COURSE DESCRIPTION

1. Course title
Analysis and Simulation Tools for the Evaluation and Optimization of Medical Imaging Systems

2. Course type
CPD/ST and postgraduate course.

3. Scientific field
Medical radiation physics, medical imaging

4. Short summary of the course
Evaluation and optimization of image quality is of critical importance in development of modern medical imaging systems and their appropriate and efficient use in clinical practice. In case of radiographic imaging, image quality is directly related to diagnostic accuracy of medical imaging systems, and the radiation dose used.

The course will review various approaches for the assessment of image quality, with the main focus on two free software tools aimed to design and perform (i) virtual clinical trials (OpenVCT, University of Pennsylvania) and (ii) image evaluation studies with human readers (ViewDEX, University of Gothenburg).

5. Target audience
The course is aimed at both clinical medical physicists and PhD students in the medical imaging field. However, all interested in evaluation and optimization of medical imaging systems are welcome to participate – subject to availability.

6. Course overview
The overall aim of the course is to give students a focused overview of the state-of-the-art computational methods and tools for the evaluation and optimization of medical imaging systems. Rapid technical development in the medical imaging field has emphasized the importance of optimization and evaluation – which must follow technological advancement while being affordable for the health system. Computational tools for observer and virtual trials are relatively new to the educational programs for medical physicists – which our course is aimed to fill. The course will cover the following:
- Image quality assessment
- Medical imaging trials
- Virtual clinical trials
- Human observer trials
- Software tools for evaluation of medical imaging systems (OpenVCT and ViewDEX)
- Benefits, challenges and limitations of the software tools

7. Course objectives

Knowledge and understanding
- Understand the need for appropriate & affordable evaluation and optimization of imaging systems
- Refresh theoretical bases of image quality assessment
- Review available software tools

Competence and skills
- Get introduced to the software tools, and learn about their requirements and capabilities
- Customise the tools for students' individual clinical and/or research needs

Open issues and future directions
- Understand limitations and challenges
- Discuss potential directions for future applications and development

8. Programme

SCHEMA

1st day (Tuesday, 15 March 2022, 13:00-17:00) start after lunch	
13:00-13:20	Welcoming remarks and introduction
13:20-14:40	Theoretical bases for the evaluation and optimization of medical imaging systems: Medical imaging trials, virtual trials, observer trials
14:40-15:00	*Coffee break*
15:00-16:00	Introduction to software tools: OpenVCT and ViewDEX
16:00-17:00	Review of hardware/software requirements for the tools
17:00	Closing of the 1st day

2nd day (Wednesday, 16 March 2022, 08:00-12:00 noon) end before lunch	
08:00-8:10	Welcoming remarks to the 2nd day
08:10-09:30	Demonstration of software tools: OpenVCT and ViewDEX
09:30-09:50	*Coffee break*
10:00-11:00	Interactive practical excercise
11:00-11:20	Breakout discussions of benefits, limitations and desired features of software tools
11:20-11:35	Group discussion of challenges and future directions
11:35-11:55	Multiple choice CPD questions (Kahoot?) and course evaluation
11:55-12:00	Closing remarks

Instructors (tentative – depending on the format: physical or online)
P. Bakic (potentially +1), Lund Univ; A. Svalkvist (potentially +1), Sahlgrenska University Hospital

9. Methodology

Pedagogical method
Our course will include:
- lectures,
- software demonstrations,
- interactive practical exercise by students, and
- breakout and group discussions.

Course material
- Introductory material about the course and software, with related publications
- Lecture slides (available after the course)
- Hardware and software requirements for interactive exercise
- Open source software packages
- List of related scientific publications

Recommended preparations
- Review hardware and software recommendations (will repeat that during the course)
- Download open source software
- Introductory readings on medical imaging and clinical trials

Testing of the fullfillment of course objectives
Multiple choice CPD questionnaire (potentially via Kahoot)

10. Follow-up after the course
We will offer additional advising to medical physicists on the ST programme, who may potentially use OpenVCT and/or ViewDEX in research projects at their local institutions. Course certificates will be issued to all attendees.

The medical physicists on the ST programme will present their work at her/his own local institution. A certificate, according to the template, of completed specialist course is sent to the National Council for specialist courses in radiation physics: kursradet@sjukhusfysiker.se.

11. Course evaluation
Compulsory course evaluation according to following templates will be carried out: http://www.sjukhusfysiker.se/sites/default/files/documents/cpd-specialist/utvarderingmall_deltagare.pdf (for the participants)

The course evaluation compilation will be sent to the National Council for specialist courses in radiation physics.

12. Practical information

Start date
Tuesday 15 March 2022, at 13 am.

End date
Wednesday 16 March 2022, at 12 pm

Course location
Hotell Södra Berget, Sundsvall

Deadline for registration
Not decided yet

Course fee
Only course (including one night accommodation 15/3-16/3) 4300 SEK
Course and participation in Nationellt möte för sjukhusfysik (including accomodation 15/3-18/3) 9500 SEK
For additional options, please see the meeting webpage:
https://sjukhusfysiker.se/nationelltmote2022

Travel, meals and accommodation
Travel to the location should be paid for by the course participants or their employer. Meals (2 lunches, 1 dinner, coffee/tea) and accommodation (one night 15/3-16/3) are included in the course fee. For attendees who have also registered for Nationella mötet för sjukhusfysik, meals and accommodation for the entire meeting (15/3-18/3) are included.

Number of participants
Minimum 10, maximum 40.

Language
English

Distribution of course information
Information regarding software and hardware recommendations and a list of related scientific publications will be sent to all attendees prior to course.

Requirements for passing the course
The presence in the course sessions and a passing score on the course questionnaire (for ST-participants)

Course certificate
All attendees will receive a Certificate of attendance.

Contacts
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Additional information
Attendees in ST-programmet will receive 7 ST-points.
Attendees in CPD-programmet will receive 9 CPD-points.

Web page
https://sjukhusfysiker.se/nationelltmote2022

13. Course admission
Attendees will be admitted to the course on the "first-come first-served" basis. However, attendees registered in ST-programmet will be prioritized.

Admission decisions will be sent by email.

14. Connection to other courses
The course is a part of the series of ST/CPD-courses.

Follow-up courses
There are no follow-up courses planned at the moment.

15. Course organisation

Initiators
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Theoretical content
The lecturers are responsible for the content in the course.

Practical course administration
The two course directors (Predrag Bakic and Angelica Svalkvist) have together planned and prepared the content of the course.

Collaboration
The course is offered in collaboration with Svensk förening för Radiofysik and Svenska Sjukhusfysikerförbundet.

Representative of the target audience
Anna Carlander (UNILABS AB)

16. Financing
The costs for the course will be covered by the fees from the participants.

Other arrangements
See the programme for Nationella mötet för sjukhusfysik.