Guide for the MSc in Biomedical Engineering
(Kandidatuddannelsen i Medicin & Teknologi)
Study year: 2019/2020

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This guide is subject to frequent updates - make sure you have the newest version available at:
bme.elektro.dtu.dk/jw/medtek

1 Target audience

This guide concerns the joint MSc program in Biomedical Engineering offered by the Technical University of Denmark (DTU) and University of Copenhagen.

This report is relevant for all students at the MSc program. However, since many decisions must be taken in the BSc program, it is relevant for students during their third term in the BSc program and onwards.

2 Nomenclature

E = Fall term     F = Spring term
~ = means course that corresponds to
GR = General Competence Courses (= mandatory courses). 30 ECTS.
TS = Technological specialization courses. A minimum of 30 ECTS must be acquired.
VF = Elective course. Up to 30 ECTS.
Thesis = Master thesis. Between 30 and 35 ECTS.

Some text is translated into Danish and shown in parenthesis and in italic.

3 The overall set of rules

It must be emphasized that the rules and regulations at all times are governed by DTU. Thus, a lot of aspects are fixed; these can be studied in the Study handbook (Studiehåndbogen) which can be accessed via this link
http://sdb.dtu.dk/2017/30/589

It is the responsibility of the student to know the rules. The HoS cannot overrule them; the only way the rules can be circumvented is by applying for and obtaining dispensation. To get a dispensation, you will, of course, need a very good reason.
Thus, only a minimum of referrals will be to DTU rules, as these can change asynchronously with this guide. In the event of inconsistencies, the DTU rules prevail.

4 Introduction and overall structure

This guide helps you to design your MSc program in such a way that you can

• start in September or February and
• take one term at a foreign university and
• conduct the master thesis during the last term and
• complete your studies within two years.

The overall structure is shown in Figure 1. There are three terms with courses and one with the master thesis. For both starting points, two possibilities for incorporating a term at a foreign university are shown. Only 25 ECTS of the GR courses are shown. A few examples of pre-master thesis courses (specialkursus) are presented, but there are many other possibilities. Below is listed a number of constraints which formed the basis of the structure of Figure 1:

• For students starting in September, there are two fall terms and one spring term. For students starting in February, there is only one fall term, but two spring terms. Thus, be aware of the following:
  • For start in February, it is, in general, not recommended to go abroad in the only fall term available.
  • There are more GR and TS courses scheduled for the fall than for the spring. For students starting in February, this schedule conflict can be partly remedied by establishing a special course (specialkursus).
• KU101 Pathophysiology is a course that follows a somewhat different learning paradigm and provides the basis for a number of the TS courses; thus it should be taken as early in the study plan as possible.

A stay at a foreign university can also take place during the thesis work (not shown in Figure 1); this makes the puzzle much easier. However, remember that a Master thesis cannot be transferred; it must be defended at DTU or at KU.

5 Content of program - TS courses

The schedules for most mandatory courses and all TS courses are given at:

bme.elektro.dtu.dk/jw/jwpublic/medtek/alle3.html

The above schedule requires two fall terms. Some courses can be moved from one fall term to another, other courses are in course chains and must be taken in the correct order. Also, note that at least one course follows an alternative term schedule (KU181).

The TS courses cover a large number of focus areas as seen in Figure 2.

These areas are closely related and most courses can logically be grouped among several areas. Notice that you have to obtain at least 30 ECTS within the pool of TS courses; subject-wise you can select completely as you wish.

It is quite important to investigate thoroughly which pre-requisites the courses have so that you can adhere to the course chains when relevant. For students starting in February, this is a larger challenge than for students starting in September.
For DTU students there is a special course plan called “overgangsordning”. For students that happen to be on this plan during the fall term and who subsequently start on the MSc program in February, it is very important to select the courses during the “overgangsordning” with due diligence.

6 Master thesis and pre-thesis project

It can be a good idea to include a pre-thesis project in the form of a special course (specialkursus) in your study plan. The pre-thesis project will be in the form of a special course. Please consider these aspects:

- A master thesis is normally 5 months. This is very short time to get acquainted with a topic, be productive (i.e., make the actual thesis work) and finally write a report. The work of being acquainted could conveniently be placed in a pre-project.
- If the pre-thesis is within biomedical engineering (which is normally the case), the points earned here can be applied according to point 2 in Section 8.
- Typically, you would make the pre-project in the term just before the master thesis.
- The pre-project is intended to be within the same topic and with the same advisor as the master thesis.

Please remember that a pre-thesis project is not something you are guarantied. It is a matter of supply and demand between students and advisors and it is your responsibility to find an advisor.

6.1 Rules

The general rules governing the Master’s thesis differ slightly between DTU and KU. For students of this program, however, the DTU rules are prevailing in the majority of cases. Please note, that the following must be full known before the start of the thesis:

- Start date, date of handing in the report and normally also the date for the defense. The defense should be placed no later than 14 days after hand-in.
- Number of ECTS point. This must match the duration (as specified in the DTU study handbook).

See also “Projects at KU” on page 6.

7 About taking one term at a foreign university

Please be aware of the following aspects:

- It is expected that the university chosen by the student is the one that provides the best choice of courses within the specialization area(s) of the student. Most of the courses will typically be TS courses.
- Normally, all courses within biomedical engineering will be accepted as TS courses, i.e., courses that contain both technical and medical subjects. Details: they have to be at graduate level. Example of courses accepted as TS courses: Bioinstrumentation, Physics of medical imaging. Not accepted: Signal processing, Cell biology, Systems Neuroscience.
- When going abroad, you should be aware that you cannot be certain to obtain a seat in the courses you plan to take when you finally arrive. Thus, it can involve some risk to postpone a mandatory course such as 31590 Medical product development to the foreign university. Specifically, if a substitute to 31590 cannot be taken, the entire MSc program will end up having to be extended by
one term. You should also be aware of another timing aspect: “Forhåndsmerit” must be obtained before the last opportunity to take 31590 is passed.

- For students who plan a stay abroad in the spring: Many universities outside Denmark begin their spring semester early in January. This can make it difficult to participate in a 3-week course in January. Consequently, you have to take 30 ECTS in the 13-week period in the fall.

- If the stay abroad is just prior to the master thesis, be sure to have the latter planned before leaving to study abroad.

- If you fail a course at a foreign university, no re-exam is needed.

- It takes a long time to plan a stay at a foreign university (typically one year). So be in good time. Replies to mails sent to HoS could take up to 10 working days (though respond time is usually shorter).

- If the foreign university requires a certificate of your ability to speak/write/understand English, this is not a matter for DTU/KU.

- The HoS offers only a limited service with respect to documents that you need for studying abroad

8 TS Courses, procedures

For clarity, the above means, that the only ways to obtain TS credits other than taking courses from the TS pool are:

1. From courses at foreign universities (Procedure: Handled via "Forhåndsmerit").

2. From special courses at KU and DTU. Maximum 10 ECTS. (Procedure: if in doubt whether the topic is acceptable, ask the HoS at DTU beforehand. When an email (or other written documentation) with title of course, full name, study ID as well as the grade has been received, forward this to the HoS with specific request for obtaining TS points.)

In both cases, courses must be clearly within biomedical engineering (i.e., have both technical and medical/biological content).

9 Internship (Praktik)

Just as you can always arrange a special course if you can find an advisor at DTU or KU, it is also possible to make an internship in a company. However, it must meet all the requirements of a special course including a report that is graded. The report must reflect an amount of scientific work that matches the number of ECTS points.

10 Different schedules at KU and DTU

Please consider that the schedules (including exam periods) differ by a variable amount from year to year between KU and DTU. Studieudvalget for Medicin og Teknologi (the Study board for Biomedical Engineering) and the Heads of studies try to remedy this on an annual basis. As an example, the exam in KU101 Pathophysiology is planned to take place at one of the very first workdays in January. This will make it possible to take 31567 Principles of Brain Computer Interface.

Sign-up for courses is also different. You have to sign-up for both DTU and KU courses via (the DTU) Campusnet. However, when you visit the page on DTU portalen, Registration deadlines for courses...
and examinations, please be aware that the Supplementary registration period (Eftertilmeldingsperiode) does not apply for KU courses; so for these, you need to make final decisions in advance.

11 Resources

If you have a question and cannot find the answer on the DTU and KU webpages nor the intranet, KU-net, then please use this directory to direct the question to the right entity:

Studievejledningen (studievejl@adm.dtu.dk) handles:

- Admission (optagelsesvejledning)
- Advice on conduct of study program (Gennemførelsesvejledning)
- Implementation (studieplanlægning – på det processuelle niveau)
- Advice on rules and regulations (Regel-vejledning)
- Advice on dispensation from the rules (Dispensationsvejledning)

The HoS at DTU and vice HoS at KU handle:

- Matters of structure
- Academic content

Both can be found at the home page of the education.

In addition, there is a welcome meeting for all new master students in the first week of the term in September and probably also in February.

There is also a Biomedical Engineering Information Meeting (Møde om kandidatuddannelsen) in the fall and all bachelor students are strongly encouraged to participate.

11.1 Projects at KU

If you plan to do a project at KU, you must use these forms:

Bachelor thesis:
https://kunet.ku.dk/studie/medicin-teknologi-ba/Sider/emne.aspx?topicid=6ececb9b-9a89-4de0-b1c7-0b8325e7c401

Master thesis:
https://kunet.ku.dk/study/medicine-technology-ma/Pages/topic.aspx?topicid=6ececb9b-9a89-4de0-b1c7-0b8325e7c401

12 Questions to consider

Since the rules change quite often, here are a number of questions that may be relevant:

- Are you able to start earlier than primo September (if yes, you might be able to include some of the new 3-week periods in July and August?)
- When is the last day of re-selection of courses (e.g., if you have signed up for a course in August, what is the latest time that you can change your mind before it is binding?)
13 Admission to the MSc program

The homepage of the program at www.dtu.dk lists the pre-requisites for entering the program.

The general rules have changed quite a bit over the last 5 - 10 years, so be sure you know them, save them to disk (for documentation purposes) and follow them!

One example: You might be required to take up to 15 ECTS of courses in the first term concurrently with the mandatory 30 ECTS. The up-to-15-ECTS only grant you admission, they do not count towards your degree nor does DTU obtain compensation. Maybe you can take them in the 3-week period prior to start. Also, you have to verify that it will be possible to take them schedule-wise.

13.1 Especially for non-Biomedical Engineering students seeking admission

In addition to taking courses to meet entry requirements, the applicant may consider to take possible pre-requisite courses to be able to follow relevant TS course specified in Figure 2.

14 Elective courses

14.1 DTU

At DTU you can take any graduate course (see www.kurser.dtu.dk).

14.2 KU

At the University of Copenhagen, you can use your elective credits towards the TS courses (i.e., KU105, etc.) without further course approval.

Other courses offered can be found via the course catalogue:

kurser.ku.dk

Courses from other programs, must be pre-approved by DTU and you need to apply for enrollment as a guest student at the KU faculty offering the course. Please be aware of the course language and admission requirements.

Also, the application deadlines differ from DTU. For example, at the Faculty of Health and Medical Sciences the deadlines are first of June for courses running in fall semester and first of December for courses running in the spring semester:

https://healthsciences.ku.dk/education/student-mobility/guest-students/

Other deadlines apply for other faculties, for example Faculty of Science where this link applies:

www.science.ku.dk/english/courses-and-programmes/other-study-opportunities/credit-students

Information about credit transfer (merit) at DTU:

auth.dtu.dk/dtu/login?service=https%3a%2f%2fmerit.dtu.dk%2f

14.3 Short list of some of the courses

An absolutely none-exhaustive list of possible elective courses that might be relevant is given in Figure 3.

15 Grades in courses

If you are evaluated on the 7-level grade system at a course at KU, this grade will automatically be passed on to your diploma which will eventually be presented by DTU upon graduation.
Letters of recommendation

The HoS does not write letters of recommendation for students. You can consider asking this of your bachelor thesis advisor.

**Medical Imaging & Radiation Physics**

- 02625 Computational Science in Imaging
- 02906 Introduction to Inverse Problems

**Signal analysis, processing & decision support**

- 31610 Applied Signal Processing
- 31222 Technical audiology & exp hearing
- 42107 Decision Support for Engineers, 5

**Ionizing:**

- NFYK13018U Topics in Medical Physics
- 10812 Radiation dosimetry
- 26206 App of X-ray & neutron scan
- NPLK17000U Biological Imaging, 7.5

**Non-ionizing:**

- 31551 Advanced MRI, 5
- 31552 Practical NMR spectroscopy: Making reactions in (bio)chemistry visible, 5

**Big data**

- 02307 Computational Tools for Data Science, 5
- NDAK15018U Large-Scale Data Analysis

**Robotics**

- TESP Summer school at Tohoku University, Sendai, Japan, 0-6
- 31383 Robotics, 5

**Innovation**

- KU141 Rethinking Healthcare/Innovation as a powerful driver, 5

**Modelling**

- 02460 - Advanced Machine Learning

**Micro and Nanotechnology**

- All courses are of potential interest

**Optics**

- 34430 - Introduction to Biophotonics
- 34455 - Optical biosensors

**Biophysics**

- 10347 Introduction to Biophysics
- 10351 Cellular biophysics

**Biological systems**

- 26126 The chemistry of metals in biological systems

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**Figure 3** A figure still in embryo: An attempt to make an overview of some relevant elective courses from KU and DTU. Please feel free to supply the HoS with additional courses to this figure.