

## **EUTEMPE course 9:**

### **Achieving quality in breast cancer screening and diagnosis**

This course provides the participant with an detailed overview of the image formation process in digital mammography and 3D mammography (stereoscopic imaging, breast tomosynthesis and breast CT). Methods to quantify image quality, breast dosimetry and (the philosophy of) technical quality evaluations for mammography equipment in screening will be discussed, including the challenges of quality evaluations of emerging technologies like breast tomosynthesis. Not only are the relevant physics and technical aspects discussed, but also other aspects of breast imaging (and screening) in radiology, radiography and epidemiology are covered. This multidisciplinary aspect is important for a Medical Physics Expert in high level trouble shooting and setting up projects.

**Aims:** This module aims to help the future MPE acquire the knowledge, skills and competences necessary to exercise a leadership role within diagnostic and screening mammography in his own country and in Europe. The content of the module will provide the knowledge to assess (screening) quality and to perform high level trouble shooting. 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.

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

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

- MPE09.01 Interpret the principles of breast cancer screening, including epidemiology, radiological issues of mammography and controversies of screening.
- MPE09.02 Interpret the process of reading of radiological images by radiologists and identify related physical parameters.
- MPE09.03 Take responsibility for the specification, selection, acceptance testing and commissioning of breast imaging systems.
- MPE09.04 Research, develop, implement and manage a state-of-the-art QC programme for mammography and new breast imaging technology based on a multi-professional approach.

- MPE09.05 Take responsibility for high level troubleshooting in technical and physical aspects of breast imaging screening.
- MPE09.06 Take responsibility for ethical issues in the area of radiation protection in diagnostic and screening mammography and apply them in practice.
- MPE09.07 Take responsibility for ethical issues in the area of (breast cancer) screening.
- MPE09.08 Assess, evaluate and optimise diagnostic effectiveness and patient dose for clinical protocols for diagnostic and screening mammography.

*The online component will consist of a series of presentations and papers on the topics below. The topics for the online course are:*

Part 1: Basics and Full Field Digital Mammography (FFDM)

Topics: Production of X-rays, Image receptors in mammography systems, Automatic Exposure Control (AEC) in FFDM systems, Image processing in FFDM, Image presentation, Introduction to DICOM and IHE, Epidemiological aspects of breast cancer screening

Part 2: 3D mammography

Topics: Stereoscopic imaging, Breast tomosynthesis technology, Breast tomosynthesis image reconstruction, breast tomosynthesis presentation and synthetic 2D views, Breast CT, AEC in breast tomosynthesis systems

Part 3: Image quality and dosimetry

Topics: Linear system theory metrics, Contrast-detail analysis, Model observers, Breast dosimetry

Part 4: Quality control and optimization

Topics: Quality control in FFDM, Quality control in breast tomosynthesis, Optimization

*The face-to-face component of the course will consist of some lectures summarizing the content of the online part and going into depth in subtopics with the opportunity to ask questions and have discussions. Problem solving will be discussed using real*

*cases ranging from small technical or radiographical problems to more complex ones with multidisciplinary aspects. Invited lectures will give insight in hot topics in breast imaging. Other lectures will provide an overview of aspects of breast imaging other than technical and physical aspects. All lectures will be interactive. Participants will be divided in small groups to work on several assignments, the results of which will be presented to the whole group.*

Face-to-face course

Topics: FFDM, 3D breast imaging, Optimization, Image quality, CAD and breast density software, Contrast mammography, Reading session with a radiologist, Contrast mammography, Controversies in breast cancer screening, Positioning, and How to set up a breast imaging research project.

Two assignments will be performed: (1) image quality metrics and (2) setting up a breast imaging research project.