MSc in Physics and Nanotechnology

Official title

Civilingeniør, cand. polyt. (Fysik og Nanoteknologi)
Master of Science in Engineering (Physics and Nanotechnology)

About the Programme Specification

This programme specification applies from 1 September 2016. Regulations on changes of earlier specifications, e.g. if a programme specific course has been changed or replaced, are written into this specification. So, the specification pertaining to those having been enrolled at an earlier programme specification is also described here. The programme specification also includes the course descriptions in DTU’s course database, which states rules pertaining to both the programme specific and eligible courses in the programme.
Assessment

Credit transfer and Exemptions

The programme specifications are laid down by DTU in accordance with Ministerial Order on Bachelor and Master's (Candidatus) Programmes at Universities No. 1520 of December 16th 2013, with subsequent amendments, Ministerial Order on the International Education Activities of Universities No. 247 of March 13th 2015 and Ministerial Order on the Grading Scale and Other Forms of Assessment of Study Programmes Offered under the Ministry of Higher Education and Science (the Grading Scale Order) No. 114 of February 3rd 2015. In accordance with DTU’s regulations section 11.8 the curricula have been approved by the Dean of Graduate Studies, authorized by the President.

Duration

The Master of Science in Engineering programme is a 2-year programme equivalent to 120 ECTS point (European Credit Transfer System).

General admission requirements

Only applicants holding either a Bachelor of Science in Engineering, a Bachelor in Engineering or a Bachelor of Natural Science degree can be admitted to a Master of Science in Engineering programme. From September 2017 the bachelor degree must be less than 10 years old.

The individual MSc Eng programme states in detail which bachelor programmes qualify and whether applicants have to complete supplementary educational activities.

Requirements for supplementary educational activities can equate to up to 30 ECTS credits and are specified in the form of a list of courses under the individual MSc Eng programmes.

The specific requirements must be met before graduating from the bachelor programme or in connection with conditional admission to a particular MSc Eng programme. The courses must be passed prior to the commencement of studies within one year from the conditional admission.

Supplementary educational activities in connection with conditional admission to an MSc Eng programme do not form part of the MSc Eng programme, and partial tuition fees are charged. If the supplementary courses have not been passed within the deadlines specified, the conditional admission to the programme is withdrawn.

The Master of Science in Engineering programmes are offered in English. Therefore applicants must demonstrate proficiency in English (B-level, IELTS, TOEFL- or Pearson test).

Academic requirements for this programme

Bachelors of science in engineering from DTU

Students from the following BSc Eng Programme at DTU are entitled to admission to the MSc Eng programme in Physics and Nanotechnology?
In order to get the optimal benefit of the Master program, it is recommended that the elective parts of the bachelor program are used to build up the right prerequisites for the desired study plan.

Students from the following BSc Eng programmes at DTU:

- General Engineering

have access to be admitted subject to having completed the following as part of their bachelor programme:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>10104</td>
<td>Quantum Mechanics; General Engineering</td>
<td>5 point</td>
<td>E4 (Tues 13-17, Fri 8-12), F4 (Tues 13-17, Fri 8-12)</td>
</tr>
<tr>
<td>10303</td>
<td>Condensed Matter Physics and Nanoscale Materials Physics</td>
<td>10 point</td>
<td></td>
</tr>
</tbody>
</table>

In addition, it is strongly recommended to have completed the course

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
<th>Time</th>
</tr>
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<tbody>
<tr>
<td>10303</td>
<td>Condensed Matter Physics and Nanoscale Materials Physics</td>
<td>10 point</td>
<td>E4 (Tues 13-17, Fri 8-12), F4 (Tues 13-17, Fri 8-12)</td>
</tr>
</tbody>
</table>

Other BSc Eng students e.g. from the programme in "Mathematics and Technology" or "Geophysics and space technology" have access to be admitted if the right prerequisites are obtained through the elective courses on the bachelor education. BSc Engs from other programmes than Physics and Nanotechnology should as a minimum have taken the following courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>01035</td>
<td>Advanced Engineering Mathematics 2</td>
<td>5 point</td>
<td>E1A (Mon 8-12), E2B (Thurs 8-12), F2B (Thurs 8-12)</td>
</tr>
<tr>
<td>10044</td>
<td>Physics 2</td>
<td>5 point</td>
<td>E4A (Tues 13-17)</td>
</tr>
<tr>
<td>10102</td>
<td>Quantum Mechanics</td>
<td>10 point</td>
<td>F4 (Tues 13-17, Fri 8-12)</td>
</tr>
</tbody>
</table>

where the course 10044 Physics 2 can be replaced with 10036 Electromagnetism for physicists or 31400 Electromagnetics.

In addition, it is strongly recommended to have completed the course

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Time</th>
</tr>
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<td>10303</td>
<td>Condensed Matter Physics and Nanoscale Materials Physics</td>
<td>10 point</td>
<td>E4 (Tues 13-17, Fri 8-12), F4 (Tues 13-17, Fri 8-12)</td>
</tr>
</tbody>
</table>

The following central courses on the bachelor are prerequisites for central courses on the master program. It is therefore recommended that students make sure that they have acquired the necessary prerequisites for the study line they intend to follow by following at least 10 ECTS (preferably more) among the following courses
It is expected, that students themselves can acquire any prerequisites within fundamental physics that they may be missing due to an atypical background.

Bachelor of Science in Engineering and Bachelor of Natural Science from other universities

Student from the following educations are entitled to admission to the MSc Eng programme in Physics and Nanotechnology:

- BSc. Eng in Nanotechnology at Aalborg University
- BSc in Physics at Copenhagen University
- BSc in Nanoscience at Copenhagen University
- BSc in Physics at Aarhus University
- BSc in Nanoscience from Aarhus University

Students with similar qualifications can be admitted after individual evaluation.

Bachelors of Engineering (dipломингениører)

The B Eng (dipломингениør) education does not normally give access to the MSc programme in Physics and Nanotechnology. However, students can in some cases be admitted after individual evaluation. Students who are interested in this option should contact the head of studies of the MSc programme as soon as possible during their study in order to acquire the necessary prerequisites during the elective part of their study.

International students

Applicants for admission to the MSc Eng programme in Physics and Nanotechnology should hold a bachelor of science degree in physics, physics engineering, nanotechnology, or similar.

A strong, working knowledge of mathematics and physics is a prerequisite. A year's full time study at DTU amounts to 60 ECTS points. The MSc program builds on a bachelor curriculum with at least the following content of mathematics and natural sciences:

- Mathematics: 25-30 ECTS.
- Classical mechanics, electromagnetism, statistical physics and thermodynamics: 25 ECTS
- Quantum mechanics, solid state physics: 20 ECTS
- Nanotechnology, optics and photonics, biophysics: 20-30 ECTS
A working knowledge at bachelor level of at least four of the following five subjects is prerequisite for the central courses of the MSc-program:

- Quantum mechanics
- Solid state physics
- Optics and photonics
- Biophysics and complex systems
- Fabrication and visualisation of micro- and nanostructures

The required level may be gauged by comparison with the contents of the corresponding DTU-courses, although of course the exact contents will vary. The applicant should have passed the necessary prerequisites with good results.

Admission will be decided on the basis of the relevance and quality of the applicant's educational background. The applicant's grade point average or equivalent, as well as individual grades for relevant courses will be taken into account.

*International students normally have a background that differ from the typical student at the MSc program, and should be willing to acquire any prerequisites that they may be missing by themselves.*

All steps in the admission procedure are handled through DTU's Office of International Affairs, whereto inquiries about formalities should be directed. Questions about academic qualifications and program content should be directed to the program coordinator.

**Objectives**

The Master of Science in Engineering programme has two central objectives:

- Academic cutting-edge competencies which are the result of a clear study progression and which are unique to the graduate. The academic competencies contain elements of actual research and are manifested in the final master thesis
- Polytechnic holistic competencies that, in addition to an identity-creating professionalism, also include being able to gain an overview of a complex technical problem and being able to think in technical terms in commercial and societal contexts

A MSc in Engineering programme from DTU is a research-based education at the highest technological level, which qualifies the holder to take on knowledge-intensive positions in the business community and society that are distinguished by a high level of scientific development. Moreover, the MSc in Engineering qualification allows the holder to continue his/her education in the field of research (research-based programmes, PhD).

The holder of an MSc in Engineering has the competencies required to analyse, synthesize and evaluate theory and experiments relating to complex and complicated engineering systems, issues and solutions for the benefit of society.

**Shared academic goals for learning outcome**

**Knowledge and understanding**
A graduate of the MSc Eng. programme from DTU
• has a solid understanding of and a firm base of knowledge in natural sciences and technological principles, possesses comprehensive knowledge within a given subject area, and is familiar with the current development trends and opportunities within the academic area
• can identify and reflect on technical scientific issues and understand the interaction between the various components of an issue
• can, based on a clear academic profile, apply elements of current research at international level to develop ideas and solve problems
• has insight into and understanding of the internal interaction between the various engineering domains and other competencies in connection with solving specific engineering problems
• possesses knowledge about sustainability, innovation and entrepreneurship

Skills
A graduate of the MSc Eng. programme from DTU

• masters technical scientific methodologies, theories and tools, and has the capacity to take a holistic view of and delimit a complex, open issue, put it into a broader academic and societal perspective and, on this basis, propose a variety of possible actions
• can, via analysis and modelling, develop relevant models, systems and processes for solving technological problems
• can communicate and mediate research-based knowledge both orally and in writing
• can discuss technological issues with various types of stakeholder
• is familiar with and can seek out leading international research within his/her specialist area

Competencies
A graduate of the MSc Eng. programme from DTU

• masters technical problem-solving at a high level through project work, and has the capacity to work with and manage all phases of a project – including preparation of timetables, design, solution and documentation
• can work independently and reflect on own learning, academic development and specialization
• can independently combine his/her technological knowledge with knowledge about business, management, organization and project work

The MSc Eng. programme qualifies the graduate to hold positions in the private and public sectors, the consulting industry or to apply for research training with a view to earning a PhD.

Competence profile

A Master of Science in Engineering (Physics and Nanotechnology)

• can - in connection with a research and/or development project at international level - independently complete a project within his/her area of specialization
• can contribute actively to solving assignments in an interdisciplinary team - even in areas located outside his/her own area of specialization
• is familiar with the laws of physics and a wide range of methods for solving problems in the fields of physics and nanotechnology, and can select them to solve technological problems
• can explain, analyse and critically assess the relationship between a mathematical model and the experimental data it is to describe
• can develop new models, processes or methods in the fields of physics and nanotechnology
• can apply, assess and adapt IT-based solutions for data collection, data analysis, calculations and simulations
• has experience with technical physics at a high academic level within one or more of the following areas: nanoscale material physics, nanosystems engineering, optics and photonics, biophysics and complex systems, quantum engineering or sustainability and energy
• has experience with nanotechnology at a high academic level within one or more of the following areas: nanoscale material physics, nanosystems engineering, optics and photonics, biophysics and complex systems, quantum engineering or sustainability and energy

Structure

The MSc Eng programme is a research-based technological programme at elite level aimed at qualifying the graduate for a knowledge-intensive position in industry and the business sector and in society in general. Graduates obtain the title Master of Science in Engineering in the given engineering field

The MSc Eng is a two-year programme with a workload of 120 ECTS credit points. The programmes comprise four categories of courses: General competences, Technology specialization, Electives and Thesis.

General Competence Courses

The General Competence Courses have a broader scope than the specialist competencies. The primary purpose is to ensure that a series of competences – in association with the individual specialization – are obtained by all candidates. The following three considerations must be emphasized:

• A generalist point of view, where technology is combined with economics, management, organization and project work, and where the key is to have a technical approach in a commercial and societal perspective
• A synthesis point of view concentrating on working with an open problem where teamwork and cooperation, especially interdisciplinary work, are a key element
• Normative technical skills that formulate a common academic identity for the degree program and/or indicate the academic point of departure and level of the program

The polytechnic holistic competencies that are cited as one of the two central objectives for the MSc program can be obtained in many ways, but the contents of the study program’s General Competencies outlined here ensure that the central aspects of these competencies are part of the course of study, depending on how the Technological Specialization and MSc thesis are undertaken.

Technological Specialization Courses

The Technological Specialization and MSc Thesis together represent the basic foundation for achieving the academic cutting-edge competencies. The specific courses offered within the Technological Specialization are dynamic and will constantly reflect (potential) technological developments.
Elective Courses
The Elective Courses, which include all MSc courses at DTU, provide an opportunity for the graduate student to either focus even more on his/her chosen area of specialization or to supplement the academic specialization with general disciplines/competencies in mathematics, physics, chemistry, biology, programming, economics, management, etc. or with disciplines from associated specializations. The graduate student may choose as much as 10 credit points among the bachelor courses at DTU and courses at an equivalent level from other higher institutions. (The opportunity of choosing basic courses will be written down to the extent that the possibility of getting a credit transfer for courses which fall outside the academic domain of the student’s studies is used.)

Master Thesis
The Master Thesis is the final project of the course of study. In many cases, it will be possible for the Master Thesis to include collaboration with a company. The Master Thesis must as a minimum equal 30 ECTS credit points, but may be 32½ or 35 ECTS credit points. Please read the chapter “Master Thesis” for more information.

Study Lines and Focus areas
Within a MSc programme, there might be one or more study lines. A study line is a suggested combination of courses geared towards a specific aspect of a discipline. The specialization title will - when approved by the head of studies - be added on the diploma.

Focus areas are exclusively descriptive and will not be added on the degree diploma.

Study lines/focus areas
The program covers several fields of study, represented by six study lines:

Nano-scale Materials Physics with focus on designing and understanding materials on the basis of a quantum mechanical or mesoscopic description. The field of study covers experimental and theoretical methods to investigate and change the structural, electrical, magnetic, mechanical and chemical properties of materials at the nanometer length scale. The subjects include neutron- and x-ray scattering and experiments at large-scale facilities, electronic quantum components, molecular electronics, spintronics, surface and nano-particle reactivity, fuel cells and storing of hydrogen, electron structure theory and atomistic simulation methods.

Nanosystems Engineering with focus on the design and manufacture of nano- and microsystems for use in research and industry. Students will be taught the most modern nano and micro manufacturing technologies, including theory, simulation and manufacture at the DANCHIP clean room facility at DTU. The components manufactured are characterized in the modern laboratory facilities at DTU-Nanotech and DTU-Fotonik. Among the subjects are sensors, actuators, sensor systems and networks, the handling and detection of biological systems in micro scale, fluid dynamics in nano and micro scale, nanophotonics, nanoelectronics, nanomanipulation, and nano/microfabrication.

Optics and Photonics with focus on understanding the spreading of light and the interplay between light and substance and its use for design and manufacture of photonic components and systems. The applications fall within optical communication, nanophotonic components, sensors and biomedicine. The area includes theory, simulation, manufacture and characterization. Among the subjects are lasers, micro structured fibers, photonic crystals, quantum photonics, terahertz radiation, biological sensors and high-speed data transmission.

Biophysics and Complex Systems with focus on understanding and simulation of biological functions from molecules via cells to entire organisms. In addition, subjects in the field of fluid dynamics are investigated. Both experimental and theoretical methods are applied and among the
subjects are instabilities in fluid flow, fluid dynamics at micro and nano scale, the structure and function of proteins, protein networks, cell mechanics, mechanics of single DNA molecules, and the use of statistical physics to describe single molecule biophysics experiments. 

*Physics and Nanotechnology for Sustainability and Energy* with focus on the physical and nanotechnological principles behind sustainable energy technology, with the purpose of enabling the student to develop and optimize energy-related components and processes. The subjects include plasma physics and fusion energy; photovoltaics; solid state illumination; fuel cells; hydrogen technology; energy production, conversion and storage; as well as catalysis and photocatalysis. Nanotechnology is used both in the bottom-up approach, where nanostructures are designed and created at the atomic scale, and the top-down approach where e.g. semiconductor technologies are scaled down the the nanometer range, and both experimental, theoretical and numerical methods are part of the education.

*Quantum Engineering* with focus on the understanding, control and design of complex quantum systems for applications in emerging quantum technologies such as extremely sensitive sensors, quantum communication systems and quantum computers. The methods involved range from quantum mechanical calculations and simulations of e.g. electrontransport in new materials like graphene to the experimental development and investigations of new optical systems, solid-state systems, electronic systems and mechanical systems that are designed to harness the fundamental properties of quantum mechanics - such as quantum superposition and entanglement.

Students are not limited to following courses within one of these disciplines, but may choose and combine subjects from all five areas.

**Programme provision**

In order to obtain the MSc Eng degree in Physics and Nanotechnology the student must fulfil the following requirements:

- Have passed General Competence Courses adding up to at least 30 ECTS points
- Have passed Technological Specialization Courses adding up to at least 30 ECTS points
- Have performed a Master Thesis of at least 30 ECTS points within the field of the general programme
- Have passed a sufficient number of Elective Courses to bring the total number of ECTS points of the entire study up to 120

**Study Activity Requirements and Deadlines**

**Study Activity Requirement of 30/45 ECTS Credit Points**

The study activity requirements mentioned below are applicable from 1 September 2016. Courses passed before this date does not count in the statement of the study activity requirement.

Students must pass at least 30 ECTS credits in the first year of study on their programme and 45 ECTS credits in each of the following years of study. The student will be allowed three examination attempts in courses where the accumulated 'study activity requirement’ applies. This means that students has had the opportunity to register for three exams in the course in accordance with their prescribed study plan pertaining to their education.
The study activity requirement is accumulated, so the students must fulfill the study activity requirements below:

<table>
<thead>
<tr>
<th>Period</th>
<th>Accumulated study activity requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. year of study</td>
<td>30 ECTS credits</td>
</tr>
<tr>
<td>2. year of study</td>
<td>75 ECTS credits</td>
</tr>
<tr>
<td>3. year of study</td>
<td>120 ECTS credit</td>
</tr>
</tbody>
</table>

**Students enrolled at February 2016**
Students enrolled at February 2016 must at least pass 15 ECTS credits in the autumn semester 2016 and 45 ECTS credits the following study years.

<table>
<thead>
<tr>
<th>Period</th>
<th>Accumulated study activity requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Sep 2016 – 31 Jan 2017</td>
<td>15 ECTS-credits</td>
</tr>
<tr>
<td>1 Feb 2017 – 31 Jan 2018</td>
<td>60 ECTS-credits</td>
</tr>
<tr>
<td>1 Feb 2018 – 31 Jan 2019</td>
<td>105 ECTS-credits etc.</td>
</tr>
</tbody>
</table>

**Students enrolled at September (Year 2015 or earlier)**
Students enrolled at September (2015 or earlier) must at least pass 45 ECTS credits per study year.

<table>
<thead>
<tr>
<th>Period</th>
<th>Accumulated study activity requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Sep 2016 – 31 Aug 2017</td>
<td>45 ECTS credits</td>
</tr>
<tr>
<td>1 Sep 2017 – 31 Aug 2018</td>
<td>90 ECTS credits etc.</td>
</tr>
</tbody>
</table>

**Study Activity Requirement of 5 ECTS Credit Points**
In order to comply with DTU’s study activity requirement students must pass a minimum of 5 ECTS credit points each academic year. This requirement applies regardless of the number of examination attempts in courses attended in the relevant academic year.

**Maximum Duration of Study**
The MSc Eng programme is a 2-year programme. The entire MSc Eng course of study must be completed within three years.

For students enrolled before September 2015 other rules applies, and the MSc Eng course of study must be completed according to this schema.

<table>
<thead>
<tr>
<th>MSc Eng</th>
<th>Enrollment</th>
<th>Maximum end of study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter admittance</td>
<td>1 February 2015</td>
<td>31 January 2018</td>
</tr>
<tr>
<td>Summer admittance</td>
<td>1 September 2014</td>
<td>31 August 2017</td>
</tr>
<tr>
<td>Winter admittance</td>
<td>1 February 2014</td>
<td>31 August 2017</td>
</tr>
<tr>
<td>Summer admittance</td>
<td>1 September 2013</td>
<td>31 August 2017</td>
</tr>
</tbody>
</table>
For all students enrolled before September 2013 the MSc Eng course of study must be completed within four years.

**Completion Requirements**
To earn a MSc degree, you must earn 120 credit points under one of DTU’s MSc programmes and the mandatory courses must have been passed.

Apart from the programme provisions regarding credit points the following rules must be complied with:

- Grades according to the 7-point grading scale must be obtained in at least 2/3 of the credit points earned
- At least 1/3 of the course of study must be evaluated by external examiners

**Courses**

**General Competence Courses**
The General Competence Courses are split into 3 groups.

A. The *general engineering competences* can be fulfilled in three ways. Choose between:

- **42490** Technology, economics, management and organisation (TEMO) 10 point E5 (Wed 8-17), F5 (Wed 8-17)
- **41633** Innovation and Product Development 10 point F3 (Tues 8-12, Fri 13-17)
- or both these courses:
  - **42430** Project Management 5 point F1A (Mon 8-12)
  - **42435** Knowledge based Entrepreneurship 5 point E2A (Mon 13-17) and F2A (Mon 13-17)

Students choosing the latter option should be aware that the course 42430 is taught in Danish only, and that the course 42435 has a limited number of places available. Please plan to take it early in your study so you can fulfill the requirements even if you are rejected from the course.

B. 5 ECTS points have to be obtained by an open-ended experimental project through the **project-course**:

- **33525** Experimental project in Physics and Nanotechnology 5 point Spring and Fall

This course is also offered during the three week periods with alternative course numbers:
The project-course focus on open-ended issues some of which have an interdisciplinary character. The projects available will vary from year to year.

C. 15 ECTS points must be obtained from this list of basic courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Points</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>10112</td>
<td>Advanced Quantum Mechanics</td>
<td>10</td>
<td>E2 (Mon 13-17, Thurs 8-12)</td>
</tr>
<tr>
<td>10122</td>
<td>Statistical Physics</td>
<td>5</td>
<td>E3A (Tues 8-12)</td>
</tr>
<tr>
<td>10304</td>
<td>Experimental Surface Physics</td>
<td>10</td>
<td>F3 (Tues 8-12, Fri 13-17)</td>
</tr>
<tr>
<td>10346</td>
<td>Continuum Physics</td>
<td>5</td>
<td>F2A (Mon 13-17)</td>
</tr>
<tr>
<td>10380</td>
<td>Quantum Optics</td>
<td>10</td>
<td>E4 (Tues 13-17, Fri 8-12)</td>
</tr>
<tr>
<td>33321</td>
<td>Nano-2: Nanosystems Engineering</td>
<td>10</td>
<td>E1 (Mon 8-12, Thurs 13-17)</td>
</tr>
<tr>
<td>33336</td>
<td>LabChip-2: Physics of Lab-on-chip systems</td>
<td>5</td>
<td>E4B (Fri 8-12)</td>
</tr>
<tr>
<td>33422</td>
<td>Nanolithography</td>
<td>5</td>
<td>January, June</td>
</tr>
<tr>
<td>34032</td>
<td>Optical Properties of Solids</td>
<td>5</td>
<td>E1B (Thurs 13-17)</td>
</tr>
<tr>
<td>34051</td>
<td>Nanophotonics</td>
<td>10</td>
<td>F1 (Mon 8-12, Thurs 13-17)</td>
</tr>
</tbody>
</table>

Courses that also appear on the list of Technological Specialization courses can either count as General Competence Courses (Basic courses) or as Technological Specialization Courses. A 10-point course can be split between the two categories.

Technological Specialization Courses
The following list defines the Technological Specialization Courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Points</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>10112</td>
<td>Advanced Quantum Mechanics</td>
<td>10</td>
<td>E2 (Mon 13-17, Thurs 8-12)</td>
</tr>
<tr>
<td>10122</td>
<td>Statistical Physics</td>
<td>5</td>
<td>E3A (Tues 8-12)</td>
</tr>
<tr>
<td>10200</td>
<td>The structure and dynamics of materials studied with X-rays and neutrons</td>
<td>5</td>
<td>E1B (Thurs 13-17)</td>
</tr>
<tr>
<td>10220</td>
<td>Physics of soft materials</td>
<td>5</td>
<td>F1B (Thurs 13-17)</td>
</tr>
<tr>
<td>10302</td>
<td>Electronic Structure Methods in Material Physics, Chemistry and Biology</td>
<td>10</td>
<td>F5 (Wed 8-17)</td>
</tr>
<tr>
<td>10304</td>
<td>Experimental Surface Physics</td>
<td>10</td>
<td>F3 (Tues 8-12, Fri 13-17)</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Points</td>
<td>Credits</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>10305</td>
<td>Advanced Solid State Physics</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>10315</td>
<td>Magnetism and Magnetic Materials - with project</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>10333</td>
<td>Physics of Sustainable Energy</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>10337</td>
<td>Theoretical microfluidics</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>10346</td>
<td>Continuum Physics</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>10380</td>
<td>Quantum Optics</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>10384</td>
<td>Quantum information</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>10400</td>
<td>Plasma Physics</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>10401</td>
<td>Fusion energy and fusion plasma physics</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>33206</td>
<td>Transport in Nanostructures</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>33250</td>
<td>Semiconductor Technology</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>33321</td>
<td>Nano-2: Nanosystems Engineering</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>33336</td>
<td>LabChip-2: Physics of Lab-on-chip systems</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>33355</td>
<td>Micro-2: MicroElectroMechanical Systems (MEMS)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>33422</td>
<td>Nanolithography</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>33442</td>
<td>Quantum mechanical modelling of nanoelectronics</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>33621</td>
<td>Nano 3 - Topics in Graphene and other two-dimensional materials</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>33647</td>
<td>Computer-based Introduction to Data Analysis for Physics and Nanotechnology</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>33692</td>
<td>PolyNano Summer School</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>34032</td>
<td>Optical Properties of Solids</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>34034</td>
<td>Applied photonics</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>34051</td>
<td>Nanophotonics</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>34052</td>
<td>Nonlinear Optics</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>34053</td>
<td>Numerical Methods in Photonics</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>34540</td>
<td>Light emitting diodes and photovoltaics for energy applications</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>34550</td>
<td>Biomedical optics</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>47309</td>
<td>Materials for Hydrogen Production and Storage</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>47319</td>
<td>Functional Materials</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>
47325  Large-scale Superconductor Technologies  5 point  F1A (Mon 8-12)

In addition, the elite module "10331 Catalysis and Sustainable Energy Solutions" counts with 10 ECTS points towards the technological specialization courses.

Courses 33241 and 33322 that are no longer offered also count as technological specialization

*Courses that also appear on the list of Basic courses can either count as General Competence Courses or as Technological Specialization Courses. A 10-point course can be split between the two categories.*

### Elective Courses

Any course classified as MSc course in DTU’s course base may be taken for credit as an elective course. This includes general competence and technological specialization courses in excess of the minimal requirements. Master students are allowed to take Bachelor DTU courses with the objective to obtaining basic skills not originally obtained in the qualifying bachelor degree (maximum 10 ECTS)

### Courses, previous admission years

The courses listed below also count as Technological Specialization for students accepted at DTU prior to September 2016:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>ECTS</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>10308</td>
<td>Superconductivity: Physics and Applications</td>
<td>10</td>
<td>F2 (Mon 13-17, Thurs 8-12)</td>
</tr>
<tr>
<td>10313</td>
<td>Magnetism and Magnetic Materials</td>
<td>10</td>
<td>F4 (Tues 13-17, Fri 8-12)</td>
</tr>
<tr>
<td>10351</td>
<td>Cellular biophysics</td>
<td>5</td>
<td>F2B (Thurs 8-12)</td>
</tr>
</tbody>
</table>

The courses listed below also count as Technological Specialization for students accepted at DTU prior to September 2015:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>ECTS</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>10355</td>
<td>Molecular Biophysics: Protein, Structure and Dynamics</td>
<td>5</td>
<td>F1B (Thurs 13-17)</td>
</tr>
<tr>
<td>10356</td>
<td>Single Molecule- and Nanoscale-Spectroscopy</td>
<td>5</td>
<td>F4B (Fri 8-12)</td>
</tr>
</tbody>
</table>

The following course counts as General Competence Courses for students accepted at DTU prior to 2014:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>ECTS</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>10311</td>
<td>Project in atomic-scale physics</td>
<td>5</td>
<td>Fall and January, Spring and June</td>
</tr>
<tr>
<td>10353</td>
<td>Project in biophysics and complex systems</td>
<td>5</td>
<td>Fall and January, Spring and June</td>
</tr>
<tr>
<td>33523</td>
<td>Project in Nanosystems Engineering</td>
<td>5</td>
<td>Fall and January, Spring and June</td>
</tr>
<tr>
<td>34047</td>
<td>Project in Optics and Photonics</td>
<td>5</td>
<td>January, June, Fall, Spring</td>
</tr>
</tbody>
</table>
The courses listed below also count as Technological Specialization for students accepted at DTU prior to September 2014:

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Description</th>
<th>Points</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>10307</td>
<td>Quantum electronics: Physics and devices</td>
<td>10</td>
<td>F2 (mon/thurs)</td>
</tr>
<tr>
<td>10355</td>
<td>Molecular Biophysics: Protein, Structure and Dynamics</td>
<td>5</td>
<td>F1B (thurs 13-17)</td>
</tr>
<tr>
<td>10356</td>
<td>Single Molecule- and Nanoscale-Spectroscopy</td>
<td>5</td>
<td>F4B (fri 8-12)</td>
</tr>
<tr>
<td>10357</td>
<td>Topics in Biophysics and Complex Systems</td>
<td>5</td>
<td>E4B (fri 8-12)</td>
</tr>
<tr>
<td>10378</td>
<td>Quantum Optics</td>
<td>5</td>
<td>E4B (fri 8-12)</td>
</tr>
<tr>
<td>34057</td>
<td>Fabrication of Nanophotonic Devices</td>
<td>7.5</td>
<td>E5 (Wed 8-17)</td>
</tr>
</tbody>
</table>

The courses listed below also count as Technological Specialization for students accepted at DTU prior to September 2013:

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Description</th>
<th>Points</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>33241</td>
<td>Theoretical microfluidics and lab-on-a-chip systems</td>
<td>5</td>
<td>E4A (tues 13-17)</td>
</tr>
<tr>
<td>33322</td>
<td>Nano-3 - Advanced NEMS</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

**Master thesis**

The Master thesis is the final assignment of the programme. The objective of the Master thesis is to give students the opportunity to apply the knowledge they have acquired in an independent way on a larger project that concludes with a written report. The thesis must document skills in applying scientific theories and methodologies to a clearly defined academic topic.

The Master thesis must be prepared individually or in groups of up to four students.

If the thesis is written by more than one student, each student is to be examined individually. However, the assessment of group projects may also include a group exam with the participation of the entire group. In this case, the individual oral exams are carried out after completion of the group exam. Beside the examinee, only group members who have already been examined are allowed to attend this part of the examination.

The Master thesis must be written in English and it must include an abstract. As an exemption the supervisor of the Master thesis can assess that the thesis may be written in Danish. This decision can only be made due to professional, academic reasons. The Head of studies for the study programme must accept this exemption.

The Head of Studies of the study programme must approve that the Master thesis falls within the programme’s technical and scientific field. The Head of Studies automatically receives this information once the thesis is reported and the student will be directly notified if the topic cannot be approved. The Master thesis may be undertaken in collaboration with a company.

**Project agreement, volume, and project period**

The thesis can only be commenced when the student lacks no more than 15 ECTS credits besides the thesis.
The start time of the thesis is just after the last study activity. The project period has a duration of one semester and therefore the following start dates apply:

**Spring term**
At the latest - the first working day in January

**Autumn term**
At the latest - the first working day in August

In the academic year 2016/2017 the following start dates apply:

- August 1st 2016, at the latest
- January 2nd 2017, at the latest

Alternate start dates may apply for academic reasons (for example if the student attends a course in August or January) and if approved by the supervisor. The justification must be reported in the project registration system.

The supervisor for a Master thesis must be a member of the scientific staff with research obligations holding a permanent position at DTU (not a PhD student) and must be approved by the Head of Department. The supervisor is required to confirm that the student has the requisite academic qualifications for undertaking the Master thesis. The student is required to document his/her qualifications and level in the form of a list of courses he/she has completed. The supervisor must regularly follow the progress of the thesis and ensure that the Master thesis falls within the academic focus area of the MSc Eng programme.

A Master thesis agreement is to be concluded between the student and a supervisor and it must be done well in advance of the starting day of the thesis. The supervisor is responsible for reporting the thesis to the project registration system.

The work must not begin until the final approval of the agreement has been given by the Office for Study Programmes and Student Affairs and the Head of Studies has approved the project. The Master thesis agreement is binding and counts as an examination attempt from the time work on the Master thesis has begun. The Master thesis agreement may be cancelled up to the start date of the Master thesis, in which case it will not count as an examination attempt.

The Master thesis must have a scope equivalent to 30, 32½ or 35 ECTS credits. In connection with the formulation of a project agreement, the project period should be specified. A Master thesis must be undertaken as a full-time course of study and the stipulated time is:

- 30 ECTS credits = 5 months
- 32½ ECTS credits = 5½ months
- 35 ECTS credits = 6 months

As a general rule no parallel activities are conducted in this period. Nevertheless in order not to prolong the total time of the study programme the period may be extended with 3 weeks study for every 5 additional ECTS credits from course activity. The extension must be reported to the project registration system prior to the start date of the Master thesis.
The content and learning objectives of the thesis
The content of the thesis is to be agreed with the programme supervisor. The thesis may contain a combination of experimental work, fieldwork, theoretical studies, synthesis, modelling and analysis. All theses must include elements of literature studies and criticism. In addition, the thesis contains the following overarching learning objectives:

A graduate of the MSc Eng programme from DTU:

- can identify and reflect on technical scientific issues and understand the interaction between the various components that make up an issue
- can, on the basis of a clear academic profile, apply elements of current research at international level to develop ideas and solve problems
- masters technical scientific methodologies, theories and tools, and has the capacity to take a holistic view of and delimit a complex, open issue, see it in a broader academic and societal perspective and, on this basis, propose a variety of possible actions
- can, via analysis and modelling, develop relevant models, systems and processes for solving technological problems
- can communicate and mediate research-based knowledge both orally and in writing
- is familiar with and can seek out leading international research within his/her specialist area.
- can work independently and reflect on own learning, academic development and specialization
- masters technical problem-solving at a high level through project work, and has the capacity to work with and manage all phases of a project – including preparation of timetables, design, solution and documentation

During the first month, the student is to submit a project plan outlining the objective of the thesis and justification for same to his/her supervisor. In the project plan, the student is also to take into account the overarching learning objectives listed above. When submitting the thesis, the student is to enclose a separate document presenting the original project plan and a revision of same, where appropriate. In addition, the document is to include a brief auto-evaluation of the project process.

Deadline

The agreed project period must be observed. Failure to observe the deadline means that the student will have used one examination attempt.

Under special circumstances the Study Board may grant extensions of up to three weeks. Application must be submitted to the relevant Study Board.

Applications for extensions beyond three weeks should be addressed to the Board of Exemptions for the MSc Programmes in Engineering and must be received by the Board no later than one month prior to the agreed submission date. Exemptions may be granted for an extension owing to unforeseen delays during the project period.

You can find more information regarding exemptions in DTU’s Rules and Regulations chapter 4.5.

If the student wish to abandon the thesis and start over within a different field of study, this is only possible within a month after the start of the thesis. The supervisor must inform the Office for Study Programmes and Student Affairs, whereafter a new project agreement must be made within the new
field of study and with a new ordinary deadline (5, 5½ or 6 months). However, the student will have used one examination attempt on the abandoned project.

Failure to observe the deadline means that the student will have used one examination attempt. The student and the supervisor must then make a new project agreement for the thesis but with a modified problem formulation within the same field. The new thesis must be submitted within 3 months of approval of the project. This procedure also applies if the student fail his/her exam.

If the student wishes to write a new thesis with a 5-month deadline this must be approved by supervisor as well as the Study Board.

**Assessment**

Learning objectives are an integrated part of the supervision.

In assessment of a Master thesis, the quality of the academic contents will carry the most weight. The student’s writing abilities will also count, though this will be weighted slightly less, while spelling will carry little weight.

The Master thesis is evaluated according to the Danish 7-point grading scale on the basis of a report and an oral defense. The report and the oral defense will be evaluated as a whole. The MSc thesis will be evaluated in conjunction with one or more external examiners. The department, supervisor and examiner will, in consultation with the student, set a date for the oral presentation and defense.

The oral defense must take place no later than two weeks after the written report has been submitted. This two-week deadline is excl. Christmas Holiday and national holidays. In exceptional circumstances, the head of department can approve a later exam date.

The oral defense of a project undertaken entirely or in part at a private company may, due to company secrets referred to in the project, be held behind closed doors subject to agreement with the supervisor. The rules are stated in *Rules and Regulations*, section 3.2 Assessment methods and grading.

**Master thesis, specific rules**

There are no programme specific requirements for the master thesis. Please observe the general DTU rules regarding starting date and duration of the master thesis work.

**Paragraphs from Rules and Regulations**

The following paragraphs are part of this programme specification but taken from the collected Rules and Regulation. The numbering of the paragraphs correspond to the numbering in the Rules and Regulations.
Rules and regulations chapter 2

2. Study Programme Rules

DTU programmes consist of courses which include lectures, seminars, classes, practical exercises, projects, etc. A course can have a duration of more than one teaching period.

The academic year is divided into six teaching periods: two 13-week periods in the autumn and spring semesters, respectively, each followed by an exam period of about two weeks, and four 3-week periods followed by exams in January, June, July, and August, respectively.

The order and scheduling of mandatory courses, academic content, teaching and working methods, as well as any prerequisites are specified in the programme-specific study plans and the individual course descriptions. The teaching periods in July and August will generally not be included in the study plan.

Course descriptions contain the following information relevant to the teaching:

- Language
- ECTS credits (work load)
- Course type (BEng, BSc, MSc, PhD, part-time diploma, or part-time MSc)
- Scheduling, location, and duration of the course
- General course and learning objectives
- Teaching and learning methods
- Attendance requirements, if any, e.g. laboratory exercises
- Mandatory or recommended academic prerequisites for attendance, if any
- Requirements, if any, for submission of mandatory written assignments as a prerequisite for exam participation.

BEng and BSc courses are usually taught in Danish, except for courses on the English-language BEng programmes and the English-language BSc programme in General Engineering. A limited number of courses can be offered in English on other BSc and BEng programmes.

All MSc courses are taught in English.
Sound- or video recording of teaching sessions at DTU are not allowed unless the teacher has approved this. Recordings are only for personal use unless the teacher has allowed publication of the recording, including what kind of publication.

2.1 Course registration

Students must be registered for a course to attend classes—including laboratory exercises—to participate in group work, and to obtain course information via DTU Inside as well as teaching material (notes etc.).

Students are responsible for ensuring that they are registered for the right courses on DTU Inside.

Students cannot register for courses they have already passed. A course has been passed if the grade 02 or the assessment ‘Pass’ has been awarded. Reregistrations for passed courses will be rejected.

Students cannot register more courses than the prescribed ECTS credit total of the programme in question. See chapter 4.2, General Rules of Credit Point Transfer, though.

Registrations for courses which do not form part of the programme on which the student is enrolled will be rejected, unless the course has been pre-approved by the Head of Studies who has notified the Office for Study Programmes and Student Affairs of this (studieservice@adm.dtu.dk).

BEng and BSc students are automatically registered for courses in the first teaching period (13-week period) in the first semester of their programme. Students must register themselves for all other courses.

After the deadline for withdrawal from exams, course registration is binding, which means that the course must be passed for the student to complete the programme.

In connection with a change of study programmes, students will be withdrawn from courses that have not been passed, and which do not form part of the new study programme.

Lecturers may cancel non-mandatory courses if less than ten students are registered, unless otherwise stated in the course description. Mandatory and semi-mandatory cannot be cancelled.

Deadlines etc. can be found on the Infosite for International Students under ‘Registration Deadlines for Courses and Examinations’.

2.2 Academic prerequisites for course participation

Prerequisites and rules for course participation are specified in the course description.

Lecturers are responsible for ensuring that exercises and other laboratory and workshop activities take place under safe conditions. They must therefore provide thorough instructions. Students who fail to understand or respect the lecturer’s safety instructions may be expelled from the activity.

Mandatory prerequisites
Students are required to pass courses specified as a mandatory prerequisite before participating in the course. Students may only register for the course and, if relevant, take part in a drawing of lots if they have passed or are registered for the exam in the mandatory course.
Recommended academic prerequisites

Recommended academic prerequisite courses form the basis for the teaching, and students are expected to have knowledge of the topics covered by the courses. Students who do not have the necessary prerequisites are not entitled to academic counselling and may, if necessary, be expelled from the class.

2.3 Participation in limited admission courses

2.3.1. Guidelines in relation to overbooked courses

It may be stated in the course description that students enrolled on certain study programmes have priority. Students who have registered for a course within the deadline will be assigned a place or participate in the drawing of lots according to this priority. If nothing is stated in the course description, all students who have registered within the deadline will participate in the draw equally.

Full-time students who have registered within the deadline and students on the flexible master’s programme (part-time programme) have priority over guest students and students on the other part-time programmes in any drawing of lots. Students for whom a course forms a mandatory part of the programme have priority over students for whom the course is not mandatory. If a student for whom a course forms a mandatory part of the programme loses a draw, the student in question will have priority in the next draw.

Guest students studying at DTU under an exchange agreement between DTU and an international partner university, and for whom the course constitutes a mandatory programme element, take precedence over full-time students for whom the course is not mandatory as well as over other guest students and part-time students.

Guest students and students enrolled on part-time programmes for whom a course constitutes a mandatory programme element take precedence over guest students and students on part-time programmes for whom the course is not mandatory.

Guest students and students on part-time programmes who have registered within the registration deadline will be assigned a place in overbooked courses and have priority over full-time students who register after the deadline.

2.3.2. Deadlines in relation to overbooked courses

No later than one month before the start of the teaching period, a study announcement will be sent out with information about the procedure for the drawing of lots in the event of overbooked courses.

All students who have registered for a course for which participation will be determined by drawing lots will receive an email after the draw with status information. There are three status types:
– Place on the course guaranteed
– On the waiting list
– Lost draw.

Students who do not attend classes when the course starts and fail to notify the lecturer of subsequent attendance will not be permitted to keep their place in an overbooked course after the dates stated below:

13-week period: after the end of class on the first day of teaching in the course
3-week period: four hours after course commencement

The place will be given to the next student present with the lowest number on the waiting list.
2.4 Class participation, including requirements for mandatory assignments

2.4.1. Class participation
Attending classes is generally not mandatory. However, many courses (practical courses, laboratory courses, etc.) require active participation to pass the course. In connection with projects, giving presentations and acting as a critic in relation to presentations given by other students may be mandatory. If participation is mandatory, this must be specified in the course description.

2.4.2. (Mandatory) written assignments etc.
Submission of assignments and reports may be optional, a prerequisite in order to qualify to take the exam, or form part of the exam. Students can only expect to have take-home assignments assessed that have been submitted on time.

If mandatory assignments etc. are a prerequisite for taking the exam, it must be stated in the course description that mandatory assignments which do not constitute the basis for assessment but are a prerequisite for taking the exam form part of the course. If mandatory assignments are a prerequisite for taking the exam, the assignments must meet the learning objectives for the course in terms of form and content, and it is expected that the course coordinator provides the students with formative feedback on the assignments.

The individual course coordinators decide on the criteria for approval of mandatory assignments and inform the students.

2.4.3. Illness or other legitimate reasons for absence
Students who, due to illness or for other legitimate reasons, are prevented from participating in mandatory teaching modules or completing laboratory or workshop activities must notify the lecturer responsible as soon as possible. Students can apply to retake the mandatory activity or have it replaced by a similar activity, but students are only entitled to take the activity again the next time the course is offered. Students must also, upon request, submit a medical certificate at their own expense (see chapter 3.6 ‘Illness in connection with exams’). The medical certificate must be sent via student email to studieservice@adm.dtu.dk.

2.5 Deadlines for publication of teaching material and syllabus

Material forming part of the exam syllabus must be available on DTU Inside no later than three weeks before the end of the teaching period together with a description of the syllabus or other reading guidelines.

2.6 Changes to course descriptions

Significant changes to the course descriptions must be available no later than:

- 25 June for the 13-week period in autumn
15 November for the 3-week period in January

25 November for the 13-week period in spring

15 April for the 3-week periods in June, July, and August.

In exceptional cases, significant changes can be made during the teaching period upon approval by the lecturer, the students, and the department board of studies.

The procedure in the event of significant changes of, for instance, ECTS credits, scheduling, teaching method, and exam form is as follows:

1. Proposed changes are formulated in writing and sent to the department board of studies for approval.
2. Following approval, the proposal is sent as a bulletin via DTU Inside to all registered students. The bulletin must clearly state that the change is a proposal which will be implemented unless objections are raised by one or more students. Students are given at least 14 days to object against the change.
3. If no objections are received, the lecturer posts a new bulletin announcing that no objections have been raised against the change, which will hereby be adopted.

Approved changes are updated in the course descriptions on DTU’s website: www.kurser.dtu.dk.

2.7 Specialization courses, projects, and PhD courses

2.7.1. Specialization courses, projects, and portfolio credit courses
The content of a specialization course is agreed between the student(s) and a DTU supervisor. Registration for specialization courses takes place at the relevant department via the project reporting system before the specialization course starts.

The ECTS credit total for a specialization course ranges from 5 to 30 ECTS credits with intervals of 2.5 credits. 5 ECTS credits correspond to around three weeks of full-time study. In exceptional cases, it is possible to take a specialization course corresponding to 2.5 ECTS credits, for example if the course constitutes the final element of the programme. In such case, the lecturer must contact the Office for Study Programmes and Student Affairs with a view to registering the course.

The project period cannot extend six months. The agreement made regarding a specialization course is binding on both parties, but can be changed according to agreement between the parties. The specialization course/project must be documented in a report or similar.

If a student fails a specialization course a re-exam is possible. The supervisor makes this decision based on academic reasons. The department board of studies make a decision in the event of a disagreement between the student and the supervisor. The student always can plead for the right of three examination attempts in the course.

2.7.1.1 Cooperation with a company
A specialization course or a project can be carried out entirely or partially with a company in Denmark or abroad. The academic content must be agreed with a DTU supervisor. The supervisor is responsible for ensuring that the project has a sufficient academic/theoretical level. The ECTS credit
total is based only on the expected project workload, which means that the duration of the internship with the company is not credit awarding.

The students are responsible for finding a company, but many departments have contact with a number of companies. It is recommended that students carry out projects in cooperation with companies in the final part of the study programme.

Students can also search the DTU Internship and Project Bank where company projects are posted, among other things. DTU’s Internship and Project Bank can be found [here](#).

*Project proposals*

Students are recommended to draw up a project proposal to be signed jointly by the student, the supervisor, and the company, since all three parties must agree on the project.

The project proposal should contain the most important details related to the project: project title, specific tasks, expected working hours/time of arrival, duration of the internship with the company, etc. If the company makes requirements in relation to confidentiality and rights to use the project, two separate agreements can be made with the student and DTU, respectively.

The project supervisor can refer the student to the person responsible for contracts at the relevant department.

*Insurance*

During an internship with a company in connection with a project, the insurance taken out by Polyteknisk Forening (PF student association) does not provide cover. Read more about this in chapter 1.4.B of the rules and regulations.

### 2.7.1.2. Portfolio credit courses

By registering for a portfolio credit course, BSc and MSc students have the opportunity to obtain up to 10 ECTS credits in the elective courses group for competences acquired through work experience, starting their own business, online courses, etc. after admission to DTU. Students generally register for the portfolio credit course after acquiring the relevant competences.

In the portfolio credit course, the students account for the academic/professional competences acquired in a report. The competences must be at the same or at a higher level than the level the students would otherwise achieve on the study programme. A portfolio credit course can be equivalent to 5, 7.5, or 10 ECTS credits. Students must register for a portfolio credit course at a department, and each student must be assigned a DTU supervisor, who determines the evaluation and assessment form.

### 2.7.2. PhD courses

MSc students can, subject to agreement with the lecturer, take PhD courses. Course registration takes place by contacting the Office for Study Programmes and Student Affairs via studieservice@adm.dtu.dk.

### 2.8 Evaluation of teaching

At the end of the semester, the teaching in all courses are evaluated via DTU Inside. The students complete the forms anonymously. Evaluations are processed by the board of studies at the department.
The evaluation of a course comprises three forms:

**Form A:** Evaluation of the course in general

**Form B:** Evaluation of the course coordinator/lecturers

**Form C:** Free-text proposals (text fields where students can give praise or criticism in their own words)

Form A is available to everyone. A summary of the course evaluations is published on DTU’s homepage.

Forms B and C are confidential as they may contain sensitive personal information. The evaluations may, however, be accessed by the following persons:

- The relevant head of department and managers with direct HR responsibility
- All members of the relevant board of studies
- The course coordinator
- When the course comprises a mandatory element of the programme, the relevant head of studies.

### 2.9 Complaints regarding teaching and supervision

Students who are dissatisfied with the teaching in a given course or with the supervision received in connection with a project must contact the lecturer/supervisor concerned immediately to find a solution to the problem. If this does not solve the problem, the following rules for complaints regarding teaching/supervision have been established:

- Complaints must be justified in writing and submitted to the board of studies at the department offering the course within two weeks of the announcement of the student’s grade.

- The department board of studies informs the head of department about the complaint if the complaint concerns issues relating to personnel, and makes sure that the lecturer/supervisor gets the opportunity to comment on the complaint.

- As soon as possible after the consultation of the lecturer/supervisor, the department board of studies forwards the decision to the student, and a copy is provided for the head of department. The decision must contain the grounds for rejection and a procedure for complaints, in case the student’s complaint is not fully upheld, see below.

- Based on the decision of the department board of studies, the head of department will decide on any measures that need to be taken with regard to the lecturer/supervisor.

- If the student does not accept the decision of the department board of studies, the student can file a complaint to the dean of the programme in question no later than two weeks after the student has received the decision. The complaint must be justified in writing and submitted to
the Office for Study Programmes and Student Affairs to studenterklager@dtu.dk using the student email address. The complaint must be accompanied by the documents included in the original complaint to the department board of studies.

The decision of the dean is final unless any procedural errors have been made. If the student believes that there are procedural errors in the dean’s decision, the student in question can appeal to the Danish Agency for Higher Education. The appeal must be filed within two weeks of announcement of the dean’s decision. It must be justified in writing and submitted to the Office for Study Programmes and Student Affairs to studenterklager@dtu.dk using the student email address. The appeal is then forwarded to the Agency.

Rules and regulations chapter 3

3. Exam rules

Each course and project concludes with an assessment. The objective of the exam is to assess the extent to which the student meets the learning objectives defined for the course or project.

The course description contains:

– Mandatory course prerequisites, if any
– Requirements, if any, for submission of mandatory assignments as a prerequisite for exam participation
– The number of mandatory assignments and other part-exams
– Weighting, if relevant, of part-exams in the final assessment
– Mandatory participation, if relevant, e.g. in laboratory exercises
– Requirements, if any, regarding the number of participants in group exams
– Forms of assessment
– The use of co-examination and grading scale, 7-point grading scale or pass/fail.

3.1 Registration and withdrawal

All approved course registrations are automatically transferred to exam registrations at the end of the supplementary registration period. Students who wish to participate in the exam in other/more courses than those transferred from the course registrations, for example re-exams or make-up exams, must register themselves via DTU Inside. Registration is binding after the deadline for exam withdrawal, and an exam attempt has been used even if the student does not participate in the exam.

Students can find the deadlines for exam registrations etc. on the Infosite for International Students under ‘Registration Deadlines for Courses and Examinations’.

The students are responsible for ensuring that they are registered for the right exams.

Students cannot register for exams in courses which have already been passed (grade 02 or higher or ‘Pass’).

If students fail to submit and/or have not had mandatory assignments approved in order to qualify for exam participation, they have used an exam attempt. Read more about submission of assignments as a prerequisite for exam participation in chapter 2.4.2. Read more about mandatory assignments and re-exams in chapter 3.9.
Oral exams must be taken before the end of the exam period, unless otherwise agreed between the course coordinator and the students.

Students are entitled to three exam attempts in each course etc.

Even though several versions of the same course with different course numbers may be available, students only have three exam attempts. Several versions of the same course both cover courses with different course number and/or title and courses that are not applicable with other courses.

Students who have not passed the first exam attempt in a course/project will automatically be registered for the second exam attempt at the next re-exam, but may withdraw their registration within the applicable deadlines. Students must register for and withdraw from any subsequent exam attempts themselves within the applicable deadlines.

Students who do not pass a third exam attempt are obliged to apply for an exemption to be granted an additional exam attempt immediately after the announcement of the grade for the third exam attempt. If they fail to do so, they will no longer be entitled to be enrolled on the study programme. The fourth exam attempt must take place at the next (re-)exam. This paragraph also applies for students who do not pass a forth exam attempt etc.

For students enrolled on BEng, BSc, and MSc programmes in accordance with the rules on part-time programmes and students admitted to an MSc programme and another part-time programme, the following applies with regard to re-exams: Students who have not passed the first attempt must have the opportunity to register for the second exam attempt in the same exam period or in immediate continuation thereof. The third exam attempt, if relevant, must be taken as soon as possible, and where possible no later than on the date of the exam in question.

All activities that form part of the programme must be assessed. To obtain an assessment, students must be registered for the exam in the activity. Students may not participate in an exam or have, for example, a substitution paper assessed if they are not registered for the exam in the course.

Students must be present at written exams (on-site exams) 15 minutes before the exam starts. Students who show up after the exam has started will not be allowed to participate in the exam.

If students do not turn up at exams for which they are registered, it is regarded as an exam attempt.

All exam results will appear from the student’s transcript of records, and the student’s certificate will contain details about all exams passed within the scope of the student’s curriculum.

For guest students and students on part-time programmes, special rules apply for exam registration (see chapter 6 ‘Guest students’ and Chapter 7 ‘Part-time programmes, competence development’ of these rules and regulations).

BEng projects, BSc projects, and MSc theses also conclude with an exam, but registration is made via the project reporting system by the department with which the student is affiliated. Reference is also made to the curriculum for the individual study programmes.
3.2 Assessment forms and grading

Exams must reflect the overall course objectives, learning objectives, and content. Exams may be written, practical, oral, or a combination of these, for instance a series of part-exams during the course.

In connection with approval of the course description, the department board of studies decides on the form of assessment, including part-exams to be taken in the course.

Students must be assessed individually. In connection with both individual exams and group exams, an assessment must be made of the performance of each individual student, and individual grades must be awarded.

During the evaluation process, the external and internal examiners must make notes about the performance and their deliberations for reference in the event of an appeal. The notes must be kept for at least one year and until any appeal procedure has been completed.

3.2.1. Requirements for passing exams and part-exams
An exam has been passed when the student has obtained the grade 02 or higher according to the 7-point grading scale or has obtained the assessment ’Pass’.

All mandatory activities (except e.g. laboratory exercises which cannot be assessed and mandatory assignments which are a prerequisite for exam participation) must be included in the assessment.

A course comprising several part-exams can be assessed based on either an overall assessment or a weighted average of the part-grades. In connection with overall assessments, students only obtain one grade for the course. If students obtain part-grades according to the 7-point grading scale, the overall grade is the weighted average of the part-grades, rounded up or down to the nearest grade on the grading scale.

The requirements for passing exams if part-grades are awarded are that 1) the average grade for part-exams must be at least 02 without rounding up, and that 2) no part-grade must be less than 00.

For some courses, it may be relevant to deviate from the above rule or to establish additional requirements for part-grades. Such deviations must be approved by department board of studies and the dean. The deviations must be stated in the course description.

All part-exams in a course must be taken in the same course module, unless otherwise stated in the course description. Part-exams cannot be retaken if the course has been passed. Read more about part-exams in connection with re-exams in chapter 3.9.1.

The exam starts when the student attends one of the part-exams of a course, and an overall grade must be given regardless of whether the student in question attends the remaining part-exams. If the student does not attend a part-exam for which a part-grade is given, the part-grade -3 will be awarded for the part-exam and included in the calculation of the overall grade for the course. The course will thus be assessed as not passed (i.e. -3), see above. This is also the case if a student does not attend an exam which is a prerequisite for making an individual assessment of a performance, such as a group project, as the student’s contribution to the group presentation cannot be established.
Students can only file complaints regarding part-grades if a change of the part-grade will change the overall grade. A complaint can only be filed when the student has been notified of the grade.

3.2.2. Individual assessment of group projects etc.
Exams in a course may consist of preparing written reports, posters, etc. during the teaching period. Such written work can be carried out individually or as group projects.

Group projects can be assessed in two different ways, see below. Before the students commence their group project, the course coordinator/examiner must inform the students about whether or not to individualize their group project. If an individual grade is awarded for a group project, the project must be individualized. A group project is not individualized if the students merely state, for example, that they have contributed equally to all sections of the report. It must be clearly indicated for which sections each student holds (primary) responsibility.

a. Group projects with indication of individual contributions
Two or more students can write individual projects on a common theme, contributing individual sections to a joint report. Provided that the students’ individual contributions are clearly separated in the joint report, a subsequent individual oral exam is not required. Students can thus be awarded an individual grade or assessment for their individual contribution to the report.

b. Group projects without indication of individual contributions
Group projects where the students’ individual contributions are not indicated must always be followed by an oral exam. The exam can be either an individual oral exam or an oral group exam. Therefore, students cannot be awarded an individual grade on the basis of a group project alone—but they are awarded a grade or another form of assessment on the basis of an overall assessment of the project and the subsequent oral exam.

Read more about group exams in chapter 3.2.3. below.

DTU recommends a maximum of six students for group projects in connection with courses. The individual course coordinator may allow a maximum number which is lower or higher than six if in line with the learning objectives.

General rules regarding BEng projects, BSc projects, and MSc theses can be found in the curricula for the individual programmes.

3.2.3. Exam forms

Different rules governing the main forms of assessment are described below. Other forms of assessment can be approved by the relevant department board of studies.

Oral exams
As a general rule, all oral exams are open to the public, but can be held behind closed doors under special circumstances—justified, for instance, on grounds of student needs. Oral exams may extend over several days. Any dates in addition to the specified exam dates must be agreed with the students (see chapter 2.7 of these rules and regulations, ‘Changes to course descriptions’).

If an individual oral exam is held as a follow-up to a group project and as a follow-up to an oral group exam, if relevant, the students may not be present in the exam room before their own individual oral exam.
**Oral group exams**

An oral exam can take place as a group exam. Group exams are typically held in connection with written assignments prepared by two or more students (group project).

At oral group exams, the students are examined individually in such a way as to ensure that an individual assessment is made of the students’ performance. When organizing an oral group exam, the course coordinator must ensure that the time allocated for the exam is adapted to the number of students participating in the exam. All members of the project group are present during the entire exam.

It is important that each assessor notes the level and quality of participation of the individual students. The assessors must also ensure that all students participate in the exam to allow individual assessments to be made.

Students are entitled be awarded the grade in private.

The possibility of choosing an individual exam instead of a group exam is only available to students with special educational needs. Decisions regarding this are made by the course coordinator.

**Practical exams as part of the teaching or as a final test**

Courses comprising exercises (laboratory courses, workshop courses etc.) may be subject to continuous assessment or include a practical exam at the end of the course. In connection with continuous assessment, the students must be informed of the criteria for passing the course at the beginning of the course. Each student’s contribution must be clearly stated so they can be assessed individually.

**Written exams (written on-site exams)**

Written exams are always individual. The duration of the exam must be stated in the course description.

The departments are responsible for preparing the exam assignments. If external examiners are used, the assignments must be approved by the external examiner(s) participating in the assessment of the exam papers. In connection with the preparation of written exam assignments, the approximate weighting of the individual tasks (questions) in the assessment can be stated to guide the students.

If less than ten students register for a written exam, the lecturer is entitled to change the assessment form to an oral exam up until one week after the exam registration deadline. This must be done with due regard for the fact that the students were expecting a written exam. The department is responsible for notifying the students in the event of a change in the assessment form. If the exam form is changed into an oral exam, the lecturer can request that registered students contact the department regarding the exam planning. If the lecturer and all registered students agree, another approved assessment form can be applied.

Exam papers must be prepared in the language of instruction. In connection with courses taught in English based on English teaching material, exam assignments must be prepared in English only. Exam papers must be prepared in the language of instruction. The assessors may allow exam papers to be submitted in other languages. Special rules apply to MSc theses.
3.3 Use of aids and materials at written exams

Exam assignments must generally be formulated in such a way that prevents them from becoming an aids and materials exam. Emphasis must be placed on testing the students’ academic knowledge at the time of the exam.

Students must not gain unauthorized access to information during the exam, including using the Internet. Therefore, students are not allowed to bring mobile phones etc. The exam paper submitted must be prepared during the exam.

Students are always allowed to bring standard dictionaries, i.e. spelling dictionaries, contemporary language dictionaries, and other language dictionaries, but not, for example, technical or medical dictionaries. This does, however, not include language exams where dictionaries are not permitted.

Students are always allowed to bring a calculator, unless the department forbids the use of calculators or makes one available at the exam. The department can make computers available at the exam, in which case students are not allowed to bring their own computer.

Students are not allowed to use their own printer at the exam.

Aids and materials permitted at exams are specified in the course description. There are three options:

1. No aids and materials permitted
2. Written materials permitted (i.e. books, notes, old take-home assignments, etc. but not technical aids)
3. All aids and materials permitted (i.e. a standard laptop, tablet, or similar in addition to written materials).

Calculators, computers, and other electronic aids must not be set up in a way that enables communication with others inside or outside the exam room.

Students are responsible for any aids and materials they bring to the exam, and DTU generally does not make any type of facilities available for their use. Students are not granted extra time if the aids they have brought to the exam have a malfunction, are out of power etc.

Special rules apply to students under the SPS scheme (Special Education Support), who may need special aids or conditions to be examined at the same academic level as the other examinees. Permission to use special aids, other than the generally permitted aids and materials, must be granted. For more information, see DTU’s website on Special Educational Support here.

3.4 Cheating at exams and other forms of assessment

DTU has established a number of principles for good scientific and ethical conduct/practice at DTU, which, among other things, state that through their projects and conduct during courses, students must show that they have understood the principles of good scientific practice. DTU’s principles can be found here.

DTU thus requires that students at DTU demonstrate independence in their work, and that the exam always reflects the students’ own work.
DTU considers it cheating if students at an exam hand in work which they have not independently produced at the exam in question, if students use prohibited aids and materials at an exam, or if students demonstrate academic dishonesty, for example by manipulating or falsifying data. DTU also considers it exam cheating if a student helps another student violate the exam rules.

Examples of violation of the exam rules include plagiarism in the form of copying entire documents or parts of documents from the Internet or copying other people’s exam papers. Violation of the exam rules can also be copying own previous exam papers/assignments, communicating on tasks during individual exams with invigilation, or falsifying data from laboratory tests or analyses. Cheating at exams furthermore includes not complying with the rules on correct quotation or referencing.

Written assignments may only be submitted for assessment once. Written assignments previously assessed at DTU or another educational institution may not be reassessed, regardless of the grade earned and whether the assignment is the result of the student’s own previously submitted work.

DTU can choose to cancel an exam and request the student to resit the exam if there are reasonable grounds for suspicion of irregularities in connection with the student’s exam paper which strongly indicate that the student’s achievement of the current learning objectives cannot be assessed on the basis of the exam. The exam form in connection with the new exam may differ from the exam form at the ordinary exam. Exams which are cancelled due to suspicion of irregularities are not considered an exam attempt.

If the new exam confirms suspicions of cheating, a decision is taken in accordance with DTU’s rules regarding disciplinary measures for students.

If the new exam does not confirm the suspicions of cheating, the decision is taken the student cannot be deemed to have violated the exam rules. The student is assessed based on the performance at the new exam.

The general rules regarding quotations and references in connection with written assignments state that direct quotes from other people’s work or own work must be indicated with quotation marks at the beginning and end of the quotation, and a precise reference to the source of the quote must be made either in parenthesis or in a note, including the pages on which the quote is found. If the quote is not rendered word by word, but derives from a specific source, the source must also be indicated in parenthesis or in a note with reference to the relevant page numbers. Sources must be listed in the bibliography.

‘Stop plagiarism’ (www.stopplagiat.nu) is a web tutorial for students on plagiarism. Here you can find further guidelines on quotes and source references.

3.4.1. Procedure in case of cheating at exams
The department must notify the Office for Study Programmes and Student Affair via eksamenssnyd@adm.dtu.dk if there is suspicion of violation of the exam rules. Violation may lead to sanctions. Find further information on this in chapter 8.1, 'Disciplinary measures'.

Following consultation of the student suspected of violating the rules, the Office for Study Programmes and Student Affairs makes a decision on the matter. If the student maintains that there are legal discrepancies in the decision, the student can appeal to the dean of the relevant programme within two weeks of receiving the decision.
These rules are laid down by the DTU President in accordance with section 14(9) of the Danish University Act (consolidated act no. 261 of 18 March 2015) (*universitetsloven*).

### 3.5 Extra time at written exams

DTU can grant exemption from the specified exam conditions for

1. students with physical or psychological impairment (e.g. dyslexia, acute illness), provided that the impairment has a significant impact on the student’s performance at the exam
2. students in their first year of study in Denmark whose mother tongue and qualifying exam are not Danish, provided that the exam is in Danish only
3. students with similar difficulties, for instance students who can document that they are in the last month of pregnancy or are breast feeding a baby. Exam anxiety is not a valid reason for extra time at written exams.

To be granted special exam conditions, the Office for Study Programmes and Student Affairs must deem it necessary in order to ensure that such students are examined on equal terms with the other students. If special exam conditions are granted, the academic level of the exam must not be reduced.

Applications for special conditions/extra time at two- and four-hour written exams must be submitted to the Office for Study Programmes and Student Affairs no later than 1 November for winter exams, no later than 15 April for summer exams, and no later than 15 June for the re-exam period in August. The application form is available here, and applications must be sent to aus-sps@adm.dtu.dk.

### 3.6 Illness in connection with exams

Students who are unable to participate in an exam or who have to leave an exam due to illness must, no later than one week following the exam period, send documentation of the illness to the Office for Study Programmes and Student Affairs. Otherwise, unattended exams during the period of illness will count as exam attempts. The student in question must bear the expenses.

Students who become ill during the exam must notify an invigilator or examiner before leaving the exam.

If a student completes an exam despite not feeling well, it will count as an exam attempt.

The following rules apply regarding medical certificates:

Students must contact the doctor on the day of the exam or the proximate weekday at the latest, possibly by telephone.

If the period of illness stated on the medical certificate is ‘of short duration’, the certificate is valid for 14 days from the date of issue. If the period of illness is ‘of long duration’, the medical certificate is valid for four weeks from the date of issue.

Exams in the course(s) covered by a medical certificate must normally be taken in the next re-exam period (see chapter 3.9 ‘Re-exams’).
If a student is unable to comply with one of the deadlines specified for the programme due to documented illness, the deadline will be extended until the next exam is held in the course in question without the student having to submit an application. If the student remains ill at the next exam in the course, the student must submit an application for an exemption to have the deadline extended again.

If a student is unable to participate in an exam due to severe illness of a family member or friend, or in case of a serious event that may affect the student’s performance at the exam, the student can apply for cancellation of the exam by submitting relevant documentation to the Office for Study Programmes and Student Affairs via email to studieservice@adm.dtu.dk. If the student has already completed the exam, it will count as an exam attempt, and the exam cannot be cancelled.

Students who fall ill while completing the BEng project, BSc project, or MSc thesis must notify the supervisor immediately. If students wish to extend the project period due to documented illness, the department may grant a short extension of a maximum of three weeks. In the event of long-term illness, students can apply for an exemption to extend the project period if medical documentation can be provided. See chapter 4.5 ‘Exemption’ in these rules and regulations.

### 3.7 External examiners and confidentiality

All external examiners used at DTU must be members of the nationwide engineering examiner corps (www.censornet.dk).

The external examiners' activities are covered by the Public Administration Act, including the provisions on disqualification and secrecy.

The course description specifies whether a course is assessed by an external examiner or as an internal examination. Final projects are always assessed by an external examiner.

The Examination Order states that during the evaluation process, both the examiner and the external examiner must make notes about the performance and grading. The notes are for personal use as a reference when drafting a statement in the event of an appeal. The notes must be kept for at least a year, and until the conclusion of any appeal procedure.

Projects which, entirely or partially, are carried out with private companies, may, taking into account any information about trade secrets, know-how etc. in the report, be treated as confidential, which means that the oral presentation will not be open to the public. It may be agreed that the report must not be made publicly available.

### 3.8. Deadlines for grading

**Exams in 13-week courses:**
No later than four weeks after the day of the exam.

**3-week courses:**
No later than four weeks after the last day of the 3-week period.

The deadlines for courses do not include Christmas holidays and public holidays.

**Engineering internship:**
No later than six weeks after the submission date. This does not include Christmas holidays and public holidays.

**BEng project/BSc project/MSc thesis**
The grade is awarded in connection with the oral exam. The oral exam must be held no later than two weeks after submission of the written report.

This does not include Christmas holidays and public holidays.

In exceptional circumstances, the head of department can approve a later exam date.

### 3.9 Re-exams

Students who have not passed the first exam attempt in a course will automatically be registered for the second exam attempt at the next re-exam, but may withdraw their registration within the applicable deadlines. Students are responsible for registering for any subsequent exam attempts. Students can furthermore withdraw from the third exam attempt themselves within the applicable deadlines.

Students are not entitled to take the same course twice. They may, however, register for the course again if there are vacant places.

Re-exams take place in May (re-exams for the ordinary exams in December) and August (re-exams for the ordinary exams in May). Exams in a specific course are offered in the ordinary exam period and in the subsequent re-exam period. A list of exam dates can be found on Inside.

The examination form in connection with re-exams may differ from the examination form at ordinary exams. Students must be informed of the examination form at the re-exam no later than 14 days prior to commencement of the re-exam period. See chapter 3.2.3 though, regarding written exams with less than ten students registered.

Students who fail an exam (non-attendance, grade -3 or 00, or not passed) or fall ill at an exam in the exam period in which they were to complete their programme have the opportunity to resit the exam in the same exam period or in immediate continuation thereof. Students wishing to take a re-exam/make-up exam must contact the Study Information at Lyngby Campus or the Study Centre at Ballerup Campus within 14 days of the announcement of the grade. Students must also contact the relevant department immediately after approval by the Study Information/Study Centre.

#### 3.9.1. Part-exams in connection with re-exams

**3.9.1.1 Course with part-exams where part-grades are awarded, and the overall grade is calculated on the basis of a weighting of the individual part-grades**

Students may not resit passed part-exams. Students resit exams to pass any part-exam(s) failed in previous attempts to pass the exam. There may, however, be special circumstances in connection with the third exam attempt requiring students to resit passed part-exams, for example if a course has changed significantly in terms of form and content.

**3.9.1.2 Course with part-exams where the course is evaluated on the basis of an overall assessment, i.e. no part-grades are awarded**
Students resit exams to complete part-exams in the course, enabling the students to pass the course based on an overall reassessment. As a general rule, approved part-exams form part of an overall reassessment at the re-exam. There may be special circumstances in connection with the third exam attempt requiring students to resit approved/passed part-exams. Such a decision is made by the course coordinator based on an academic assessment.

For both part-exams with part-grades and overall assessments, the department board of studies make a decision in the event of a disagreement between a student and a course coordinator regarding whether a part-exam is to be resit in connection with the third exam attempt.

### 3.9.2. Mandatory assignments as a prerequisite for exam participation

Students who have not submitted mandatory assignments and/or had them approved etc. in connection with the ordinary exam in a course will not be registered for the second exam attempt in the course until the course coordinator has given the students the opportunity to fulfill the prerequisite for exam participation. Students must be registered for the second exam attempt in the course as soon as possible.

- **Second exam attempt**: Students who, in connection with the ordinary exam in a course, have submitted the mandatory assignments and had them approved to be able to take the exam, but failed the exam, can participate in the first re-exam without having to submit the mandatory assignments again. The reason for this is that it is technically the same exam period (December/May and May/August).

**Third exam attempt etc.**: Students are not entitled to take a re-exam based on previously submitted and approved mandatory assignments. The course coordinator can decide that it is necessary for the student to resubmit the assignments in order to take the re-exam. This decision can, for instance, be based on educational and didactic considerations or the fact that the mandatory assignments have changed significantly due to changes in the course content and the learning objectives for the course.

Read more about mandatory assignments as a prerequisite for exam participation in chapter 2.4.2.

### 3.11 Dating of certificates

If students complete their programme with a BEng project, a BSc project or a MSc project, the date on their certificate will be the date of the oral presentation.

If the final programme element is a course, the date on the students’ certificate will be the date on which the last course was passed.

### 3.10 Exam complaints

Exam complaints must be submitted within two weeks of the announcement of the grade on DTU Inside. For oral examinations, the deadline is two weeks after the examination is held.

Students are encouraged to discuss their exam paper/performance with the course coordinator/examiner before submitting an exam complaint. The two-week submission deadline, however, still applies.
Complains can be submitted regarding:
1) Legal issues
2) The basis for examination (questions, assignments etc.)
3) The exam process
4) The assessment

- The complaint must be in writing and justified. Dissatisfaction with the grade without further justification does not suffice and does not qualify as a justified complaint.

- The complaint must be submitted using the student email (sxxxxxx@student.dtu.dk) to the Office for Study Programmes and Student Affairs via email to studenterklager@dtu.dk

- Complaints must include the student’s name, address, student ID number, and course number of the relevant course.

- The Office for Study Programmes and Student Affairs forwards the complaint to the examiner and, if relevant, the co-examiner, who submit a statement on the assessment and the student’s objections.

- The assessors’ statement is then forwarded to the student, who has one week to comment on the statement.

- A decision on the matter is made by the Office for Study Programmes and Student Affairs on the basis of the assessors’ statement and the student’s comments, if any, and may be one of the following:
  1) Offer of a reassessment (new assessment) by new assessors (however, not in connection with oral exams)
  2) Offer of a re-exam (new exam) assessed with new assessors
  3) The student’s complaint is not upheld.

If the student is offered a reassessment or re-exam, the student has two weeks to accept the offer. The student must be aware that a re-exam and a reassessment may result in a lower grade. Note that it is not possible to complain about the assessment of a re-exam or a reassessment unless the complaint concerns legal issues.

If the student’s complaint is not upheld, the student has the possibility of appealing against the decision. The appeal must be filed within two weeks of announcement of the decision. It must be justified in writing and submitted to the Office for Study Programmes and Student Affairs to studenterklager@dtu.dk using the student email address. The decision is made by a board of appeals appointed specifically to make a decision on the matter, comprising two external examiners, a lecturer, and a student within the relevant subject area. The decision of the board of appeals may be 1) to offer a reassessment by new assessors (however, not in connection with oral exams), 2) to offer a re-exam with new assessors, or 3) that the student’s appeal is not upheld. The decision of the board of appeals cannot be further appealed with respect to academic issues.
Rules and regulations chapter 4

4. Credit Transfer, Studying Abroad, Exemption, Leave, etc.

4.1 Credit transfer from previously non-completed study programmes at the same level (pre-commencement credit transfer)

4.1.1 General information on pre-commencement credit transfer
Upon admission to DTU’s BEng, BSc, and MSc programmes, students are obliged to apply for credit transfer for passed programme elements (courses etc.) from all previous non-completed study programmes at the same level. This may, for example, be the case if an applicant to a BSc programme has previously been admitted to another BSc programme without having completed the programme.

Students are free to apply for credit transfer for passed programme elements from previous completed study programmes at the same level.

For BEng programmes and BSc programmes transferred courses must be at BEng level as a minimum, i.e. from an engineering college, a university college or a university. This is applicable from the Summer 2017 intake. For MSc programmes transferred courses must be at master level.

Students who have been granted pre-commencement credit transfer must still comply with the study activity requirement (30 ECTS credits in the first year of study and 45 ECTS credits in each of the following years of study). The number of transferred ECTS credits will not be deducted from the study activity requirement.

Applicable from Winter 2016/2017 the maximum duration of study will be reduced with one semester for each 30 ECTS the student has been granted in pre-commencement credit transfer.

4.1.2 Submission of applications for pre-commencement credit transfer
If it is deemed that credit transfer for programme elements can be granted to the mandatory parts of the programme, students will be granted credit transfer. If it is deemed that credit transfer for programme elements can be granted to the elective parts of the programme, students can decide whether they want credit transfer. A credit transfer cannot be withdrawn once it has been granted.

In connection with pre-commencement credit transfer, students can still obtain a diploma from DTU even though credit transfer has been granted for more than half of the programme.

If students do not submit an application for credit transfer for previously passed programme elements at the same level or submit incorrect or incomplete information thereon, DTU may withdraw its offer of a place on the study programme.
4.2 General rules on credit transfer during the study programme

DTU may grant credit transfer upon submission of an application. Credit transfer means replacing DTU courses or programme elements forming part of the student’s study programme by courses or exams passed at another Danish or foreign educational institution.

As a general rule, courses with a higher weighting than the prescribed ECTS credit total of the DTU study programme cannot be pre-approved or transferred. However, the weighting of transferred courses often does not correspond to the weighting of DTU courses. Furthermore, transferring courses equivalent to 7.5 ECTS credits may entail that the ECTS credit total only adds up if courses equivalent to 2.5 ECTS credits are chosen, which are only offered to a limited extent at DTU. In such cases, students may register for a final course corresponding to 5 ECTS credits—even if this means exceeding the prescribed ECTS credit total of the programme in question.

Students cannot be granted transfer of credits from the qualifying programme/exam.

It is not possible to transfer an MSc thesis from one MSc programme to another.

Courses for which credit transfer is being requested must be relevant to the DTU programme. Courses must be ‘passed’, ‘approved’, or awarded at least the grade 02 on the 7-point grading scale in order to be transferred to the programme.

For BEng programmes, transferred courses must be at BEng level as a minimum, i.e. from an engineering college, a university college, or a university.

For BSc programmes, transferred courses must be at university level.

For MSc programmes, transferred courses must be at university level. MSc students, however, are entitled to take 10 ECTS credits at BSc level in the course of the MSc programme. BSc level courses always form part of the electives group.

BEng and BSc students must as a minimum pass courses and projects at DTU corresponding to 90 ECTS credits to receive a diploma for a full-time study programme at DTU. This rule does not, however, apply to pre-commencement credit transfer.

MSc students must as a minimum pass courses and projects at DTU corresponding to 60 ECTS credits to receive a diploma for a full-time study programme at DTU. This rule does not, however, apply to pre-commencement credit transfer.

As regards credit transfer, a distinction is made between specific engineering courses and general engineering courses. Courses that do not have technical-scientific content, but fall within the learning objectives of the programme, are categorized as general engineering courses. Students may earn the following number of ECTS credits within the general engineering course category:

- 15 ECTS credits on the BSc programme
- 10 ECTS credits on the MSc programme
Language and culture courses can only be approved in connection with study abroad semesters and may not exceed 5 ECTS credits. Such courses are always transferred as BSc credits and are therefore included in the maximum of 10 ECTS credits at BSc level which MSc students are allowed to take as part of their programme. For BSc and MSc students, they are considered part of the general engineering courses as described above. For BEng students, they are considered part of the elective courses. Only language and culture courses related to the country in which the student is on the exchange can be transferred. English language courses cannot be transferred to the programme. Pre-commencement credit transfer for language and culture courses will not be granted.

In connection with credit transfer for completed programme elements from another educational institution, the grade ‘Pass’ will appear on the student’s DTU diploma.

All courses passed and ECTS credits must subsequently be transferred to the study programme. Students therefore cannot apply for credit transfer for some of the courses passed or ECTS credits only. A credit transfer cannot be withdrawn once it has been granted.

Credit transfer for study activities completed more than five years before admission will not be granted. In special cases, however, the credit transfer and exemption committee can make an exemption from this rule. The same applies to courses completed at DTU in connection with readmission or renewed admission to a DTU programme. Applications for exemption must be submitted via the exemption database www.dispensation.dtu.dk. From February 2017 and forth the head of studies, and not the credit transfer and exemption committee, will decide whether an exemption should be made from the 5-year limitation period. This decision is made in connection with the application for credit transfer through www.merit.dtu.dk.

BEng students who have completed a higher education programme in technical sciences prior to admission can apply for credit transfer for parts of the programme, provided that a fixed credit transfer agreement has been concluded. Students apply for credit transfer at www.merit.dtu.dk.

4.2.1 Pre-approved credit transfer
Students must apply for pre-approved credit transfer for planned programme elements from another university or another institution of higher education in Denmark or abroad. When the pre-approved courses have been passed, students must apply for final credit transfer at www.merit.dtu.dk. At the same time, students give their implied consent to DTU requesting the necessary information from the host institution if the students are unable to procure the documentation themselves.

The pre-approved credit transfer ensures that students are registered as studying actively during the semester in which they are not registered for courses at DTU due to study stays etc. elsewhere. If the pre-approved courses which the student is taking at the host university change during the semester, the student must submit a new application for pre-approved credit transfer. Each application must include a complete list of courses taken at the host university.

4.2.2 Submission of applications
Applications for pre-approval of credit transfer and final credit transfer are submitted electronically via www.merit.dtu.dk. Other enquiries regarding credit transfer are submitted electronically to merit@adm.dtu.dk via the student email.

Applications must include course description, documentation of level, and work load. As regards final credit transfer, applications must also include documentation of passed and failed courses. In
addition, an official description of the grading scale according to which the course is assessed must be enclosed.

The credit transfer and exemption committee for the MSc programmes (CMDU) and the credit transfer and exemption committee for the BEng programmes (DMDU) have authorized the Office for Study Programmes and Student Affairs to make decisions in cases related to credit transfer.

4.2.3 Students who have completed MSc courses on their BSc programme

Students who, as part of their qualifying exam, have passed a course or otherwise acquired academic knowledge and competences corresponding to courses in either the general competence group or the technological specialization group for the MSc programme must take a different course that contributes to the overall learning outcomes of the programme in question.

If the course in question belongs to the general competence group, students must choose a different course from the general competence group or the technological specialization group. In the latter case, students must contact the Study Administration at studieservice@adm.dtu.dk.

If the course in question belongs to the technological specialization group, students must choose a different course in the technological specialization group.

If it is not possible to choose a different course in line with the above rules, students must obtain approval from the head of studies to take a different course that supports the academic profile of the study programme. The head of studies contacts the Study Administration.

4.3 Studying abroad

A thorough description of the possibilities for studying abroad and the application deadlines can be found on Inside under ‘Study Abroad’ or on DTU’s website.

To be eligible for an exchange place, students must meet the following criteria:

- Students enrolled on a BSc or BEng programme must have completed at least two years of study (120 ECTS credits) prior to commencement of the exchange stay, unless the student is attending a summer school abroad.

- Students must be enrolled on an ordinary full-time DTU programme at the time of application and during the entire exchange stay.

Students are expected to pass and transfer at least 20 ECTS credits per semester (however, not students attending summer school abroad) and comply with other study activity requirements made by DTU, the host university, and other relevant bodies. Students who do not comply with this requirement may be requested to repay any grants received from DTU.

4.4 Transferring to a MSc programme

Students lacking less than 55 ECTS credits of the BEng/BSc programme can apply to take MSc courses worth a total of up to 30 ECTS credits, provided that they wish to apply for admission to an MSc programme at DTU. Exemption will not be granted for additional ECTS credits. The using of this rule may not lead to a prolongation of the total time of study of the BEng/BSc programme.
4.5 Exemption

Students who fail to comply with the rules specified in the curriculum may continue their studies only if they are granted exemption. DTU’s Exemption Committee may grant exemption from the curriculum rules, course descriptions, and DTU’s rules and regulations, provided that the exemption is not contrary to any acts or ministerial orders in the field of education.

Applications for exemption must be justified and accompanied by the necessary documentation. Reasons for submitting an application may include the following:

1. Special circumstances, such as personal illness, the death of a close relative, civic duties as a lay judge or juror, compulsory military service, or other circumstances in relation to the individual student and for which the student is not responsible.

2. Maternity/paternity leave
   Upon submission of an application, the study activity requirement will be reduced by 45 ECTS credits for birth-giving parents.
   Upon submission of an application, the study activity requirement will be reduced by 22.5 ECTS credits for co-parents.
   Application is to be submitted through studieservice@adm.dtu.dk accompanied by the necessary documentation.

3. Functional impairment in the event that support under the SPS scheme cannot be granted.

4. The student is an elite athlete under Team Danmark.

5. The student is an entrepreneur. Students must as a minimum document either that they have their own business which has a turnover and income-generating activities, or that they are part of an entrepreneurial environment at DTU or regional growth environments. [This rule will be elaborated in more detail as soon as possible.]

6. The student is chairman of a voluntary organization under the Danish Youth Council (DUF), a member of the board of Polyteknisk Forening (PF student association) or other similar...
organizations, and is able to document that the activities are so time-consuming that being a full-time student is not possible.

As a general rule, the transfer and exemption committees do not consider the following as reasons entitling exemption:

- Regular or voluntary work
- Participation in committee and board work, including department boards of studies and the advisory committees for the MSc programmes (CUU) and BEng programmes (DUU), respectively
- Lack of knowledge of the rules governing the study programme
- Personal circumstances, such as housing or financial problems etc.

Applications for exemption must be submitted via the exemption database www.dispensation.dtu.dk. You can read more about the submission of applications for exemption on the website of the Study Guidance Office here.

If the student's application is not met, the decision of the Exemption Committee can be referred to the Dean of Undergraduate Affairs. The deadline for submission of complaints is two weeks from the day the student received the decision. The complaint, which must be written and well-reasoned, should be submitted to DTU, the Office for Study Programmes and Student Affairs via dispensation.dtu.dk.

4.6 Leave of absence

[The text below written in Italics are not valid anymore.]

Leave of absence without justification

At the end of the autumn semester 2016, students can no longer apply for a leave of absence without justification. This means that from 1 February 2017, a leave of absence can only be granted if special justification is provided. See below.

For autumn 2016, the following applies:
Students can apply for a leave of absence without justification if they have passed 60 ECTS credits in connection with the study programme on which they are enrolled; however, MSc students only have to pass 30 ECTS credits.

Throughout the entire programme, students may be granted a maximum leave of absence of one year of study. Students can apply for a leave of absence once for an entire year or twice for the duration of the teaching period. A teaching period can be either one semester or a 13-week period.

Leave of absence with special justification

Students can apply for a leave of absence with special justification for up to one year, for example due to maternity/paternity leave, adoption, compulsory military service or illness.
Students cannot be granted a leave of absence during final projects without providing documentation of special justification.

If students do not comply with DTU’s rules regarding study programmes, they cannot apply for a leave of absence until they have been granted an exemption to continue their studies.

All study activity must cease during the period of leave. Students may not participate in courses and exams or submit final projects in the teaching period during which the leave of absence has been taken. From February 2017 during their leave of absence students may register for and attend exams in the exam period.

The study activity requirement will be reduced by the duration of the period for which leave has been granted.

Students will not receive monthly grants (SU) during a leave of absence, and deadlines relating to the programme, e.g. the first-year exam and maximum period of study, will be extended by the period of leave (calculated in entire semesters).

To participate in elections to governing bodies, students must be enrolled on the first day of the month in which the election is called, and must still be enrolled at the time of the election. Students may only exercise their voting rights and retain their eligibility during a leave of absence exceeding six months if the period of leave expires at the beginning of the term of office at the latest.

During the period of leave, students must keep updated on announcements posted by DTU.

Students who are admitted to another study programme during the period of leave must withdraw from one of the programmes, so that they are only enrolled as full-time students on one programme (see chapter 5 of the rules and regulations, ‘Change of study programme’ below).

Applications for leave must be submitted to the Office for Study Programmes and Student Affairs to studieservice@adm.dtu.dk no later than three weeks into the required period of leave. The application form can be found at DTU Inside under ‘Structure and rules / Leave of absence’.

If students wish to extend their leave of absence beyond one year, the application must be submitted via www.dispensation.dtu.dk.

4.8 Withdrawal from study programmes

Students cannot be enrolled on more than one full-time study programme at the time.

Students who wish to withdraw from their study programme at DTU must contact the Study Guidance Office.

4.9 Readmission

4.9.1. BSc and BEng programmes

Students who withdraw from their study programme and wish to be readmitted must have passed what corresponds to the first academic year on the programme to which they are applying for readmission. Students who do not meet this requirement must apply for admission again on equal terms with other students.
On the BEng programmes, the first and second semesters of the relevant study programme must be passed as a minimum.

On the BSc programmes, 60 ECTS credits from the three mandatory blocks of courses (basic natural science courses, technological specialization courses, and projects and professional skill courses) must be passed as a minimum.

Students may apply for readmission twice a year:

Application deadline 1 May for readmission on 1 September:
Applications for readmission are submitted via www.optagelse.dk.

Application deadline 1 November for readmission on 1 February:
To apply for readmission, students must use the winter application form made available on DTU’s website some time before 1 October from when applications for winter admissions open. Students who apply for readmission to a study programme which is not open for winter admissions must instead complete the application form on readmission available on DTU’s website.

Readmission will only be granted if there are vacant places at the level of study on the study programme for which the student is applying. Students who withdraw from their study programme themselves can, however, at the earliest be admitted to and enrolled on the programme five months after withdrawal.

Students who have been withdrawn from their study programme by DTU for study-related reasons or who have violated DTU’s rules at the time of application for readmission need to apply for an exemption. This can only be done after DTU has informed the student about the matters for which an application for exemption must be submitted. If an exemption is granted, if the admission requirements can be met, and if there is a vacant place at the level of study for which readmission is applied, the student will be readmitted. If an exemption cannot be granted, the student’s application for readmission will be rejected.

Courses completed at DTU more than five years prior to readmission can generally not be transferred to the new study programme. In special cases, however, the credit transfer and exemption committee can make an exemption from this rule. Applications for exemption must be submitted via the exemption database www.dispensation.dtu.dk. From February 2017, the relevant head of studies, and not the credit transfer and exemption committee, will carry out an assessment of whether an exemption from the five-year limitation period can be granted.

4.9.2. MSc programmes
Students who wish to be readmitted to an MSc programme must apply according to DTU’s general rules on admission to MSc programmes and within the applicable deadlines. Find out more on DTU’s website: http://www.dtu.dk/Uddannelse/Ansoegning-og-optagelse/Optagelse-kandidat/Ansoegningsskema-og-ansoegningsfrister

Readmission will only be granted if there are vacant places at the level of study on the study programme for which the student is applying. Students who withdraw from their study programme themselves can, however, at the earliest be admitted to and enrolled on the programme five months after withdrawal.

Students who have been withdrawn from their study programme by DTU for study-related reasons or who have violated DTU’s rules at the time of application for readmission need to apply for an exemption. This can only be done after DTU has informed the student about the matters for which
an application for exemption must be submitted. If an exemption is granted, if the admission requirements can be met, and if there is a vacant place at the level of study for which readmission is applied, the student will be readmitted. If an exemption cannot be granted, the student’s application for readmission will be rejected.

Courses completed at DTU more than five years prior to readmission can generally not be transferred to the new study programme. In special cases, however, the credit transfer and exemption committee can make an exemption from this rule. Applications for exemption must be submitted via the exemption database [www.dispensation.dtu.dk](http://www.dispensation.dtu.dk). *From February 2017, the relevant head of studies, and not the credit transfer and exemption committee, will carry out an assessment of whether an exemption from the five-year limitation period can be granted.*

### 4.9.3. Deadlines for readmitted students

The study activity requirement for readmitted students is 45 ECTS credits per academic year. The academic year is calculated from the date of readmission.

The maximum period of study for readmitted students is the prescribed period of study + one year from the readmission date; however, reduced by one semester for every 30 ECTS credits which the student has already passed.

**Head of study**

Kirstine Berg-Sørensen  
**DTU Physics**  
Building: 309 Room: 220  
Phone: 45 25 31 01  
Email: [Kirstine.Berg-Sorensen@fysik.dtu.dk](mailto:Kirstine.Berg-Sorensen@fysik.dtu.dk)