIATRIC PATIENTS: PARAMETERS THAT INFLUENCE PATIENT RADIATION DOSE Radiography and fluoroscopy parameters that influence the dose CT parameters that influence the dose CT parameters that influence the dose MONTE CARLO SIMULATION AND MATHEMATICAL PHANTOMS Monte Carlo simulation Monte Carlo simulation Mathematical phantoms simulating pregnancy/children TLD/MOSFET DOSIMETRY AND PHYSICAL PHANTOMS TLD and MOSFET dosimetry TLD and MOSFET dosimetry Physical phantoms simulating pregnancy/children ABSORBED DOSE: Critical review of studies

	Amount of dose absorbed by the conceptus from diagnostic and interventional x-ray examinations: Critical review of studies Amount of dose absorbed by pediatric patients from radiographic, fluoroscopic and interventional x-ray examinations: Critical review of studies Amount of dose absorbed by pediatric patients from CT examinations: Critical review of studies OPTIMIZATION OF EXAMINATIONS PERFORMED DURING PREGNANCY Radiography/Fluoroscopy during pregnancy: Methods for dose optimization CT during pregnancy: Methods for dose optimization CT during pregnancy: Methods for dose optimization OPTIMIZATION OF EXAMINATIONS PERFORMED ON PEDIATRIC PATIENTS Radiography/Fluoroscopy: Methods for dose optimization CT: Methods for dose optimization CT: Methods for dose optimization THE MANAGEMENT OF A) PREGNANT PATIENTS AND B) PREGNANT EMPLOYEES The management of pregnant patients The management of pregnant patients The management of pregnant employee
Face-to- Face Phase	**DAY 1: Pregnant patient: Calculation of conceptus absorbed dose from DR, Fluoro and CT** Morning: Learn how to estimate conceptus dose in clinical routine (Theoretical session, ppt presentations) 09:00-10:00 Normalized Doses (NDs) and software available to estimate conceptus dose from DR/F/IR/CT examinations performed on pregnant patients. 10:00-11:00 Isodose curves and software available to anticipate conceptus dose for pregnant personnel. Special session 11:00-13:00 Discussion of research studies on conceptus dose estimation and research methodology Afternoon: Learn how to estimate conceptus dose for research purposes (Practical session) 14:00-17:00 Monte Carlo Simulation using MCNP **DAY 2: Pregnant patient: Calculation of conceptus absorbed dose from DR, Fluoro and CT & Reporting dose results** Morning: Practical session 09:00-12:00 Patient cases. Each student calculates conceptus dose using NDs and submits his/her report. 12:00-13:00 Occupational exposure during pregnancy: Each student anticipates conceptus dose for a pregnant radiologist working in an

	interventional radiology suite and submits his/her report. Afternoon: Learn how to estimate conceptus dose for research purposes (Practical session) 14:00-17:00 TLD dosimetry **DAY 3: Pediatric patient: Calculation of organ and effective dose** Morning: Learn how to estimate dose in clinical routine (Theoretical session, ppt presentations) 09:00-10:00 NDs and software available to estimate dose from DR/F/IR examinations 10:00-11:00 NDs and software available to estimate dose from CT examinations Special session 11:00-13:00 Optimization of paediatric CT examinations. Practical session: Questions and Answers Afternoon: Learn how to estimate pediatric dose for research purposes (Practical session) 14:00-17:00 Monte Carlo Simulation using MCNP **DAY 4: Pediatric patient: Calculation of organ and effective dose** Morning: Patient cases and dose calculation (Practical session) 09:00-11:00 Patient cases. Each student calculates effective and organ dose using NDs and submits his/her report. 11:00-13:00 Special session: Discussion of research studies on pediatric doses and research methodology. Afternoon: 14:00-17:00 Learn how to estimate pediatric dose for research purposes (Practical session) 14:00-17:00 TLD dosimetry **DAY 5: Use of Dosimetric Software** 09:00-13:00 Familiarization with PCXMC, CODE, IMPACTMC, IMPACT (Split in 5 groups; 5 teachers, Practical session) 14:00-15:30 Examinations 15:30-16:00 Quality assessment of the course 16:00-17:00 Summary

READING LIST (APA format) Final List to be delivered to the QAC electronically 30 days before the start of the online phase of the module	
Required Pre-Module Reading list	
Required Within Module Reading list	
Suggested Post-Module Reading list	

TWO EXEMPLAR ASSESSMENT QUESTIONS To be delivered to the QAC electronically 30 days before the start of the online phase of the module	
Question 1	
Question 2	

EFOMP ACCREDITATION

To be delivered to the QAC electronically 30 days before the start of the online phase of the module

EFOMP accreditation certificate stating that the 'The module is appropriate for preparing Clinically Qualified Medical Physicists to achieve Medical Physics Expert status in Diagnostic and Interventional Radiology'

Please scan and paste a copy of the EFOMP accreditation certificate here.