# Information and Communication Technology

## Studieplan for retningen

### 1st semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Points</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>62400</td>
<td>Mathematics 1</td>
<td>10</td>
<td>Outside schedule structure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E1A (mon 8-12) and E5A (wed 8-12)</td>
</tr>
<tr>
<td>62401</td>
<td>Digital Electronics 1</td>
<td>10</td>
<td>Outside schedule structure</td>
</tr>
<tr>
<td>62402</td>
<td>Object oriented programming 1</td>
<td>10</td>
<td>Outside schedule structure</td>
</tr>
<tr>
<td>62403</td>
<td>Workshop Course</td>
<td>0</td>
<td>Outside schedule structure</td>
</tr>
</tbody>
</table>

### 2nd semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Points</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>62431</td>
<td>Digital Electronics 2</td>
<td>10</td>
<td>E3A (Tues 8-12) and E2B (Thurs 8-12) and January</td>
</tr>
<tr>
<td>62432</td>
<td>Object oriented software engineering</td>
<td>10</td>
<td>E2A (Mon 13-17) and E1B (Thurs 13-17) and January</td>
</tr>
<tr>
<td>62440</td>
<td>Mathematics 2 - Discrete Mathematics</td>
<td>5</td>
<td>E1A (Mon 8-12) Autumn E4B (Fri 8-12)</td>
</tr>
<tr>
<td>62441</td>
<td>Game physics</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

### 3rd semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Points</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>62470</td>
<td>Computer Science</td>
<td>5</td>
<td>E5A (Wed 8-12) and January, F5A (Wed 8-12) and June</td>
</tr>
<tr>
<td>62471</td>
<td>Distributed Systems</td>
<td>5</td>
<td>E1A (Mon 8-12) and E2B (Thurs 8-12) and January, F1A (Mon 8-12) and F2B (Thurs 8-12) and June</td>
</tr>
<tr>
<td>62472</td>
<td>Computer Networks and the Internet</td>
<td>5</td>
<td>E3A (Tues 8-12) and January, F3A (Tues 8-12) and June</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
<td>Schedule</td>
</tr>
<tr>
<td>------------</td>
<td>------------------------------------------------</td>
<td>---------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>62473</td>
<td>Project Course in Distributed Systems</td>
<td>15</td>
<td>E2 (Mon 13-17, Thurs 8-12) and E4B (Fri 8-12) and January, F4 (Tues 13-17, Fri 8-12) and F2B (Thurs 8-12) and June</td>
</tr>
<tr>
<td>62500</td>
<td>Linear Algebra and Data Mining</td>
<td>10</td>
<td>E1A (Mon 8-12) and E5A (Wed 8-12), F1A (Mon 8-12) and F5A (Wed 8-12)</td>
</tr>
<tr>
<td>62502</td>
<td>Operating Systems and Embedded Linux</td>
<td>5</td>
<td>E3A (Tues 8-12) and January</td>
</tr>
<tr>
<td>62503</td>
<td>Parallel Programming 4</td>
<td>5</td>
<td>E4B (Fri 8-12) and January</td>
</tr>
<tr>
<td>62504</td>
<td>Interdisciplinary Project 4</td>
<td>10</td>
<td>E4A (Tues 13-17) and E2B (Thurs 8-12) and January</td>
</tr>
</tbody>
</table>

4th semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Schedule</th>
</tr>
</thead>
</table>

5th semester

- Elective courses 30 point

**Variant 1: internship semester**

6th semester

- Internship 30 point

7th semester

- Elective courses 15 point

-- Diploma Engineering Project 15 point

**Variant 2: split internship**

6th semester

- Internship 15 point

-- Elective courses 15 point

7th semester

- Internship 15 point

-- Diploma Engineering Project 15 point

**NOTE:** you cannot start on the diploma engineering project until the full internship has been completed and approved.
## Elective courses

13 week courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>62407</td>
<td>Internet of Things - Theory and Practice</td>
<td>5 point</td>
<td>E4B (Fri 8-12), F4B (Fri 8-12)</td>
</tr>
<tr>
<td>62413</td>
<td>Advanced Object Oriented Programming using C# and .NET</td>
<td>5 point</td>
<td>E5B (Wed 13-17), F5B (Wed 13-17)</td>
</tr>
<tr>
<td>62415</td>
<td>Mobile Application Development</td>
<td>5 point</td>
<td>E2B (Thurs 8-12), F2B (Thurs 8-12), August</td>
</tr>
<tr>
<td>62416</td>
<td>Advanced Mobile Application Development</td>
<td>5 point</td>
<td>E1B (Thurs 13-17), F1B (Thurs 13-17)</td>
</tr>
<tr>
<td>62417</td>
<td>Mobile Application Development with Swift</td>
<td>5 point</td>
<td>E2B (Thurs 8-12), F2A (Mon 13-17)</td>
</tr>
<tr>
<td>62437</td>
<td>Advanced Mobile Application Development w/ project</td>
<td>10 point</td>
<td>F1B (Thurs 13-17), E1B (Thurs 13-17)</td>
</tr>
<tr>
<td>62438</td>
<td>3D-application development on mobile devices</td>
<td>5 point</td>
<td>E3B (Fri 13-17)</td>
</tr>
<tr>
<td>62439</td>
<td>3D-application development on mobile devices w/ project</td>
<td>10 point</td>
<td>E3B (Fri 13-17)</td>
</tr>
<tr>
<td>62501</td>
<td>Linux Server and Network</td>
<td>5 point</td>
<td>E4A (Tues 13-17), F4A (Tues 13-17)</td>
</tr>
<tr>
<td>62519</td>
<td>Security in IoT Devices and Networks</td>
<td>5 point</td>
<td>E5A (Wed 8-12), F5A (Wed 8-12)</td>
</tr>
<tr>
<td>62528</td>
<td>Security in IoT Devices and Networks w/Project</td>
<td>10 point</td>
<td>E3A (Tues 8-12), F3A (Tues 8-12)</td>
</tr>
<tr>
<td>62530</td>
<td>Network Security</td>
<td>5 point</td>
<td>E4B (Fri 13-17)</td>
</tr>
<tr>
<td>62531</td>
<td>Digital coding and error correction methods</td>
<td>5 point</td>
<td>F2B (Thurs 8-12)</td>
</tr>
<tr>
<td>62538</td>
<td>Network Security w/Project</td>
<td>10 point</td>
<td>E1B (Thurs 13-17), Spring</td>
</tr>
<tr>
<td>62549</td>
<td>Advanced Object Oriented Programming using C# and .NET</td>
<td>7.5 point</td>
<td>E5B (Wed 13-17), F5B (Wed 13-17)</td>
</tr>
<tr>
<td>62570</td>
<td>Intelligent Cars and Mobile Applications</td>
<td>5 point</td>
<td>E3B (Fri 13-17), F3B (Fri 13-17)</td>
</tr>
<tr>
<td>62582</td>
<td>Digital Telephony</td>
<td>5 point</td>
<td>E1B (Thurs 13-17)</td>
</tr>
<tr>
<td>62583</td>
<td>Programmering af embedded wireless systems and sensors</td>
<td>5 point</td>
<td>E2A (Mon 13-17), F2A (Mon 13-17)</td>
</tr>
<tr>
<td>62589</td>
<td>Business Intelligence</td>
<td>5 point</td>
<td>E3B (Fri 13-17)</td>
</tr>
<tr>
<td>62598</td>
<td>Artificial Intelligence in Computer Games</td>
<td>5 point</td>
<td>E4B (Fri 8-12), F4A (Tues 13-17)</td>
</tr>
<tr>
<td>62999</td>
<td>Innovation Pilot</td>
<td>10 point</td>
<td>E5A (Wed 8-12) and E5B (Wed 8-12)</td>
</tr>
</tbody>
</table>
3 week courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Time</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>62238</td>
<td>Business Innovation</td>
<td>5</td>
<td>point</td>
<td>August</td>
</tr>
<tr>
<td>62408</td>
<td>Smart Devices and Internet of Things - Project</td>
<td>5</td>
<td>point</td>
<td>January, June</td>
</tr>
<tr>
<td>62419</td>
<td>System and Network Security - Project</td>
<td>5</td>
<td>point</td>
<td>January, August</td>
</tr>
</tbody>
</table>

Courses at Lyngby Campus

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Time</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>01410</td>
<td>Cryptology 1</td>
<td>5</td>
<td>point</td>
<td>F2A (Mon 13-17)</td>
</tr>
<tr>
<td>02209</td>
<td>Test of digital systems</td>
<td>5</td>
<td>point</td>
<td>E1B (Thurs 13-17)</td>
</tr>
<tr>
<td>02239</td>
<td>Data Security</td>
<td>7.5</td>
<td>point</td>
<td>E5B (Wed 13-17)</td>
</tr>
<tr>
<td>02393</td>
<td>Programming in C++</td>
<td>5</td>
<td>point</td>
<td>Fall</td>
</tr>
<tr>
<td>02561</td>
<td>Computer Graphics</td>
<td>5</td>
<td>point</td>
<td>E5A (Wed 8-12)</td>
</tr>
</tbody>
</table>

As a rule any elective course at DTU can be chosen, but only after an individual evaluation of the relevancy of the course.

**Bachelor (BEng) Project**

**General learning objectives**

The student must in the BEng project demonstrate the ability to act as an engineer in relation to:

1. Applying technical research as well as scientific and technical knowledge when developing and solving technical problems.

2. Acquiring new knowledge in relevant areas of engineering and be able to critically evaluate the found results.

3. Independently solving engineering tasks.

4. Planning, implementing and if relevant managing, technical and technological products, processes and systems.

5. Including relevant social, economic, environmental and work environment consequences when solving technical problems.

**Programme specific learning objectives**

6. The ability to analyse technical problems and design engineering solutions.

7. The ability to select relevant analysis, design, planning, implementation, testing, and documentation tools/methods in connection with an engineering task.

8. The ability to document and present processes and results of engineering tasks.
Course Substitution

From the summer of 2014 DTU offered a new Bachelor of Engineering. Due to this, some study activities will no longer be offered.

For details on removed study activities and courses of substitution, see the scheme below.

<table>
<thead>
<tr>
<th>Course</th>
<th>Course of Substitution</th>
<th>Another form of substitution</th>
</tr>
</thead>
<tbody>
<tr>
<td>62644</td>
<td>01901, Calculus and Algebra</td>
<td></td>
</tr>
</tbody>
</table>

Please contact your Head of Study Bo Holst-Christensen regarding other courses, which no longer will be offered.

Deadline for the study

Study Activity Requirements and Deadlines

Students must meet the study activity requirements and deadlines set out below. If students do not meet the requirements set out below, they can only continue on the study programme if granted an exemption.

Study Activity Requirements 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 your programme and 45 ECTS credits in each of the following years of study. The student must be allowed three examination attempts in courses where the accumulated ‘study activity requirement’ applies. Courses are understood as courses that the student has had the opportunity to register for 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 credits</td>
</tr>
<tr>
<td>4. year of study</td>
<td>165 ECTS credits</td>
</tr>
<tr>
<td>5. year of study</td>
<td>210 ECTS credits</td>
</tr>
</tbody>
</table>

Students enrolled at August 2015 or earlier

Other students enrolled at August 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</td>
</tr>
<tr>
<td>1 Sep 2018 – 31 Aug 2019</td>
<td>135 ECTS credits ect.</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>
</tbody>
</table>

**Students enrolled at February 2015 or earlier**
Students enrolled at February 2015 or earlier must at least pass 22.5 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>22,5 ECTS-point</td>
</tr>
<tr>
<td>1 Feb 2017 – 31 Jan 2018</td>
<td>67,5 ECTS-point</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 points each academic year. This requirement applies regardless of the number of examination attempts in courses attended in the relevant academic year.

**First-year Exam**
For students admitted before September 2015, the first-year exam is passed when the students, before the end of the second year of study after study start, have passed the exams in which they must participate before the end of the first year of study after study start (60 ECTS credits) in accordance with the student regulations.

**Maximum Period of Study**
For students admitted before September 2015, the maximum period of study can be seen below in the scheme.

<table>
<thead>
<tr>
<th>Enrolled in August</th>
<th>Programme</th>
<th>Enrolment</th>
<th>Maximum end of study</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B Eng</td>
<td>1 September 2014</td>
<td>31 January 2020</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 September 2013</td>
<td>31 January 2019</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 September 2012</td>
<td>31 January 2018</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 September 2011</td>
<td>31 August 2017</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 September 2010</td>
<td>31 August 2017</td>
</tr>
<tr>
<td></td>
<td>1 September 2011 or earlier</td>
<td>Prescribed study period + 3,5 year</td>
<td></td>
</tr>
</tbody>
</table>

**Completion Requirements**
Students must meet the following requirements in order to complete the B Eng programme:
• All courses, compulsory and elective, the engineering internship, and the B Eng project must be passed, i.e. students must have achieved at least the grade ‘02’ on the 7-point grading scale or the
assessment ‘Pass’ in courses that are assessed as pass/fail. This rule applies to all B Eng programme students from 1 September 2007.

- 210 ECTS credits must be obtained. Students on the Arctic Technology programme must obtain 240 ECTS credits, and Global Business Engineering students 270 ECTS; however, only 240 ECTS credits if the students at the time of admission have passed mathematics at A level, physics at B level, and chemistry at C level.
- At least 1/3 of the study programme for the individual students must be assessed by an external co-examiner.

- Students must have achieved grades in accordance with the 7-point grading scale in at least two-thirds of the total credits.

**Interim arrangement**

Students admitted before 1. september 2014 has the right to finish their bachelor in Engineering with this curriculum within the prescribed period of study plus a year.

If a student is not finished within this period, the student will be transferred to a new programme specification. If at all possible passed courses will be transferred to the new programme specification.

**Study regulations for the BEng programme at Ballerup Campus**

**Joint curriculum**

The curriculum comprises the following parts:

1. Introduction
2. Programme objective
3. Programme competence profile
4. Study form, study environment, and teaching
5. Programme structure
   - Mandatory part
   - Internship
   - Electives
   - Bachelor project
6. Contents
   - Courses
   - Internship
   - Bachelor project (BEng project)
7. Prerequisites and conditions for completion

7.1 Workshop course
7.2 First-year exam
7.3 Internship
7.4 Bachelor project
7.5 Duration

8. Exam forms and assessment

8.1 Criteria for passing
8.2 Exam registration

9. Other provisions

9.1 Evaluation and quality development
9.2 Course descriptions
9.3 Exemptions
9.4 Credit transfer
9.5 Transfer of credits from short-cycle higher education programmes
9.6 Internationalization
9.7 Title
9.8 Diploma

This curriculum was approved by the Executive Board of the former Copenhagen University College of Engineering (IHK) in May 2009. The curriculum was adjusted in September 2014.

1. Introduction

The curriculum is applicable to BEng students admitted to BEng programmes at Ballerup Campus (the former Copenhagen University College of Engineering, IHK) from 1 September 2007 up to and including 1 February 2014.

Students admitted up to and including February 2014 are entitled to complete the study programme to which they have been admitted within the prescribed period of study + one year. If students admitted prior to February 2014 are unable to complete the programme within this period, they will be transferred to one of the new BEng programmes which had the first admission of students in September 2014, and passed programme elements (courses) will be transferred to the new programme to the extent possible.

From September 2014, DTU’s Rules and Regulations apply to all BEng students at DTU, regardless of the year of admission. The Rules and Regulations can be found on DTU’s website at http://sdb.dtu.dk.

The curriculum has been prepared in accordance with the Danish Ministry of Higher Education and Science’s Ministerial Order no. 527 of 21 June 2002 on the Bachelor of Engineering programme (the Engineering Order), Ministerial Order No. 223 of 11 March 2014 on Admission to and Enrolment on Academy Profession and Professional Bachelor Programmes, and Ministerial Order No. 1519 of 16 December 2013 on Tests and Examinations in Professionally Oriented Higher Education Programmes.
Not all the rules of the Engineering Order and other general ministerial orders are reproduced in the curriculum.

2. Programme objective
(From the Engineering Order (only in Danish)):
The Bachelor of Engineering programme is to qualify students to take on professional roles in national and international contexts which involve:

- translating technical research results as well as natural science and technical knowledge into practical application by engaging in development projects and solving technical problems
- critically acquiring new knowledge in relevant fields of engineering
- independently solving engineering tasks
- planning, implementing, and managing technical and technological facilities, and being able to incorporate societal, economic, environmental, and occupational health and safety consequences in the solution of technical problems
- taking on high-level collaborative and management roles and engaging in relationships with people from different educational, linguistic, and cultural backgrounds.

In addition, the programme is to qualify students for an MSc programme or another continuing or further education programme.

3. Programme competence profile
The programme is built around coherent and theme-based courses of study providing the BEng graduates with academic, personal, and educational competences that enable them to perform their jobs and ensure continued personal development. The internships, electives, and final project constitute a coherent whole and provide the individual students with a special academic profile.

With reference to the Danish Ministry of Higher Education and Science’s publication of May 2007 on a new ‘Danish Qualifications Framework for Higher Education’ as well as the terminology applied and levels of higher education defined therein, the Bachelor of Engineering (BEng) programme provides the following qualifications:

Knowledge and understanding
Upon completion of the programme, the students are expected to have acquired:

- an understanding of how to convert natural science, technical, and - to varying extents, depending on the study programme - commercial knowledge into practical development and problem-solving
- knowledge of the planning, execution, documentation, and assessment of technical projects. This includes the incorporation of societal, economic, environmental, and occupational health and safety consequences.

Skills
Upon completion of the programme, the students are expected to have the necessary skills to:

- apply analysis methods and technical solution methods at a general level in analysing and solving problems within the chosen study programme
- assess theoretical and practical issues at both a general and specific level, and justify the actions and solutions chosen
argue for and communicate technical issues, analyses, and solutions - as well as their consequences - both orally and in writing for industry professionals and users alike in both Danish and international contexts.

Competences
Upon completion of the programme, the students are expected to have the necessary competences to:

- take on both collaborative and management roles and engage in relationships with people from different educational, linguistic, and cultural backgrounds
- display professional integrity within the ethical framework of the engineering profession, including the incorporation of societal, economic, environmental, and occupational health and safety consequences into the solution of engineering problems within the chosen study programme
- analyse the exercise of the profession from the perspective of organizational and administrative frameworks and societal terms, and adjust actions accordingly
- enter into relevant development work, including converting technical research and development results - as well as natural science and technical knowledge - into practical application
- structure their own learning and efficiently and critically acquire new knowledge in relevant fields of engineering within the chosen study programme
- master fundamental academic work methods that are a precondition for qualifying further education at MSc level
- communicate clearly in writing and orally in both Danish and international contexts.

4. Study form, study environment, and teaching
To achieve the above objectives, the programme is designed to ensure interaction between subject area and problem-oriented work and between classes, lectures, exercises/tasks, company visits/excursions, project work, etc. The students work individually and in groups. The teaching and working methods applied are aimed at promoting independence, cooperation, and reflection in the students’ work.

The study environment should have a practical, knowledge-based, creative, and international focus.

The programme is continuously adapted to the requirements of the surrounding society, the results of study-related projects, and solutions to real-life issues in companies. Also, the six months’ engineering internship contributes to transferring the latest knowledge from companies to DTU, so it can be applied in the organization of the programme.

The teaching methods promote the students’ academic and personal competences, including the willingness to adapt and to life-long learning.

The teaching is application-oriented and problem-based and finds inspiration in real-world engineering. Project work is the method applied in the organization of at least half of all teaching activities.

The students are in focus and are expected to play an active role.

5. Programme structure
The programme is organized so that students can complete it within three and a half years. The Global Business Engineering programme takes four to four and a half years.
The programme is designed to ensure coherence across the various study programmes through, among other things, common courses and lectures and through interdisciplinary flexibility with the possibility of participating in courses on other study programmes. The programme is designed with a view to progression, and increasing requirements are made regarding the students’ knowledge, skills, and independence.

One year of study activity corresponds to 60 ECTS credits, which is also the definition of a full-time equivalent per student.

The programme is divided into four parts:

5.1) Mandatory part
The mandatory part contains the basic preconditions and core competences forming the basis for the rest of the study programme, and it is fundamental to the programme identity and competence profile. The mandatory part constitutes between 105 and 120 ECTS credits. On the Global Business Engineering programme, the mandatory part constitutes 180 ECTS credits.

5.2) Internship
The integrated internship corresponds to 30 ECTS credits and usually takes place in the third year of the programme. The internship is based on the labour market situation and competence needs of engineers with a view to acquiring professional competences within the relevant study programme. The internship is carried out with approved internship host companies in Denmark or abroad.

5.3) Electives
The electives part constitutes at least 30 ECTS credits and preferably takes place in the last part of the programme. It consists of elective courses and/or projects, of which at least half must be related to engineering.

DTU can lay down detailed rules on recommended and/or required combinations of electives to ensure that the programme constitutes a substantive whole aimed at specific professional roles and job functions.

The head of studies can approve courses offered either as part of other study programmes at DTU or at other Danish or foreign institutions of higher education as elective courses. In connection with the approval, emphasis is placed on the following criteria:

- The course must be at a higher educational level corresponding to, as a minimum, the BEng programme.
- The course scope must be relevant in terms of ECTS credits.
- The course in question must not significantly overlap with courses which the students have already passed or want to pass later.
- The course in question must be relevant to the students’ BEng competence profile or qualify the students to participate in further education.
- Documentation must be provided that the course in question has been passed.

The electives part is designed to allow students to spend a semester abroad studying.

All the courses chosen must be pre-approved by the head of studies of the specific study programme as regards relevance to the chosen specialization, and any overlap with mandatory courses.

5.4) Bachelor project (BEng project)
The bachelor project must demonstrate independent, critical reflection within a topic approved by DTU. The bachelor project corresponds to 15-30 ECTS credits, of which at least 15 ECTS credits are obtained in the final semester.

5.4.1 General learning outcomes for the BEng project

Students must use the BEng project to demonstrate the ability to take on the engineering role in relation to:

1. translating technical research results as well as natural science and technical knowledge into practical application by engaging in development projects and solving technical problems
2. acquiring new knowledge in relevant areas of engineering and adopting a critical approach to it
3. working independently in the solution of engineering tasks
4. planning and realizing technical and technological products, processes, or systems and, if relevant, manage these
5. incorporating societal, economic, environmental, and/or occupational health and safety consequences in the solution of technical problems, if relevant.

6. Contents

6.1 Courses

Mandatory courses

Mandatory courses include, for example, precondition courses in mathematics, physics, statistics, and English, and special courses within the individual study programmes. The scope of the courses is stated in ECTS credits, and the courses are designed to ensure coherence throughout the semester. The course of study is characterized by progression with increasingly more focus on the individual study programme profiles. The courses can be based directly on each other, meaning that one course can be a precondition for participation in another course.

Electives

The electives are primarily placed at the end of the programme. Students are relatively free to choose the electives they prefer, but the above items 1-5 in the electives section must be taken into account.

6.2 Internship

The internship coordinator approves the individual internship host company, and the internship supervisor visits the internship host company at least once in the course of an internship; however, not if the internship takes place abroad.

The internship is intended to allow students to apply the skills acquired in the course of the programme, and the internship content must be composed in such a way as to ensure that the acquired skills can be of benefit in relation to other electives or the bachelor project (BEng project).

The sharing of experience by students who have done an internship with students who have not constitutes an integral part of the mandatory semesters on the programme.

The integrated internship is organized on the basis of the labour market situation and competence needs of engineers with a view to ensuring that the internship, together with the remaining programme elements, can promote the students’ development of professional competences. The internship is organized as a progressive process.

6.3 Bachelor project (BEng project)
The head of studies approves the subject/problem statement and the project company and visits the company at least once.

The bachelor project has a Danish and an English title and contains a brief summary in English.

The bachelor project must be carried out in collaboration with a company or department and demonstrate independent, critical reflection in one of the subject areas approved by the head of studies.

The project can be carried out either individually or in groups of two or three students. The students must document their ability to apply engineering methods and methods of scientific theory within a defined (inter)disciplinary area.

The bachelor project topic and scope are agreed between the student and the project supervisor/s and must allow students to demonstrate the extent to which they meet essential parts of the programme objectives.

The basis for assessment of the bachelor project is a written report on the work followed by an individual interview. The interview takes place between the student, the examiner(s), and the co-examiner. The assessment of the bachelor project includes the students’ spelling skills and their ability to express themselves.

The bachelor project marks the end of the programme and is given high importance. A grade is always awarded according to the applicable grading scale, and there is always an external co-examiner.

7. Prerequisites and conditions for completion

7.1 Workshop internship

Students who, according to the head of studies, do not possess the necessary practical qualifications to complete the engineering programme must—in the course of the first semester (first and second semesters for the Global Business Engineering programme)—take a workshop internship. It is a course of maximum five weeks and can take the form of either one overall course or be divided into topics.

7.2 First-year exam

For students to continue their studies, the exams in which they must participate according to the curriculum (study plan) before the end of the first year of study after study start must be passed before the end of the second year of study after study start. The first-year exam is thus always equivalent to 60 ECTS credits.

7.3 Internship

Students must have passed courses corresponding to at least 120 ECTS credits before starting their internship. This is to ensure that the students get the most out of their stay with a company, and to enable the company to assign relevant tasks to the students.

Regarding the possibility of an exemption from internship:

Students who have vocational education and training in the relevant field of education can—on a case-by-case basis—be granted an exemption from parts of or the entire internship. The student must state in the application that he / she has worked in the course of his / her vocational training, which has enabled the student to meet the learning objectives for the internship. Decision on exemption from internship is with the head of study. The application must be sent to praktik@adm.dtu.dk.
General learning outcomes for internships (applicable for internships starting after 1 September 2014):

- Capable of independently using their academic competences in the solution of practical engineering problems
- Possess knowledge about the social, technical, and business aspects of engineering
- Able to work independently and take responsibility for own learning and academic focusing
- Able to work in (interdisciplinary) teams
- Capable of describing the culture of the internship host company
- Capable of planning and carrying out engineering work based on relevant prerequisites and requirements
- Possess knowledge about the implementation of engineering solutions within the subject area
- Capable of documenting their work
- Able to incorporate societal, economic, and environmental factors in engineering solutions.

The students are also required to meet the any programme-specific learning outcomes.

7.4 Bachelor project
The students must have passed all mandatory courses, the integrated internship, and the electives corresponding to a specified number of ECTS credits in order to register for the bachelor project exam. In exceptional cases, exemption is granted from these requirements.

7.5 Duration
The programme must be completed within seven years (nine years for the Global Business Engineering programme). The programme is equivalent to a total of 210 and 270 ECTS credits, respectively.

8. Exam forms and assessment

8.1 Criteria for passing
The programme has been completed when the workshop internship, if relevant, has been approved and the student has passed all mandatory courses, the integrated internship, the electives, and the bachelor project—a total of at least 210 ECTS credits, and 270 ECTS credits for the Global Business Engineering programme.

A study activity has been passed when the student has obtained the grade Pass or at least 02 according to the 7-point grading scale (6 on the 13-point grading scale).

8.2 Exam registration

9. Other provisions

9.1 Evaluation and quality development
The individual study activities, large coherent study elements, and the programme as a whole are evaluated on an ongoing basis. The evaluation results are used to ensure continuous development of the programme.

The evaluation is organized with a view to motivate students and lecturers to pay attention to and be critical of their own teaching and learning, and to have a sense of joint responsibility.

In connection with exams with external co-examiners, the co-examiner and examiner must discuss the course content, the students’ knowledge and competences, and the development of the subject and its practice. On this basis, the examiners prepare a brief conclusion and submit it to the head of studies.

9.2 Course descriptions
All courses are described in the DTU course database (kurser.dtu.dk). The course database forms part of the curriculum. Reference is made to chapter 2 in DTU’s Rules and Regulations, ‘Rules for Study’, at http://sdb.dtu.dk.

9.3 Exemptions
Students can apply to the credit transfer and exemption committee for the BEng programme (DMDU) for an exemption from passing the first-year exam and individual courses as well as from various prerequisites and the prescribed period of study.

The application must be in writing and state the reasons for applying. Lack of academic aptitude does not qualify as a reason to be granted exemption.

Reference is made to chapter 4 of DTU’s Rules and Regulations, ‘Credit Point Transfer, Studying Abroad, Exemption, Leave, etc.’, section 4.5, ‘Exemption’. Students can also contact the International Student Guidance for assistance (http://sdb.dtu.dk).

9.4 Credit transfer
Reference is made to chapter 4 of DTU’s Rules and Regulations, ‘Credit Point Transfer, Studying Abroad, Exemption, Leave, etc.’, section 4.2.1, ‘Pre-approved Credit Transfer’ (http://sdb.dtu.dk).

9.5 Credit transfer from short-cycle higher education programmes
Students with a relevant short-cycle higher education degree may obtain credit transfer prior to study start. To obtain credit transfer, students must apply to the head of studies, even though a credit transfer agreement has been concluded between the educational institution and DTU. In that case, they only need to agree on the number of ECTS credits to be transferred.

9.6 Internationalization
Engineering internships, courses, and bachelor projects may, subject to approval by DTU, be completed with foreign companies or engineering-oriented educational institutions abroad according to a cooperation agreement.

The period abroad must not prolong the period of study, and the content of the courses must not be similar to that of courses which the student has already passed.

Students who are doing courses abroad are evaluated by the foreign institution in question. It is the responsibility of the students to document that the foreign study activity has been passed.

Reference is made to chapter 4 of DTU’s Rules and Regulations, ‘Credit Point Transfer, Studying Abroad, Exemption, Leave, etc.’, section 4.3, ‘Studying Abroad’ (http://sdb.dtu.dk).
9.7 Title
The programme earns the graduate the title of: Bachelor of Engineering (BEng). In Danish: Diplomingeniør, Professionsbachelor i ingeniørvirksomhed.

9.8 Diploma
Upon completion of the programme, graduates receive a diploma. The diploma consists of a front page indicating the completed study programme and title, a list of grades in Danish and English, a diploma supplement, and a cover.

General curriculum for BENG