

Technical University of Denmark



Medicine and Technology

UNIVERSITY OF
COPENHAGEN



Medicine and Technology

The MSc program in Medicine and Technology aims at educating engineers with an in-depth understanding of the clinical problems facing modern medicine and gives you the ability to suggest new technological solutions for the future.

Diversified and flexible study environment

The MSc program is an interdisciplinary education jointly offered by the Technical University of Denmark (DTU) and the Faculty of Health and Medical Sciences at the University of Copenhagen (KU). The students are enrolled at both universities and spend 70% of their time at DTU and 30% at KU.

The MSc program offers a unique possibility for you to acquire an internationally competitive education through:

- A flexible course plan fitted to individual needs
- Easy access to industrial collaborators
- Individual coaching and guidance
- An attractive and diverse study environment
- A wide range of attractive job possibilities



'.. a MSc diploma from DTU & KU ensures the students an internationally competitive education which gives them a head start in their engineering career.'

Preparing for the future

With a MSc in Medicine & Technology you will be well prepared for the future development of new medical equipment.

You will attain an attractive career profile, combining engineering and medical competences. The program offers you to specialize within three specialization tracks:

- Signal and model based diagnostics
- Image diagnostics and radiation physics
- Biomechanics and biomaterials

The scientific environment includes many internationally esteemed research groups within MR, PET, ultrasound, bio-mechanics, hearing aids, image interpretation, and cognitive signal processing. The open and informal environment makes it easy to find an interesting subject for the Master thesis and a chance to participate in world class research.

Structure and contents

The MSc program in Medicine and Technology focuses on classical technical science: mathematics, technology, and bio-medical engineering combined with subjects in health sciences: human anatomy and physiology, pathophysiology, cell biology, and science.

The program emphasizes learning to translate textbook theories and apply them in practice. Therefore, laboratory exercises and project work are essential elements throughout the entire program.

General competences

The three compulsory courses in the MSc program are:

- Pathophysiology
- Statistical design and analysis of experiments
- Medical product development

Master of Science in Engineering - 120 ECTS

General competences - 30 ECTS

Electives - 30 ECTS

Technology specialization - 30 ECTS

Thesis - 30 ECTS

'.. with a MSc in Medicine and Technology you will be able to analyze complex problems and develop rational and robust solutions for the future.'

Personalized study plans

As a student you can to a very large degree personalize your own course portfolio and select among the many courses offered at the two universities. The courses vary from highly theoretical to practical courses with the opportunity for experimental work in advanced state-of-the-art laboratories.

Attractive business profile

Many of the biomedical companies and hospitals in the greater Copenhagen area are involved in the MSc program by providing guest lectures and offering student projects. You are able to obtain an attractive business profile through a collaboration with the companies, either through projects or employment as a student assistant.



Career opportunities

With a MSc in Medicine and Technology you will be able to analyze complex problems and develop rational and robust solutions. Based on your advanced knowledge of mathematics, science, medicine and technology, you will have many career opportunities. Typical career areas are:

Hospitals

- Develop and optimize methods and equipment
- Participate in clinical research
- Test and maintain complex technical installations
- Training of other staff groups

Companies

- Product development and research
- Participation in research planning
- Sales, marketing and service

Universities

- Teaching
- Research



Unique student environment

The MSc program has a unique social environment with an equal gender balance and a good atmosphere supporting learning and networking between students. Project work plays a central role in many of the courses and gives you the perfect opportunity to work with other students and obtain a large social network.

Would you like to know what it's *really* like to study at DTU/KU?

Here's is your chance to ask a real student about student life at DTU/KU and in Denmark. Our ambassadors are here to answer your questions about the Danish way of life, costs of living, the MSc program and what you must not forget to pack before you set off on your next adventure.

Write to ambassador@medicineandtechnology.org or post a message on our facebook page 'Medicin & Teknologi'.

Honors program

Medicine and Technology offers an Honors Program. In this program, elite students have access to a particularly challenging course of studies.

■ Signal and model based diagnostics

This study line educates the student in designing and implementing advanced programs for signal processing and modeling. These are based on one or multi dimensional signal processing of biomedical signals and modeling of linear and non-linear physiological processes.

Signals are acquired everywhere in hospitals from the ECG of the heart, the EEG from the brain to sequences from DNA chips along with numerous other examples. The modeling and processing of these signals are the center parts of the studyline in signal- and model based diagnostics. This could be the extraction of diagnostic information from the ECG to reveal heart problems and devise a strategy for using a pacemaker. It could be the development of a new estimation scheme for finding the blood velocity based on signals from ultrasound. Often the development includes making a model of the biological system and then devising a signal processing scheme based on this model.

Projects within the field typically include both a theoretical part and the implementation and testing of the approach in a clinical environment on real patient data.

Recommended foundation courses:

- Circuit theory - min 5 ECTS
- Signals and systems - min 5 ECTS
- Stochastic signals - min 5 ECTS

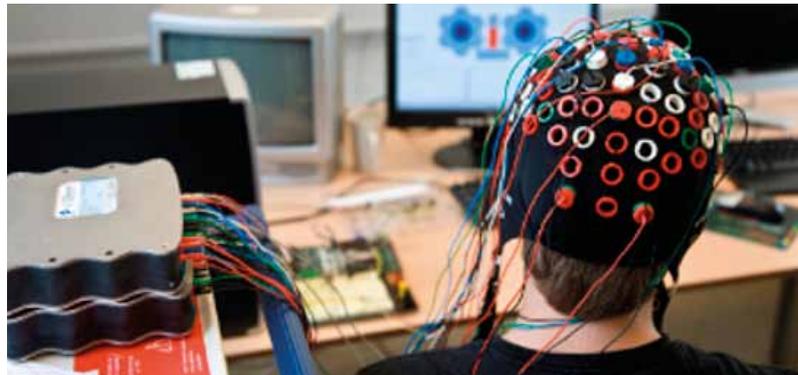
| 1st semester | | | | |
|-------------------------|---------------------------|-----------|-------------------------|---------------------------|
| Monday | Tuesday | Wednesday | Thursday | Friday |
| Patho-physiology | | | Medical imaging systems | Medical signal processing |
| Medical imaging systems | Medical signal processing | | Patho-physiology | |

| 2nd semester | | | |
|---------------------------|--|------------------------|----------------------------|
| Design of experiments | | Physiological modeling | Medical signal processing |
| Medical signal processing | | Physiological modeling | Cellular signal processing |

| 3th semester | |
|---------------------|---------------------|
| Product development | Product development |

* Courses in red are general competence courses

* Courses in blue are elective courses



■ Image diagnostics and radiation physics

A major part of diagnostics in modern hospitals is based on medical imaging. Modern scanners like X-ray Computed Tomography, Magnetic Resonance Imaging, and Ultrasound Imaging reveals a wealth of information about the anatomy and physiology of the patient. The field is in rapid development and this study line aims at giving the student the necessary competences for understanding and developing these techniques.

Courses are given on all the modern imaging techniques, and the curriculum includes a thorough understanding of the physics, signal, and image processing based on real world examples and exercises. Image interpretation and new methods for finding features in images are also an important part of the study line.

Courses are also given on optics and radiation physics, the diagnostics and treatment of cancer, and an in-depth understanding of molecular imaging techniques such as PET scanning. The faculty involves a range of prominent research groups within medical imaging both on the technical and the clinical side.

Recommended foundation courses:

- Medical imaging - min 5 ECTS
- Signals and systems - min 5 ECTS
- Stochastic signals - min 5 ECTS

| 1st semester | | | | |
|-------------------------|----------------------|----------------------------|---------------------------|--------|
| Monday | Tuesday | Wednesday | Thursday | Friday |
| Patho-physiology | | | Medical imaging systems | |
| Medical imaging systems | | | Patho-physiology | |
| 2nd semester | | | | |
| Design of experiments | Radioactive isotopes | | | |
| Radioactive isotopes | | | Magnetic resonans imaging | |
| 3th semester | | | | |
| | | Medical ionizing radiation | Product development | |
| Product development | | Medical ionizing radiation | Medical image analysis | |

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* Courses in blue are elective courses



■ Biomechanics and biomaterials

This study line is centered on the physiology of the human body from the cellular and the organ level to the whole body. The mechanical and material properties of tissue are studied in detail. This includes mathematical analysis of how cells and tissue deform in response to various biomechanical as well as biochemical stimuli, and how this affects the normal function of the body.

The students are educated within physiology, solid and fluid biomechanics, orthopedic biomechanics, sports physiology, rehabilitation, and the mechanical properties of prostheses and their interaction with the human body. Students work with solid mechanical models for characterization of different tissue types as well as quantitative models of physiological transport phenomena such as blood flow in the circulation and diffusion through the vessel walls and cell membranes.

The goal is to develop equipment, materials and methods for protection and preservation of organ function, and enabling restoration of lost body functions.

Recommended foundation courses:

- Material sciences - min 5 ECTS
- Strength of materials - min 5 ECTS
- Organic chemistry - min 5 ECTS

| 1st semester | | | | |
|-------------------------------|---------------------------|--------------------------------|-------------------------------|----------------------|
| Monday | Tuesday | Wednesday | Thursday | Friday |
| Patho-physiology | Tissue biomechanic | Partial differential equations | | Organic chemistry |
| | Physical chemistry | | Patho-physiology | |
| 2nd semester | | | | |
| Design of experiments | Transport phenomena | | Musculo-skeletal biomechanics | Biomedical materials |
| Musculo-skeletal biomechanics | Biomedical materials | Physical chemistry | Cellular info. processing | Transport phenomena |
| 3th semester | | | | |
| Multivariate statistics | Polymer-technology | Transport phenomena | Product development | |
| Product development | Theoretical microfluidics | Transport phenomena | | |

* Courses in red are general competence courses
 * Courses in blue are elective courses



Admission procedure

Admission



| | |
|---------------|--|
| November | Online application form opens |
| March | Application deadline |
| May | Tuition fee waivers awarded to non-EU/EEA citizens |
| Medio May | Deadline for submission of accommodation form |
| June | Deadline for tuition payment for non-EU/EEA citizens |
| August | Deadline for submission of language test |
| Ultimo August | Introduction week |
| September | Semester start |



Frequently Asked Questions

FAQ

How do I apply?

DTU opens for MSc applications in November. Apply at: www.dtu.dk/English/education.aspx

How is the admission process?

An admission committee studies the applicants and their applications. After having reviewed and validated the applications, students may be invited for a phone or Skype interview. The interview is conducted by the admission committee and lasts 15-30 minutes.

What are the admission decisions based upon?

Admission decisions are based on several factors in the application, including grade point average, English language proficiency, statement of purpose, and letters of recommendation. You should have good skills in mathematics, physics, engineering, and physiology and must hold a bachelor degree in bio-medical engineering or other relevant academic field.

For a list of specific requirements go to: www.medicinandtechnology.org



Facts about us

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Technical University of Denmark - DTU

DTU welcomes around 750 international students per year.

There are more than 6,500 bachelor and master students at DTU. More than 300 are enrolled in the Medicine and Technology program.

DTU emphasizes a combination of theory and practice through projects and lab work.

DTU has a high 1:4 teacher-to-student ratio and a high student-teacher interaction during and after classes.

All MSc courses are taught in English.

University of Copenhagen - KU

KU is one of the leading universities in Europe and the largest institution of research and education in Denmark.

The University consists of 6 faculties and around 100 departments and research centers.

It is located in four campus areas in central Copenhagen.

Total number of enrolled students is 37,869 of which more than 6,000 are international students.

Technical University of Denmark





www.medicineandtechnology.org

Websites

www.medicineandtechnology.org

www.medicinogteknologi.dk

www.dtu.dk

www.ku.dk

Program coordinators

Ass. Professor Martin C. Hemmsen, DTU Elektro

Phone +45 45 25 57 38

E-mail: mah@elektro.dtu.dk

Professor Jens E. Wilhjelm, DTU Elektro

Phone +45 45 25 39 05

E-mail: jw@elektro.dtu.dk

International study counselors

Phone +45 45 25 10 23

international@adm.dtu.dk

Opening hours Monday - Friday, 10 am - 2 pm

DTU Elektro

Department of Electrical Engineering

Technical University of Denmark

Ørsteds Plads, Bldg. 349

DK - 2800 Kgs. Lyngby

Phone +45 45 25 25 25

info@medicineandtechnology.org

www.elektro.dtu.dk

Faculty of Health and Medical Sciences

Faculty of Health and Medical Sciences

University of Copenhagen

Blegdamsvej 3B

DK - 2200 Copenhagen N

Phone +45 35 32 79 00

International-office@sund.ku.dk

www.healthsciences.ku.dk