LUND UNIVERSITY
Faculty of Science

19 November 2015 Reg. no 2016/82

1. Programme syllabus for the Master of Science programme in Medical Physics, 300 credits

The syllabus was approved by the board of the Faculty of Science on 30 May 2007 with the support of the Higher Education Ordinance (1993:100). It is valid from 1 July 2007.

The syllabus was amended on 31 March 2011 in accordance with the Higher Education Agency regulations on field-specific entry requirements (HSVFS 2007:8).

The syllabus was amended on 19 November 2015 in accordance with the Council of Higher Education regulations on field-specific entry requirements (UHRFS 2013:2).

Programme code: NASJF

2. Programme description

The aim of the programme is to train students to become medical physicists with professional expertise and confidence, possessing the knowledge, skills and approaches required for meeting the changing demands of expertise in radiation physics made by healthcare and wider society.

Furthermore, the programme aims to provide students with a sound academic foundation and a scholarly approach to their future professional activities. On completion of the programme, students are to have acquired the theoretical and practical skills required to pursue research studies.

A degree of Master of Science in Medical Physics entitles the holder to apply for National Board of Health and Welfare registration as a medical physicist and to apply for research studies.

The Lund University Master of Medical Science programme in Medical Physics is to

- provide students with profound knowledge and the skills required to be employed within all the areas of activity and expertise of the medical physicist and to be admitted to research studies,

- provide students with the knowledge required to work within other fields (such as radiation safety authorities, the nuclear energy sector, the medical engineering industry),

- provide students with the knowledge required to intervene in radiation accidents and disasters,

- reflect the broad and collective expertise of medical physicists and research teams at Lund University,

- continually and seamlessly establish links between research and development activities at the University and University hospital and undergraduate studies,

- provide education that ensures progressive specialisation of the students' learning and organises course content and structure in accordance with proven experience,

- provide students with good opportunities to practise oral and written communication, and

- ensure that all the topics and components of the programme are of relevance to the students' future professional activities, and that the students are taught by professional medical physicists at an early stage in the programme.

All the courses on semesters 5–8 have as course director a medical physicist or researcher active in the relevant field in order to ensure that the course content is linked to future professional duties as a medical or radiation safety physicist. As registration as a medical physicist does not require internships after graduation, major efforts have been made to include a great deal of clinical training in the form of hospital laboratory work with modern equipment and a carefully planned work placement of twelve weeks within typical areas of medical physics. The clinical training is based on European guidelines for professional training and continuing professional development, in addition to the expertise of the supervisor.

3. Learning outcomes

For a degree of Master of Science in Medical Physics the student shall demonstrate the knowledge and skills required for registration as a Medical Physicist. The outcomes to be attained are specified in the Higher Education Ordinance (as of the 2015:389 version) according to the following:

Knowledge and understanding

For a degree of Master of Science in Medical Physics the student shall

- demonstrate knowledge of the disciplinary foundation of the field and insight into current research and development work as well as the links between research and proven experience and the significance of these links for professional practice

- demonstrate both broad and specialised knowledge of physical, biological and technological aspects of radiation treatment and image and functional diagnosis as well as the application of this knowledge in healthcare

- demonstrate knowledge of planning, management and coordination in the professional field, and
- demonstrate knowledge of the relevant statutory provisions, particularly in the area of radiation protection.

Competence and skills

For a degree of Master of Science in Medical Physics the student shall

- demonstrate specialised skills in applying mathematical and scientific methods autonomously in all operations involving radiation in the healthcare services
- demonstrate the ability to assume responsibility for and undertake the requisite quality assurance procedures for both equipment and working routines in interventions involving radiation
- demonstrate the ability to integrate knowledge from relevant areas as well as to analyse, assess and deal with complex phenomena, issues and situations autonomously and critically
- demonstrate the ability to develop, use, evaluate and optimise new methods in the field
- demonstrate the ability to initiate, plan, manage, coordinate and evaluate measures for radiation protection in healthcare for both staff and patients
- demonstrate the capacity for teamwork and cooperation with other professional categories as well as the ability to inform and instruct staff involved in radiation protection measures, and
- demonstrate the ability to present and discuss new data, phenomena and issues in speech and writing to different audiences in both national and international contexts and so contribute to the development of the profession and professional practice.

Judgement and approach

For a degree of Master of Science in Medical Physics the student shall

- demonstrate self-awareness and the capacity for empathy
- demonstrate the ability to make assessments using a holistic approach to individuals informed by the relevant disciplinary, social and ethical aspects and taking particular account of human rights
- demonstrate the ability to adopt a professional approach to patients and those close to them
- demonstrate the ability to identify ethical aspects of his or her own research and development work, and
- demonstrate the ability to identify the personal need for further knowledge and undertake ongoing development of his or her skills.

Independent project (degree project)

A requirement for the award of a degree of Master of Science in Medical Physics is completion by the student of an independent project (degree project) for at least 30 credits.

Local outcomes

In addition to the outcomes listed above, students graduating from the Lund University Master of Medical Science programme in Medical Physics shall, as healthcare and community experts on both ionising and non-ionising radiation within their field,

- be able to use their specialised knowledge and understanding of the processes of radiation physics to contribute to the optimisation of image and functional diagnosis and radiation treatment so as to obtain the best examination and/or treatment results possible with minimal damage to the individual and community

- demonstrate subject specialisation that, combined with sound knowledge of radiation regulations, promotes preventive work within radiation safety as well as research and development, primarily within healthcare but also in society at large

- be able to take on leadership roles within the area and to instigate the development of methods, introduction of new equipment, quality assurance, optimisation and preventive radiation safety for both patients and staff

- be able to adopt a professional approach to both patients, their relatives and staff to inform them about the possible risks of exposure to radiation in the context of examination and treatment, and provide instruction on radiation safety and optimisation to different staff categories within healthcare

- be able to identify problem areas, analyse, formulate and propose measures based on research and reconsider measures on account of new research findings

- demonstrate the ability to inform the public about the use and significance to society of ionising and non-ionising radiation and the risks associated with radiation

- use their knowledge and understanding of the presence of radioactive substances and the implications of radiation for human beings, animals and the environment to analyse problems, and formulate and implement measures in the context of radiation accidents and disasters.

The outcomes of the programme are attained through studies within the different areas on which the discipline of medical radiation physics is based. Detailed outcomes for the different areas are provided in the course syllabi for the compulsory courses.

4. Course information

Semesters 1–4 are taught in the context of the Bachelor of Science programme in Physics. The courses included are to provide the general foundation in mathematics, numerical methods, and classical and modern physics required to pursue studies in medical physics.

Semester 5 initiates the specialisation within radiation physics. The focus is placed on basic radiation physics and, subsequently, specialised theories on the properties and biological impact of ionising and non-ionising radiation.

Semesters 7–9 are more focused on the profession as a medical physicist. Students take courses to obtain a specialised understanding of applications of ionising radiation within image and functional diagnosis and radiation treatment. They will also perform laboratory work in authentic settings. Semester 9 is dedicated to clinical training including supervision, legislation and relevant practical aspects of the profession as a medical physicist. The programme is concluded with an independent project of 30 credits.

All components of semesters 5–9 are compulsory, unless otherwise stated. The language of instruction is normally Swedish.

5. Degree

A degree of Master of Science in Medical Physics is awarded to students who have completed 300 credits within the programme, in accordance with Annex 2, Qualifications Ordinance, of the Higher Education Ordinance (SFS 1993:100, in the 2015:389 version).

The compulsory courses that must be included are listed in the appendix *Course requirements for a degree of Master of Science in Medical Physics, 300 credits (NASJF).*

Students who started their studies on the programme earlier than 1 July 2015 are covered by transitional provisions detailed in the appendix *Transitional provisions for course requirements for a degree of Master of Science in Medical Physics, 300 credits (NASJF).*

The Swedish title of the degree is *Sjukhusfysikerexamen*.

6. Admission requirements and selection criteria

The requirements and selection principles for admission to first cycle studies are regulated in the Higher Education Ordinance (SFS 1993:100, in the 2015:389 version) and the admission rules for first and second cycle education at Lund University approved on 18 February 2014.

For admission to the Master of Science programme in Medical Physics, students must, in accordance with the Council of Higher Education regulations on field-specific entry requirements (UHRFS 2013:2), in addition to meeting the general requirements for higher education in Sweden, have at least a Pass in Biology A, Physics B, Chemistry B, Mathematics E or Biology 1, Physics 2, Chemistry 2, Mathematics 4 (field-specific entry requirements 10/A10) from Swedish upper secondary school. Students admitted to the Master of Science programme in Medical Physics are guaranteed a place (and automatic admission) on all courses on the programme, provided that they meet the admission requirements.

7. Further information

Transitional provisions

The Faculty Board decides on transitional provisions for students who started the programme before 1 July 2015.

Grades and assessment

The rules for grades and assessment are stated in the course syllabi approved by the Faculty Board.

Appendix to programme syllabus for the Master of Science programme in Medical Physics (approved 30 May 2007, most recently amended 19 November 2015)

Course requirements for a degree of Master of Science in Medical Physics, 300 credits (NASJF)

Approved by the study programmes board on 19 November 2015

A degree of Master of Science in Medical Physics (300 credits) must include the following compulsory courses:

Semester	Course code	Course title
1	FYSA01	Physics 1:General Physics, 30 credits
2	MATA21	Mathematics: Analysis in One Variable, 15 credits
2	MATA22	Mathematics: Linear Algebra 1, 7.5 credits
2	NUMA01	Numerical Analysis: Computational Programming with Python, 7.5 credits
3	MATB21	Mathematics: Analysis in Several Variables 1, 7.5 credits
3	MATB22	Mathematics: Linear Algebra 2, 7.5 credits
3	FYSB11	Physics: Basic Quantum Mechanics, 7.5 credits
3	FYSB12	Physics: Basic Statistical Physics and Quantum Statistics, 7.5 credits
4	FYSC11	Physics: Atomic and Molecular Physics, 7.5 credits
4	FYSC12	Physics: Nuclear Physics and Reactors, 7.5 credits
4	FYSC13	Physics: Solid State Physics, 7.5 credits
4	FYSC14	Physics: Particle Physics, Cosmology and Accelerators, 7.5 credits
5–6	MSFM11	Medical Radiation Physics: Level 1, 60 credits
7–8	MSFM21	Medical Radiation Physics: Medical Physics, 60 credits
9	MSFM31	Medical Radiation Physics: Clinical Training and Legislation, 30 credits
10	MSFT01	Medical Radiation Physics: Degree Project, 30 credits

Appendix to programme syllabus for the Master of Science programme in Medical Physics (approved 30 May 2007, most recently amended 19 November 2015)

Transitional provisions for course requirements for a degree of Master of Science in Medical Physics, 300 credits (NASJF)

Approved by the study programmes board on 19 November 2015

Transitional provision 1

Students who started the programme before 1 July 2015 but after 1 July 2007 (autumn semester 2007–autumn semester 2015) must have passed the following compulsory courses for a degree of Master of Science in Medical Physics:

Semesters 1–4	FYSA01 or FYSA11, MATA14, MATA15, FYSA21, FYSC11, FYSC12, FYSC12, FYSC14
Semesters 5–10	MSFM11, MSFM21, MSFM31, MSFT01

Transitional provision 2

Students who started the programme before 1 July 2007 but after 1 July 2004 (autumn semester 2004–autumn semester 2006) must have passed the following compulsory courses for a degree of Master of Science in Medical Physics:

Semesters 1–4	MAT131, MAT132, FYS001, FYS020 or FYSA21, and FYS023 or FYSA31
Semesters 5–10	RAF310 or MSFM11, MSFM21, MSFM31, MSFT01

Transitional provision 3

Students who started the programme before 1 July 2004 but after 1 July 2003 (autumn semester 2003) must have passed the following compulsory courses for a degree of Master of Science in Medical Physics:

Semesters 1–4	MAT131, MAT132, FYS001, FYS020, and FYS023
Semesters 5–10	RAF310, RAF320, MSFT01, and a freestanding course in Physics (20/30 credits) or another second cycle course of relevance to medical radiation physics. The course must be approved by the director of studies and subject director of medical radiation physics in order to be credited towards the degree.

For all other students, the applicable programme syllabus is the one for a degree of 180 credits, approved by the Faculty Board 3 June 2001 (reg. no MN G221 78/2001) and amended 16 December 2003. It is not possible to complement the courses on the programme according to this syllabus to obtain a degree of Master of Science in Medical Physics of 300 credits.