

Master's Degree Program in Medical Physics (MedPhys)

In the Master's degree programme in Medical Physics (MedPhys) curriculum theory meets practice: the programme includes a possibility for internships in research groups and companies. In addition, it is also possible to conduct a clinical internship at the Kuopio University Hospital, consisting of e.g. quality assurance measurements, training in radiation dosage planning for cancer treatment and getting familiar with the routine tasks of a medical physicist. The Master's degree programme is based on high quality international research in medical physics and biomedical engineering performed at the Department of Applied Physics, University of Eastern Finland (Kuopio campus). The University of Eastern Finland offers a full curriculum for students of the MedPhys programme. In addition, courses (except the Clinical internship in medical physics) of the MedPhys programme are also offered for short term exchange students (3-9 months) through bilateral agreements and exchange programs from partner universities of the University of Eastern Finland.

Students eligible to apply should hold a Bachelor of Science degree in a related field. Suitable backgrounds for the MedPhys programme are, for example, degrees in physics, mathematics and engineering. However, fundamentals in both university level physics and mathematics are prerequisite. Furthermore, basic knowledge on human anatomy and physiology and basic skills in programming are beneficial. The study curriculum covers a wide range of topics from medical imaging data and signal analysis to clinical measurement techniques and medical radiation physics. The programme consists of 120 ECTS credits and it is expected to be completed within two years.

Aims of the Master's Degree Program

MedPhys is intended to give the student a basic understanding of the subject matter and tools to apply theoretical and practical training to various areas of medicine, including diagnostic imaging, cancer treatment, and physiological monitoring.

Each person receiving an MSc degree upon completion of these studies will:

- Possess excellent theoretical and practical skills in a wide range of applications related to medical physics (and/or engineering)
- Know how to work independently on a research topic relevant to medical physics (and/or engineering)
- Know how to present a research topic and results in a written report and in an oral presentation
- Have experience of working as a member of a research group and/or in clinical settings in a hospital
- Be trained in a highly international environment where students from all around the world have interacted and co-operated

Curriculum (MDP Medical Physics, Master of Science, 120 ECTS)

Compulsory Introductory Studies (3 cp)		ECTS	Year
3350784	Personal Study Plan in International Master's Programme in Medical Physics	1 cp	I – II
8031003	University Study Skills	1 cp	I
1131003	Orientation for International Students	1 cp	I
Compulsory Language and Communication Studies (2 cp)			
8015017	Advanced English Academic and Professional Communication for the International Master's Degree Programmes of Science and Forestry	2 cp	I – II
Complementary Courses (3 cp)		ECTS	Year
8020280	Information skills and sources in science for international students	1 cp	I – II
8014300	Survival Finnish	2 cp	I – II

General Physics Courses (7 cp) (if equivalent know-how is not gained in previous studies)		ECTS	Year
3350551	Mathematical Software	2 cp	I – II
3351511	Data Analysis in Physics	5 cp	I – II

Advanced Studies in Medical Physics (min. 60 cp), Compulsory		ECTS	Year
3352501	Physics in Clinical Radiology*	5 cp	I
3352502	Physics in Radiotherapy*	5 cp	I
3352503	Nuclear Medicine Physics**	5 cp	II
3352542	Signal Analysis*	5 cp	I
3352515	Physics in Clinical Physiology and Neurophysiology**	5 cp	II
3352982	Project Work in Applied Physics	5 cp	I – II
3352410	M.Sc. Thesis in Applied Physics	30 cp	II
3352400	Maturity test for Master's thesis in Applied Physics	0 cp	II

Other Compulsory Studies in Medical Physics (5 op)			
4429209	Human basic anatomy, physiology and radiology	5 cp	I

In the following modules or studies at least 15 credits:

3354101	I - Thesis and project work		I – II
3354102	II – Advanced Physics and Mathematics		I – II
3354103	III - Computational methods for Applied Physics		I – II
3354104	IV - Medical Physics		I – II
3354105	V - Signal and Image Analysis		I – II
3354106	VI - Applied Materials Physics		I – II
3354107	VII – Numerical and Computational Methods		I – II
3354108	VIII – Inverse Problems and Optimization		I – II

Other Studies (so that total 120 credits are completed)			
3352516	Clinical internship in medical physics	1-10 cp	I – II
3352985	Internship in Physics	1-10 cp	I – II
	Other physics or other field courses		I – II

Modules:

3354101	I - Thesis and project work	ECTS	Year
3352410	Thesis in Applied Physics	30 cp	II
3352005	Undergraduate Seminar in Applied Physics	2 cp	II
3352982	Project Work in Applied Physics 1	5 cp	I – II
3352982	Project Work in Applied Physics 2	2-5 cp	I – II

3354102	II - Advanced Physics and Mathematics	ECTS	Year
3352615	Physical Acoustics*	5 cp	I
3352580	Solid State Physics*	5 cp	I
3356505	Kompleksianalyysi I a* (in Finnish)	4 cp	I
3356506	Kompleksianalyysi I b* (in Finnish)	4 cp	I

3354103	III - Computational Methods for Applied Physics	ECTS	Year
3352755	Statistical Data Analysis for Applied Physics*	5 cp	I
3352542	Signal Analysis*	5 cp	I
3352541	Digital Image Processing**	5 cp	II
3352601	Optimization*	5 cp	I
3352617	Numerics in Computational Physics*	5 cp	I

3354104	IV - Medical Physics	ECTS	Year
3352501	Physics in Clinical Radiology*	5 cp	I
3352502	Physics in Radiotherapy*	5 cp	I
3352503	Nuclear Medicine Physics**	5 cp	II
3352515	Physics in Clinical Physiology and Neurophysiology**	5 cp	II
3352544	Ultrasound Techniques in Medicine*	5 cp	I
3352545	Magnetic Resonance Imaging**	5 cp	II
3352576	Medical Approval Process**	5 cp	II

3354105	V - Signal and Image Analysis	ECTS	Year
3352542	Signal Analysis*	5 cp	I
3352611	Time Series Analysis*	5 cp	I
3352541	Digital Image Processing**	5 cp	II
3352612	Image Analysis**	5 cp	II

3354106	VI - Applied Materials Physics	ECTS	Year
3352580	Solid state physics*	4 cp	I
3352579	Introduction to nanotechnology**	5 cp	II
3352573	Characterization of Materials**	5 cp	II
3352572	Material techniques*	5 cp	I
3352571	Biomaterials*	5 cp	I
3352575	Biomechanics*	5 cp	I
3352577	X-ray powder diffraction*	5 cp	I
3352578	Wood-based solid and composite materials	5 cp	I – II

3354107	VII - Numerical and Computational Methods	ECTS	Year
----------------	--	-------------	-------------

3352617	Numerics in Computational Physics*	5 cp	I
3352603	Finite Element Methods**	5 cp	II
3352618	Technical programming**	5 cp	II

3354108	VIII - Inverse Problems and Optimization	ECTS	Year
3352601	Optimization*	5 cp	I
3352610	Estimation Theory**	5 cp	II
3352604	Inverse Problems*	5 cp	I
3352609	Statistical Inverse Problems**	5 cp	II

* The course will be held only every second academic year, next time in 2022-2023

** The course will be held only every second academic year, next time in 2021-2022