KURSBESKRIVNING

1. Utbildningens titel

“Proton therapy physics”

2. Typ av utbildning

A postgraduate course and/or CPD/ST course.

3. Ämnesområde

Medical radiation physics, radiotherapy physics

4. Kort sammanfattning av utbildningen

The course covers the path of the proton from production and delivery until it deposits its energy in the patient. The pathway goes through interaction mechanisms, dosimetry, tissue characterization, dose planning, and radiation biology, to conclude with clinical examples and future visions. During the course, the participants will be given time for discussion and reflection in groups.

5. Målgrupp

The course is primarily aimed at PhD students in the medical radiation physics research field. The course is also suitable for Medical Physicists in the national MPE training program (Swedish ST-fysikerutbildning). However, all interested in proton therapy physics are welcome to participate – subject to availability.

6. Behovsbeskrivning

The overall aim of the course is to give the students a deeper knowledge of proton therapy physics. There is a great need for this, not least considering that our first national proton therapy facility was commissioned just 4 years ago. The course is further motivated as this knowledge is not yet fully met within the framework of the basic education of hospital physicists.

7. Utbildningsmål

Knowledge and understanding
Understand the key processes of proton interaction with matter.

Describe proton beam production and delivery techniques.

Understand the dosimetric foundation for proton therap

Competence and skills

Discuss how the composition of tissues can be estimated with different types of imaging modalities.

Explain how the absorbed dose can be determined for the medium and how the reference dosimetry should be performed.

Describe various RBE models and optimisation strategies and discuss the radiobiological foundations for proton therapy.

Judgement and approach
Understand the uncertainties in proton planning and how to address them.

Summarise the latest developments within proton therapy physics.

Reflect on the current 'open questions' in proton therapy physics and discuss potential research projects to address these issues.

8. Program

	Monday 13/5	**Tuesday 14/5**	**Wednesday 15/5**	**Thursday 16/5**	**Friday 17/5**
09:00 - 09:40	Intro to the course (SC, 20 min) and very short history of proton therapy (MS), 20 min)	Dosimetry 1 (JM)	Intrafraction motion management (MS)	RBE Basis (JÖ)	How to compare photon and proton plans (MS)
09:40- 10:20	Proton Interaction part 1 (JM)	Dosimetry 2 (JM)	In-vivo range verification (ET)	RBE Advanced (JÖ)	Patient selection approaches (MS)
10:2010:40	Coffee break				
10:40 - 11:20	Proton Interaction part 2 (JM)	Equipment characterization and QA (MS)	Dual energy CT (ET)	Should we use constant or variable RBE in the clinic? (JÖ and MS)	Feedback and reflections on Questions and exercises (SC)
11:20 - 12:00	Proton Interaction part 3 (JM)	Physics aspects of eye treatments (TBD)	Monte carlo applications in proton therapy (ET)	Journal club part 1 (every group read and discuss their paper)	Journal club part 2 (Preparing the presentation)

12:00 - 13:00	Lunch break				
13:00 - 13:40	Beam production and delivery - part1 (MS)	Imaging for planning & basic in CT calibration (MS)	CT calibration in real life (JÖ) - part 1	Treatment planning exercises (IK)	Journal club part 3 (presentation and discussion)
13:40 - 14:20	Beam production and delivery - part 2 (MS)	Treatment planning - Dose calculation (MS)	CT calibration in real life (JÖ) - part 2	Treatment planning exercises (IK)	From protons to heavier ions (MS)
14:20- 14:40	Coffee break				
14:40 - 15:20	Compact systems (MS)	Treatment planning - Geometrical uncertainties (MS)	Patient specific QA (MS)	Treatment planning exercises (IK)	Clinical perspective on proton therapy (MG-M)
15:20 - 16:00	Questions and exercises (SC)	Image guidance and adaptive (MS)	Questions and exercises (SC)	Treatment planning exercises (IK)	Open question/future challenges for physicists in proton therapy + Course evaluation (SC & MS)

Teachers

SC – Sofie Ceberg (Course director), PhD, Assoc. Senior Univ. Lecturer, Department of Medical Radiation Physics, Lund University
MS- Marco Schwarz (Course director), Head of proton medical physics (Proton therapy Department) and head of medical physics section (TIFPA-INFN), Trento, Italia
JM- Joakim Medin, Assoc Prof., Department of Hematology, Oncology and Radiation Physics, Skåne University Hospital, Lund
IK- Ingrid Kristensen, PhD, Department of Hematology, Oncology and Radiation Physics, Skåne University Hospital, Lund
JÖ- Jakob Ödén, PhD-student, Medical Radiation Physics, Stockholm University
ET- Erik Traneus, PhD, Senior Physicist at Raysearch Laboratories
MG-M- Maria Gebre-Medhin, MD, PhD, Department of Hematology, Oncology and Radiation Physics, Skåne University Hospital, Lund

9. Metodik

Pedagogisk metod
Our pedagogic methods include lectures, interactive treatment planning session, Kahoot learning game, and reflection exercises. In addition, we will have journal clubs were different groups will read, discuss, prepare and present a paper each. The students´ participation in their learning process will be the common theme throughout the course.

Utbildningsmaterial
Lectures presentations and lectures notes as well as scientific literature.
After the course, all rewired assignments will be put together as a course book.

Rekommenderade förberedelser
It is desirable that the participants have considered in advance some topics they might want to write about in their in-depth report.

Kontroll av förvärvad kunskap och kompetens
The postgraduate students will after the week of lectures read and write an in-depth report (6000 words) and present their work at a final joint seminar in Lund, or at the course participant's local institution.

The control of acquired knowledge and competence for medical physicists on the ST programme will be carried out as described here: http://www.sjukhusfysiker.se/cpd-specialist

10. Uppföljning

Stöd för att föra kunskapen vidare på hemmaplan
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. Utvärdering

Genomförande av kursutvärdering
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)

http://www.sjukhusfysiker.se/sites/default/files/documents/cpd-specialist/utvarderingsmall_sammanstallning.pdf (for the course directors)

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

12. Formalia

Startdatum
Monday 13 May 2019, at 9 am.

Slutdatum
Friday 17 May, at 4 pm.

Andra tidsuppgifter
The joint seminar for the participants´ presentations of their in-dept reports will be held in in the autumn 2019.

Kursort och plats
Department of Medical Radiation Physics at Lund University in Lund.

Sista anmälningsdag
31 April 2019

Avgift
Free of charge.

Resa, kost och logi
Travel, board and lodging, as well as any salary during the course period, are paid for by the course participants or their employer.

Antal deltagare
No limit

Språk
English

Utskick av programinformation och förberedande uppgift inför kursstart
All information regarding the course is published on: https://www.msf.lu.se/event/postgraduate-course-in-proton-therapy-physics

Krav för godkänd utbildning

- To pass the week of lectures (2 hp credits), the participant is required to attend all lectures and submit a written report (2 A4 pages), where she/he reflects on the significance of the course for her/his postgraduate education.
- To pass the individual assignment (additional 5.5 hp credits), the participant is required to submit an in-depth report (about 6000 words) to be presented either at a final joint seminar in Lund, or at the course participant's local institution.

- The control of acquired knowledge and competence for medical physicists on the ST programme will be carried out as described here: http://www.sjukhusfysiker.se/cpd-specialist
- The participant must also complete the course evaluation form.

Kursintyg
Course certificates are awarded after approved education in connection with the course's completion.
For medical physicists on the ST programme the ST credits will be registered as described at http://www.sjukhusfysiker.se/cpd-specialist

This course gives 28 ST credits

Kontaktperson för deltagare

Sofie Ceberg, PhD, Assoc. Senior Univ. Lecturer, Department of Medical Radiation Physics, Lund University
Sofie.ceberg@med.lu.se
Phone: +46-725-585057

Övrig info

Webbsida
https://www.msf.lu.se/event/postgraduate-course-in-proton-therapy-physics

13. Antagning

Antagningsförfarande
Mail course director Sofie Ceberg, Sofie.ceberg@med.lu.se

Antagningsbesked
Admission to the course takes place with the course application.

14. Koppling till andra utbildningar

Serie där utbildningen ingår
The post graduate course “Proton therapy physics” is given within the so-called umbrella course “Clinical dosimetry”, which course syllabus is confirmed by the Faculty board (Faculty of Science, Lund University) for graduate studies.

Fortsättning på utbildningen

15. Utbildningsansvariga

Initiativtagare
Department of Medical Radiation Physics, Lund University, Lund

Teoretiskt innehåll
Proton physics, beam production and delivery, dosimetry, imaging and CT calibration, dual energy CT, treatment planning, *in-vivo* range verification, geometrical uncertainties, RBE optimisation, LET optimisation, Proton-MC validation, image guidance and adaptation, photon and proton plan comparisons, and patient selection approaches.

Övergripande kursansvar
Michael Ljungberg, Professor, Head of Department of Medical Radiation Physics, Lund University, Lund
Michael.ljungberg@med.lu.se

Praktiskt genomförande och kursadministration
The two course directors (Marco Schwarz and Sofie Ceberg) have together planned and prepared the content of the course, including headhunting suitable teachers for each part.
Sofie Ceberg is responsible for the course administration.

Samarbetspartners
Marco Schwarz (Course director), Head of proton medical physics (Proton therapy Department) and head of medical physics section (TIFPA-INFN), Trento, Italia

Representant för målgruppen
Chairman of the PhD student group at the Department of Medical Radiation Physics, Lund University: Hampus Olsson (hampus.olsson@med.lu.se)

16. Finansiering

Aktörer som ställer resurser till förfogande för utbildningens genomförande
Skåne University Hospital, SUS Lund, makes the following resources available:

Time for the employees Joakim Medin, Ingrid Kristensen and Maria Gebre-Medhin to teach on the course as well as time for preparing their lectures.

Facilities such as the lecture hall, computer room and conference room

Kringarrangemang och deras finansiering
Course dinner paid for by the course participants or their employer.

Sponsorers närvaro
No sponsors