The Nordic Engineering Hub

# Engineering education in the Nordic countries

## Report of the Nordic hub project:

STEM skills and competes for the new generation of Nordic engineering

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# Contents

**Country contributions:**

Denmark

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Engineering education in the Nordic countries
Report of the Nordic hub project
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# Introduction

This report is a part of an Erasmus+ project *STEM skills and competences for the new generations of Nordic engineers* (deliverable O2). The core activity in the project is a STEM knowledge hub called NordEnHub, an arena for exchange of experiences, best practices, and knowledge.

The focus of this report is engineering education in the Nordic countries, Denmark, Faroe Islands, Finland, Iceland, Norway, and Sweden. These countries offer similar study programs with some differences. The main study programs are engineering and applied engineering (engineering technology) where engineering programs are more theory based and applied programs focus more on application and implementation. A practical final project, as well as an internship in an industrial firm, are usually a part of applied engineering programs. Programs in applied engineering as most often offered at university colleges or universities of applied sciences but can also be found in classical universities.

Engineering education developed fast in the late 19$^{th}$ and early 20$^{th}$ century and continues its rapid development with the restoration of Europe and the growing economy of the USA after World War II. Traditionally, from the early 20$^{th}$ century, engineering programs of 5 to 7 years were taught towards an MSc degree, or equivalent, at classical research universities and were aimed at students with a strong interest and high level of competence in the STEM subjects. Programs in applied engineering were 3 to 4 years with an aim towards a BSc degree, or equivalent, practically oriented, and very linked to the industry, aimed at students with a vocational background. Today, the difference between “engineering” and “applied engineering” is not as clearly defined; both paths are generally open to students with a variety of educational backgrounds.

Engineering is the application of science and mathematics to solve problems. The focus of engineering education is to further students' skills in understanding problems, creating solutions and being creative in technology and science. Engineers work to find solutions for people - everything from noise in classrooms to new aids to the elderly. As an engineer, one becomes an expert in understanding problems, creating solutions and being creative in technology and science.

Universities across Europe offer engineering programs. Traditional programs are civil, computer, electrical and mechanical engineering but over the last decades the number of new programs has increased rapidly to include programs in, for example, energy, medicine, chemical, satellite, financial, environment/ecology, global management and manufacturing engineering. The possibilities are endless.

This report includes information about engineering studies in the Nordic countries with some information on the Baltic countries in the Appendix. The findings of this report will hopefully provide helpful insights and foster interest in engineering education through a useful overview and comparison of the disciplines in the Nordic and Baltic countries.

# Denmark

## The School system

The Ministry of Education, the Ministry of Higher Education and Science, the Ministry of Culture and the Ministry of Defence manage the Danish education system. Compulsory education is from 6 to 16 years and then students can attend academically oriented programs (upper secondary schools) or vocational education programs. Most academic programs take 3 years to complete. Higher preparatory examination (HF) takes 2 years and vocational education programs can take 1.5 to 5.5 years but are usually 3.5 to 4 years long. The academic programs prepare students for higher education where there are three types of educational institutions: business academies that offer short-cycle programs; university colleges that offer medium-cycle programs and universities that offer long-cycle programs. Figure 1 shows the structure of the Danish school system.

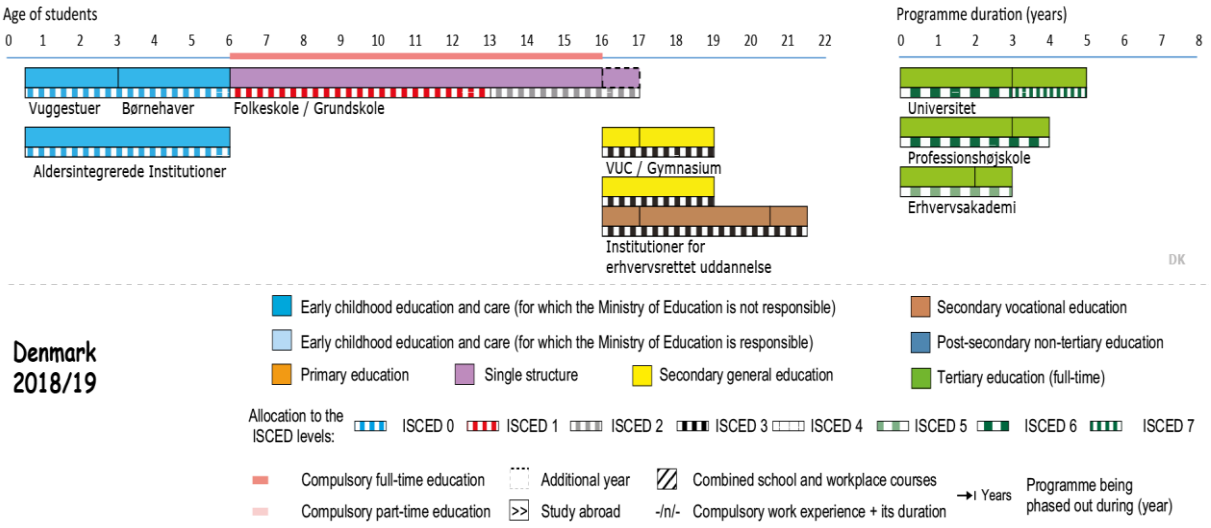


**Figure 1: The structure of the Danish school system. (https://eacea.ec.europa.eu/national-policies/eurydice/content/denmark_en)**

## Engineering education

In Denmark, there are more than 150 engineering programs in 13 different campuses across nine different cities. Most programs are taught in Danish, but some programs are available in English. The engineering education has two paths:

1. Diplomingeniør (Bachelor of Engineering), a 3.5-year study, practical oriented program.
2. Civilingeniør (Bachelor/Master of Science in Engineering), consisting of 3-year bachelor programs and 2-year master programs.

The bachelor programs are BSc or BEng, where the Bachelor of Engineering degree is academically equal to the Bachelor of Science. It is also possible to complete an Industrial

Master of Science degree, e.g. in Engineering, in Operations Management and Software Engineering.

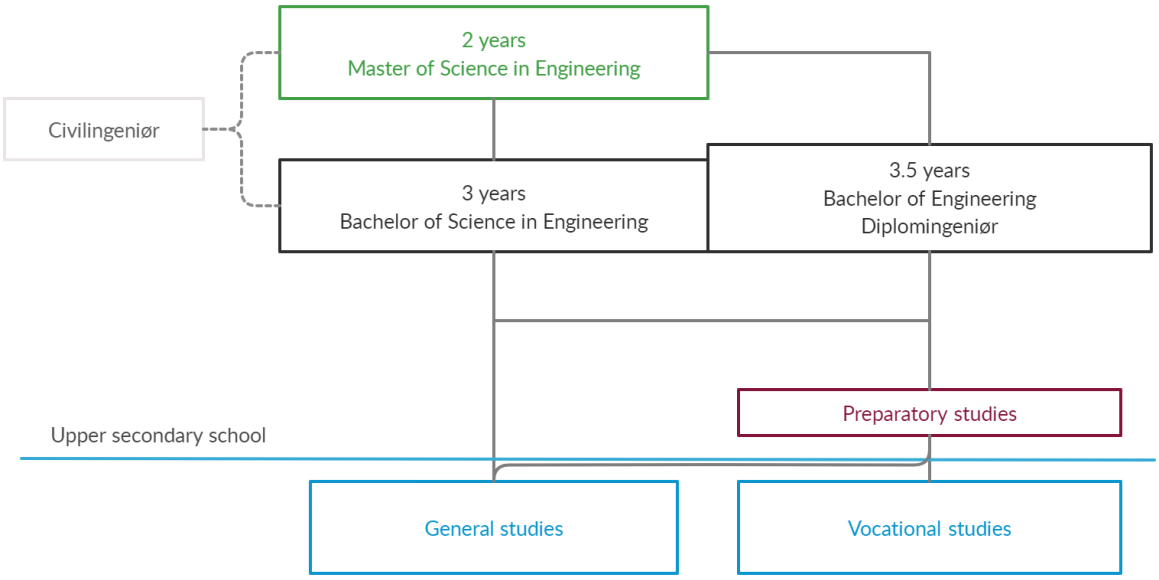


**Figure 2: The structure of engineering studies in Denmark.**

### Civilingeniør

The civilingeniør programs consist of a 3-year bachelor program and 2-year master program. The universities that offer civilingeniør programs are DTU: Danmarks Tekniske Universitet, Aarhus University, VIA University College (bachelor only) and SDU: Syddansk Universitet. The universities offer a wide variety of different programs, from biotech to design and innovation.

### Diplomingeniør

The universities that offer diplomingeniør programs are DTU: Danmarks Tekniske Universitet, Aalborg University, Aarhus University, SDU: Syddansk Universitet and Absalon University College. These programs are practical oriented and take 3.5 years (7 semesters). The sixth semester is a work-placement (internship) in a relevant industrial firm and the seventh semester is dedicated to a final project in cooperation with the relevant industry.

### Application and preparation

There are both general and specific requirements for applying. Different programs have different specific requirements, but a general rule is for students to have good knowledge of physics, chemistry and mathematics. For engineering programs, the general requirements are:

1. Upper secondary school leaving certificate or equivalent
2. An admission course for engineering programs

Most universities offer an admission course, running from a couple of weeks to 1.5 years depending on the amount of supplying needed. The shorter courses are students who might need more knowledge in one subject while the longer courses are students who finished a primary school exam and have years of practical work or have a vocational education.

The required subject levels in the majority of civilingeniør programs are:

1. Danish A (is replaced with native language on equivalent level for Nordic students)
2. English B
3. Mathematics A
4. Physics B and/or Chemistry C

The required subject levels in the majority of diplomingeniør programs are:

1. Mathematics A
2. Physics B
3. Chemistry C and/or English B

The upper secondary education programs that offer the necessary subject levels are STX and HTX programs, so these are the optimal programs for students aiming for engineering programs at university level.

For master programs, the application requirements are a recognised bachelor's degree of good standard or equivalent and proof of good English skills if the program is taught in English and good Danish skills if the program is taught in Danish (for non-Danish citizens).

Applications are digital and go through the same website for every university. There are two entry quotas for applicants. Most applicants are admitted through quota 1 where they are assessed on a matriculation exam. In quota 2, applicants are admitted with a different admission basis than a matriculation exam (admission course) or if they have additional qualifications, they would like to be assessed on. The application requirements for quota 2 are set by each university. Universities determine the number of quota 2 places available in their programs.

Programs only have a certain amount of study places available, so meeting the requirements does not necessarily guarantee a study place. If there are more quota 1 applicants than quota 1 study places available, applicants are ranked based on the grade point average in their upper secondary school leaving certificate. If there are more quota 2 applicants than quota 2 study places available, applicants are ranked based on the quota 2 application criteria set by each university.

It is possible to apply for multiple programs at once in case admission for some program is not granted. The applications are ranked by students' preferences. Students are only offered one study place, which will be the highest placed program on their list of preferences that the student has been accepted into.

# Faroe Islands

## The School system

In the Faroe Islands the Ministry of Research, Education and Culture has administrative and financial control of all the schools. Schooling from primary school to higher education is free of charge for all Faroese citizens and programs in the University of the Faroe Islands are free for Danish citizens and citizens of other Nordic countries. Children start school in first grade when they are 7 years old and school attendance is mandatory until ninth grade is completed. After that, students have the option to enrol in upper secondary school, which takes 3 years to complete. Completion of upper secondary school grants qualifications to enrol in higher educational institutions.

## Engineering education

There is one university in the Faroe Islands, University of the Faroe Islands, which offers engineering programs. There are two programs on offer, Bachelor of Science in Software Engineering and Bachelor of Science in Energy Engineering. Both programs give the option of taking a master's degree abroad.

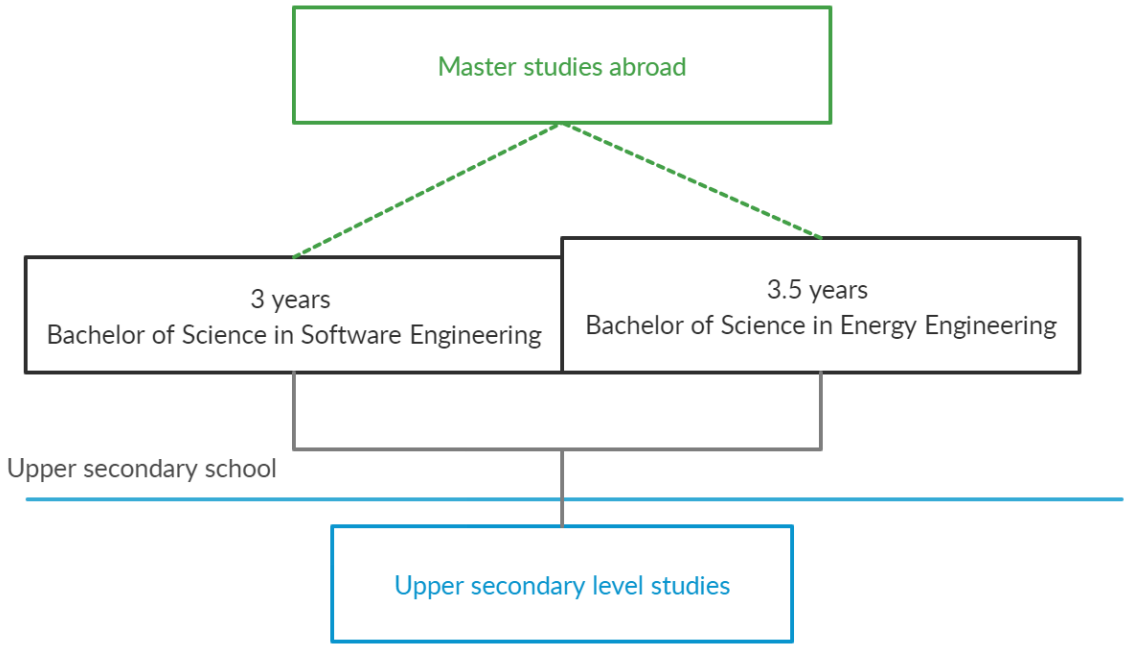


**Figure 3: The structure of engineering studies in the Faroe Islands.**

### Bachelor of Science in Software Engineering

Bachelor of Science in Software Engineering is a 3-year program (180 ECTS). Good skills in Faroese, English and Scandinavian languages are necessary. Requirements for applying are one of the following (Danish subject levels):

1. Matriculation exam with mathematics at B- or A-level.

2. The average grade of at least 4 at B-level or 2 at A-level in mathematics according to the 7-step scalar (7-trinsskalaen).
3. Students that do not meet the requirements can apply in quota 2, where they will be evaluated on other skills and experiences.

### Bachelor of Science in Energy Engineering

Bachelor of Science in Energy Engineering is a 3.5-year program (210 ECTS). This program includes a half year of work placement in industry. The program is taught in Faroese, Danish and English so enough knowledge in these languages is expected. Requirements for applying are one of the following:

1. Matriculation exam with
    a. an average of 6 in mathematics at A-level according to the 7 step scalar (7-trinsskalaen),
    b. physics at B-level and
    c. chemistry at C-level.
2. Maskinmeistaraprógv with a minimum average of 7 according to the 7 step scalar.
3. Students that do not meet the requirements can apply in quota 2, where they will be evaluated on other skills and experiences.

Applications are done by filling out an application form and sending it via email or by postal delivery to the university.

# Finland

## The School system

In Finland, the responsibility for education is at both the state and the local authorities where the Ministry of Education and Culture supervise the education policy while the Finnish National Agency for Education oversees its implementation. Early childhood care covers ages 0-5 while pre-primary education covers the year preceding entrance to primary school most often at the age of 7. Compulsory basic education from 7 to 16 years, after which the upper secondary education. At higher education level, there are universities and universities of applied sciences. All education, excluding the early childhood care, is publicly funded and free for the students. Figure 4 shows the structure of the Finnish school system.

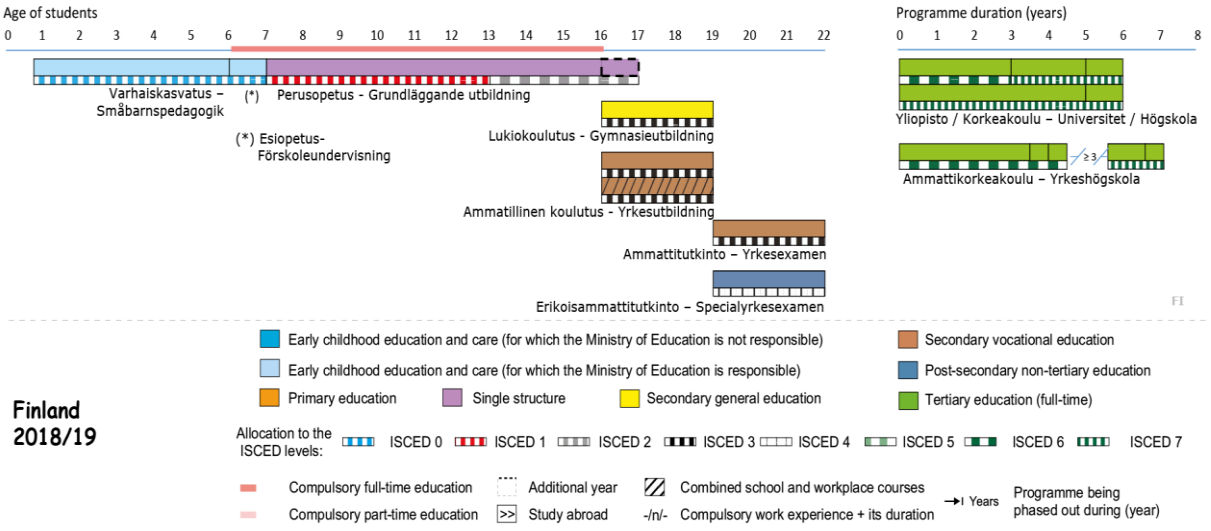


**Figure 4: The structure of the Finnish school system. (https://eacea.ec.europa.eu/national-policies/eurydice/content/finland_en)**

## Engineering education

In Finland, there are two options for students to study engineering. Universities offer 5-year programs that are academically oriented and consist of 3 years bachelor (180 ECTS) and 2 years master (120 ECTS) studies. Universities of Applied Sciences offer 4-year bachelor programs (240 ECTS) that are more professionally oriented. Master programs at universities of applied sciences require two years' work experience.

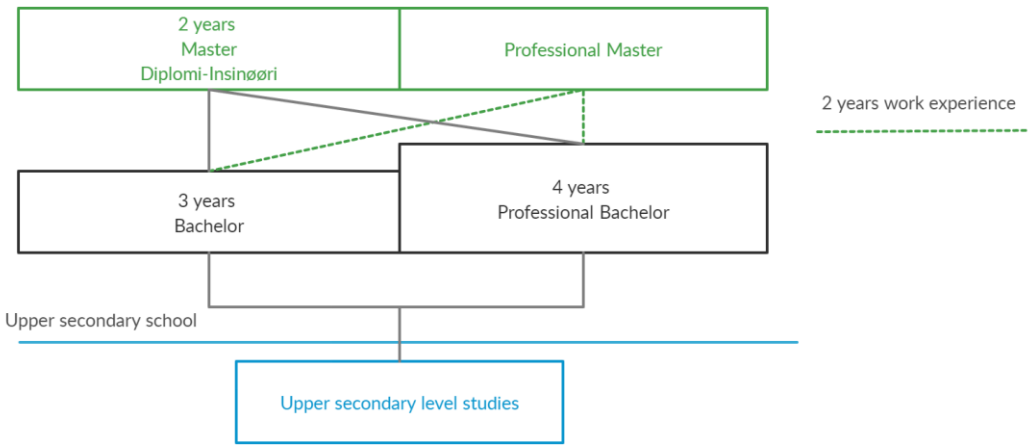


**Figure 5: The structure of engineering studies in Finland.**

### Engineering

Universities that offer 5-year engineering programs, which are academically oriented, are Aalto University, LUT University (Lappeenranta-Lahti University of Technology), University of Oulu, University of Tampere and University of Turku.

### Applied engineering

Universities of applied sciences offer applied engineering programs. These programs take 4 years and are professionally oriented. In these 4-year programs, students with different educational backgrounds take different courses in the first year, with the aim of bringing all students to the same level of competence both theoretically and practically. The remaining 3 years are the same for all students within the same program. Universities that offer applied engineering programs are Centria University of Applied Sciences, Arcada University of Applied Sciences, Oulu University of Applied Sciences and Häme University of Applied Sciences, Savonia University of Applied Sciences, Turku University of Applied Sciences, Kajaani University of Applied Sciences, Lappi University of Applied Sciences, Seinäjoki University of Applied Sciences, Metropolia University of Applied Sciences, Kaakkois-Suomi University of Applied Sciences (Xamk), Jyväskylä University of Applied Sciences, Tampere University of Applied Sciences, Saimaa University of Applied Sciences, LAB University of Applied Sciences, Satakunta University of Applied Sciences, Vaasa University of Applied Sciences, Karelia University of Applied Sciences, Novia University of Applied Sciences, and Åland University of Applied Sciences.

### Application and preparation

Students are eligible for applying if they meet one of the following criteria:

1. Have finished the Finnish matriculation exam or equivalent.
2. Have completed vocational qualifications of 3 years or more.
3. Have a Finnish vocational upper secondary qualification or a further or specialist vocational qualification as a competence-based qualification, or a comparable previous qualification.

4. Have a foreign qualification that provides eligibility for higher education studies in the awarding country.

Some programs may include additional requirements. Different language skills are required depending on universities/universities of applied sciences and the language the programs are taught in. Programs are in Finnish, Swedish or English. To apply for a master program in universities, a bachelor's degree from a university or a university of applied sciences is required. To apply for a master's program at a university of applied sciences students must have finished a bachelor's degree or a higher education degree and have a minimum of 2 years work experience.

There are two ways to apply for a program in Finland: joint application or separate applications. In both cases, applications are digital. With the joint application, it is possible to apply to up to six programs with one application form. These programs are listed by preferences. A study place will be offered to the program that is placed highest on the list of preferences and to which students have enough points to be accepted. The other way to apply for a program is with separate applications. In this case, students apply directly to a university's program and separate application forms are filled for each program. There is no limit to how many programs students can apply to with separate applications and applying is done through the application website or universities' website, depending on programs.

# Iceland

## The school system

The political and legal responsibility for the education system is under the Icelandic parliament and the Ministry of Education, Science and Culture but local authorities are responsible for running nursery schools and primary schools. Figure 6 shows the structure of the Icelandic school system. Early childhood education and care usually starts when children are 1 year old with home-based provision and children can then attend preschool around the time when they turn 2 years old. Preschools are considered the first school level. At 6, children attend compulsory schools, a ten-year program. Then they can take different 3- to 4-year programs at the secondary school level and most of the upper secondary schools offer both general academic education ending with matriculation exam and vocational education and training (VET). If students finish the matriculation exam, they can attend tertiary education, but if not, some preliminary studies can prepare students for university study. The preliminary studies are 1-year programs offered at three universities. All universities have their own admission system.

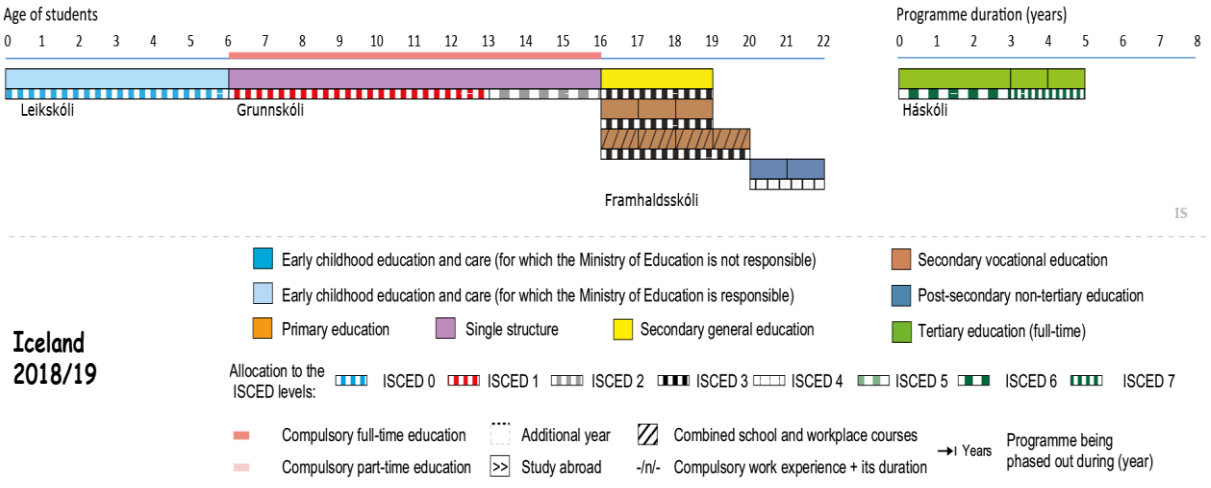


**Figure 6: The structure of the Icelandic school system (https://eacea.ec.europa.eu/national-policies/eurydice/content/iceland_en)**

## Engineering education

In Iceland, students have two options, to learn engineering or applied engineering. Both programs are taught at the university level and both degrees lead to statutory protected professional titles in Iceland. The engineering program is a 5-year program in total, a 3-year bachelor program (180 ECTS) and 2-year master program (120 ECTS) and the applied engineering study is a 3.5-year bachelor program (210 ECTS). Application is online where students apply directly to the university they prefer. Bachelor programs are offered in Icelandic but master programs are available in English.

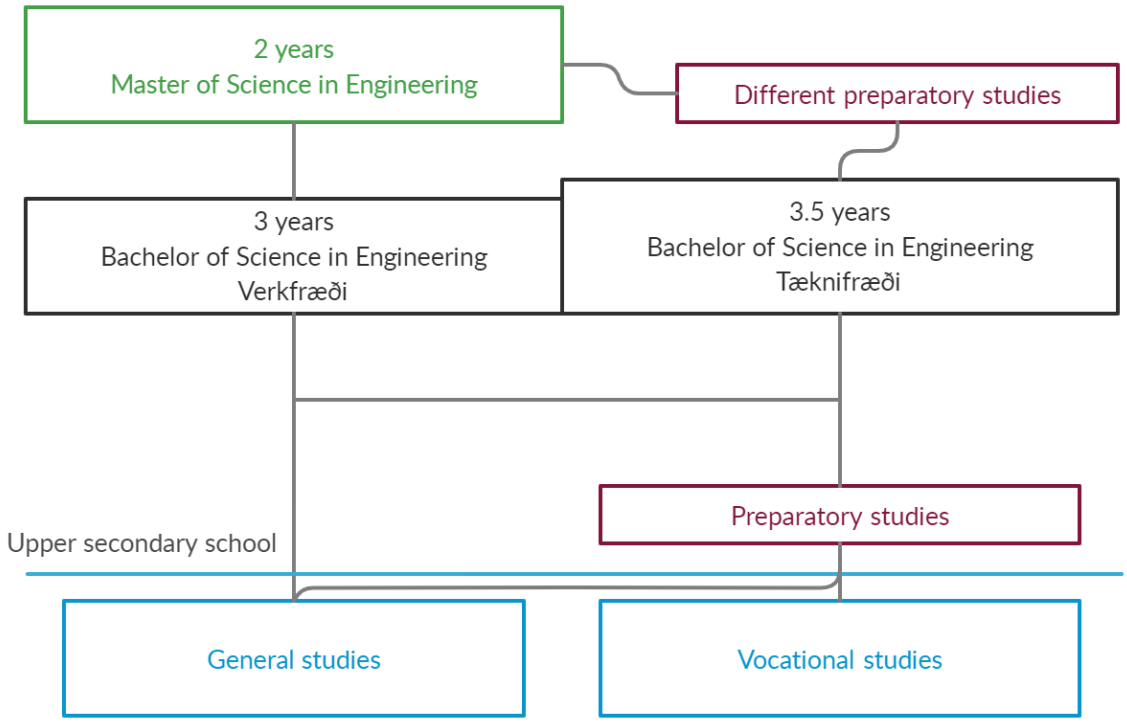


**Figure 7: The structure of engineering studies in Iceland.**

### Engineering

Engineering is taught at two universities in Iceland, Reykjavik University and University of Iceland. To attend, students must have passed a matriculation exam, but other options are also available. At both universities, the engineering programs are BSc 180 ECTS and MSc 120 ECTS.

**Application and preparation**

At Reykjavik University (RU), students can apply if they have one of the following:

1. Matriculation exam or equivalent with emphasis on mathematics, physics and chemistry
2. A degree from the Department of Preliminary Studies at Reykjavik University
3. Degrees and examinations from abroad are evaluated for each applicant

Study materials and instruction is based on students having a certain amount of preparation. The necessary preparation for engineering at Reykjavik University are:

4. 30 Fein[1] in mathematics, which of 15 are on level 3 or higher.
5. 10 Fein on level 2 or 3 in physics with knowledge in motion, forces and electricity.
6. 5 Fein in chemistry on level 2

(see www.ru.is)

[1] One Fein corresponds to 18 to 24 hours of student work

At University of Iceland (HI), students can apply if they have one of the following:

1. Matriculation exam or equivalent with emphasis on mathematics, natural sciences (physics)
2. Fourth degree examination from the Mechanical Engineering program at the Technical College in Iceland.
3. A degree from the Department of Preliminary Studies at Reykjavik University
4. Final examination from Keilir, the Preliminary University Studies Academy related to University of Iceland.
5. Degrees and examinations from abroad are evaluated for each applicant, but understanding of written and spoken Icelandic is required.

40 Fein in mathematics and 50 Fein in natural science subjects, with at least 10 Fein in physics, are strongly recommended

(see www.hi.is).

### Applied Engineering

Applied Engineering is taught at two universities in Iceland, Reykjavik University and University of Iceland and is a 210 ECTS BSc degree at both universities.

**Application and preparation**

At Reykjavik University (RU), students can apply if they have one of the following:

1. Matriculation exam or equivalent with emphasis on mathematics and physics.
2. Fourth degree examination from the Mechanical Engineering program at the Technical College.
3. A degree from the Department of Preliminary Studies at Reykjavik University
4. Degrees and examinations from abroad are evaluated for each applicant.
5. 20 Fein in mathematics, which of 15 are on level 3 or higher, and 10 Fein on level 2 or 3 in physics with knowledge in motion, forces and electricity required. Applicants who do not meet the requirements are offered evaluation exams in mathematics and physics. These exams are for students who
    a. Consider themselves to have sufficient knowledge in the subjects but have not finished the required Fein.
    b. Meet the requirements but want to review the study materials to see where they stand before the program begins.

(see www.ru.is)

At University of Iceland (HI), students can apply if they have one of the following:

1. Matriculation exam or equivalent with emphasis on mathematics and physics
2. Fourth degree examination from the Mechanical Engineering program at the Technical College in Iceland.
3. A degree from the Department of Preliminary Studies at Reykjavik University

4. Final examination from Keilir, the Preliminary University Studies Academy related to University of Iceland.
5. Degrees and examinations from abroad are evaluated for each applicant, but understanding of written and spoken Icelandic is required.
6. Applicants who have studied at the upper secondary level can be exempted from the above conditions by getting through a special evaluation of both job experience and finished studies as follows:
    a. Attend a preparatory course in mathematics during the first semester and
    b. Complete the preparatory courses to gain the right to continue studying in the second semester.

(see www.hi.is)

# Norway

## The School system

In Norway the government is responsible for higher education, but the municipalities are responsible for primary and lower secondary education and the counties are responsible for upper secondary education and training and post-secondary vocational education. In Norway, children can attend kindergarten at the age of 1 and compulsory education is from 6 to 16 years. The upper secondary education or training takes 3 to 4.5 years and students can choose between three academic education programs (3 years) or nine vocational education programs (3 to 4.5 years). The academic programs finish with a general university and college admissions certification. Figure 8 shows the structure of the Norwegian school system.

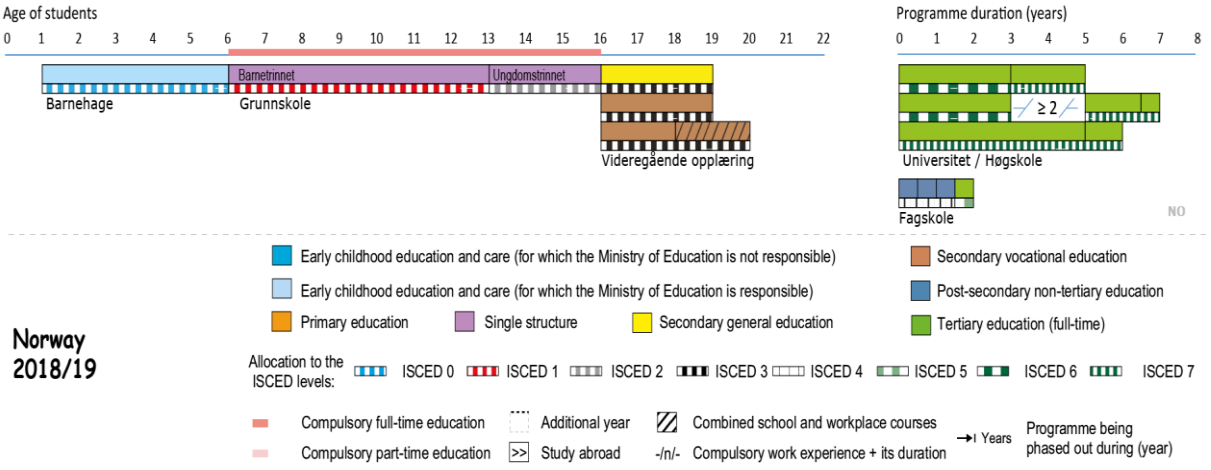


**Figure 8. The structure of the Norwegian school system (https://eacea.ec.europa.eu/national-policies/eurydice/content/norway_en)**

## Engineering education

Universities offer 5-year integrated master programs in engineering or 3-year bachelor programs and 2-year master programs. Finishing a 5-year engineering program awards the title Sivilingeniør (Civil Engineer), a legally protected professional title awarded by technical universities in Norway. At some universities and universities of applied sciences (högskule) students can complete a 3-year bachelor program (180 ECTS) that leads to professional qualifications. The bachelor programs are primarily taught in Norwegian and the master programs are taught in Norwegian or English. The universities that offer both bachelor and master engineering programs are:

- Oslo Metropolitan University
- Western Norway University of Applied Science
- University of Stavanger
- Norwegian University of Science and Technology (NTNU)
- University of South-Eastern Norway

- UIT the Arctic University of Norway
- University of Agder

Some universities have campuses in multiple locations around Norway.

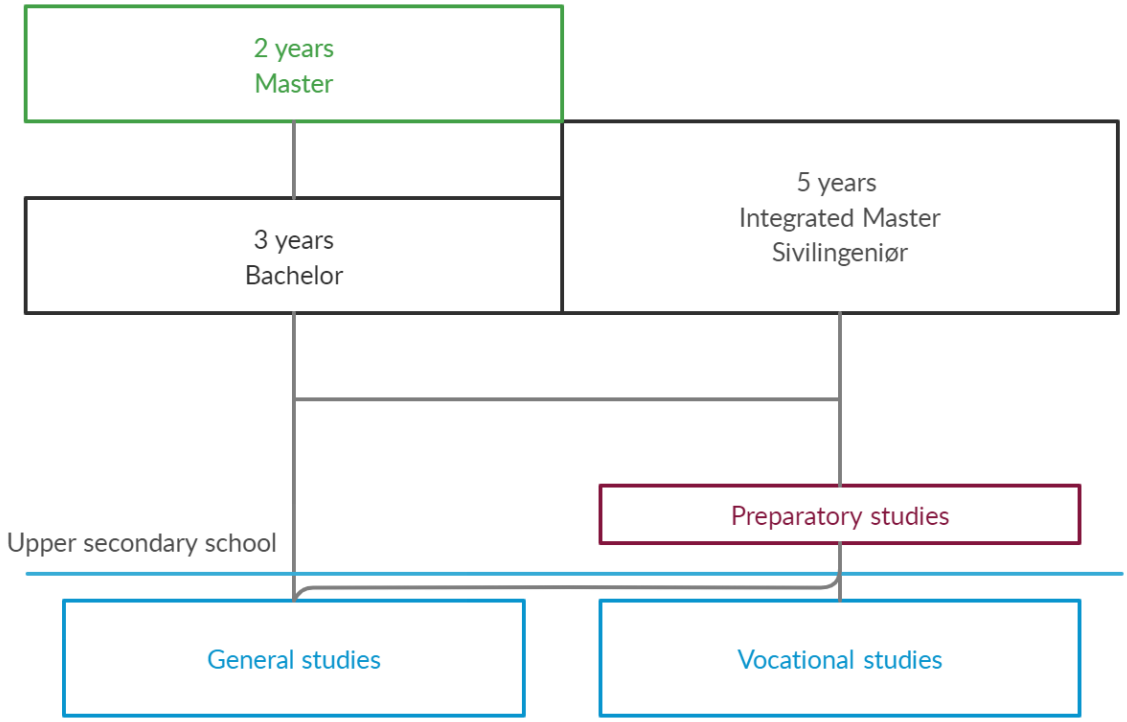


**Figure 9: The structure of engineering studies in Norway.**

## Application and preparation

Students apply online via the Norwegian Universities and Colleges Admission Service (NUCAS) to most bachelor programs. Some private universities may have their own admission system and entrance examinations. Applications for master programs are sent directly to universities. Higher education admission certification (matriculation exam) is the most common qualification for applying for university or college but engineering students must have certain levels in mathematics and physics. There are language requirements for Norwegian university applications. An English proficiency test is required, e.g. TOEFL, for programs in English. Requirements for applying are one of the following:

1. Matriculation exam with mathematics (R1 and R2) and physics I.
2. Technical vocational education including documented knowledge in mathematics and physics equivalent to mathematics (R1+R2) and physics I.
3. Exemptions may be made for students who
    a. Do not have a matriculation exam but are at least 23 years of age in the year of admission and have at least 5 years of education or practice, and have completed and passed the six study skills subjects (Norwegian, English, history, social studies, mathematics and natural science)

b. Are at least 25 years old in the admission year and want to apply on the basis of real competence (professional practice, unpaid work, organizational work, education etc.). Universities assess whether applicants have the necessary prerequisites to be able to complete the study they are applying for.

Students who do not have the necessary levels in mathematics and physics can apply for three-semester schemes or 1-year prerequisite programs. The three-semester scheme (TRESS) is a bachelor program, 3 years in total. In the three-semester scheme, the first year consists of three semesters. Education starts in the middle of summer where intensive mathematics and physics courses are completed. In autumn, when the school year starts, TRESS runs alongside the engineering program the student also gained admission to. After the first year is completed, TRESS is completed and students have the prerequisite to finish the engineering program without additional courses.

Each program has a certain amount of study places available so meeting the requirements does not necessarily guarantee a study place. If there are more applicants than study places, students compete in two quotas. Half of the study places go to the first quota where students under 21 years, who finished their matriculation exam in normal time or finished their vocational education in normal time and have the additional subjects required, compete for places. In this quota students are ranked based on their school score, which is the point grade average from their upper secondary school education plus any additional language and science subjects. In the second quota, students are ranked based on their competition score, which is the school score plus additional points for age, higher education, folk high school or military service. 50 percent of study places go to the second quota and students that compete in the first quota also compete in the second quota.

# Sweden

## The School system

In Sweden, the municipalities are responsible for preschool, compulsory education and upper secondary schools but higher education is a responsibility of the government. Preschools welcome children from 1-year old and compulsory education starts at the age of 6 (preschool class), followed by compulsory school years between 7 and 16 years. Upper secondary school is from 16 to 19 years, which may include higher education preparatory programs, vocational programs and introductory programs. Further education is provided at universities, university colleges and higher vocational education. Students who have completed upper secondary school, depending on their choice of upper secondary program and courses within the framework of individual alternatives, may also apply for universities (universities), colleges (college) and / or higher vocational education (vocational college). For students that do not complete upper secondary school the state offers adult education that may lead to university study. Figure 10 shows the structure of the Swedish school system.

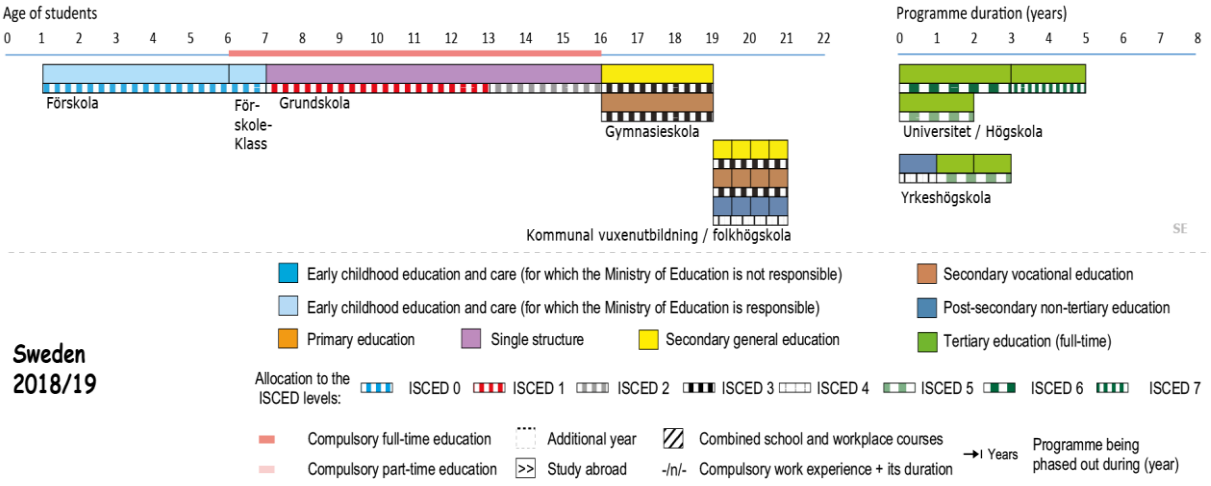


**Figure 10: the structure of the Swedish school system (https://eacea.ec.europa.eu/national-policies/eurydice/content/sweden_en)**

## Engineering education

In Sweden students can take a 5-year integrated master program in engineering (civilingenjör, 300 ECTS). At some universities and university colleges (högskole) students can graduate from a 3-year bachelor program with professional qualifications (högskoleingenjör, 180 ECTS) and then take a 1- or 2-year master program (60-120 ECTS). Civilingenjör is a legally protected professional title in Sweden. Civilingenjör programs are often more theoretical while högskoleingenjör programs are more applied, incorporating work-placement and an industry-focused final project. Bachelor programs are usually taught in Swedish and master programs are taught in Swedish or English. Universities in Sweden that offer engineering programs are:

- KTH Royal Institute of Technology
- Luleå University of Technology
- Chalmers University of Technology
- Mälardalen University
- Jönköping University
- Halmstad University
- Linnaeus University
- University of Gävle
- Umeå University
- Uppsala University
- Mid Sweden University
- Lund University
- Malmö University (bachelor only)
- Dalarna University

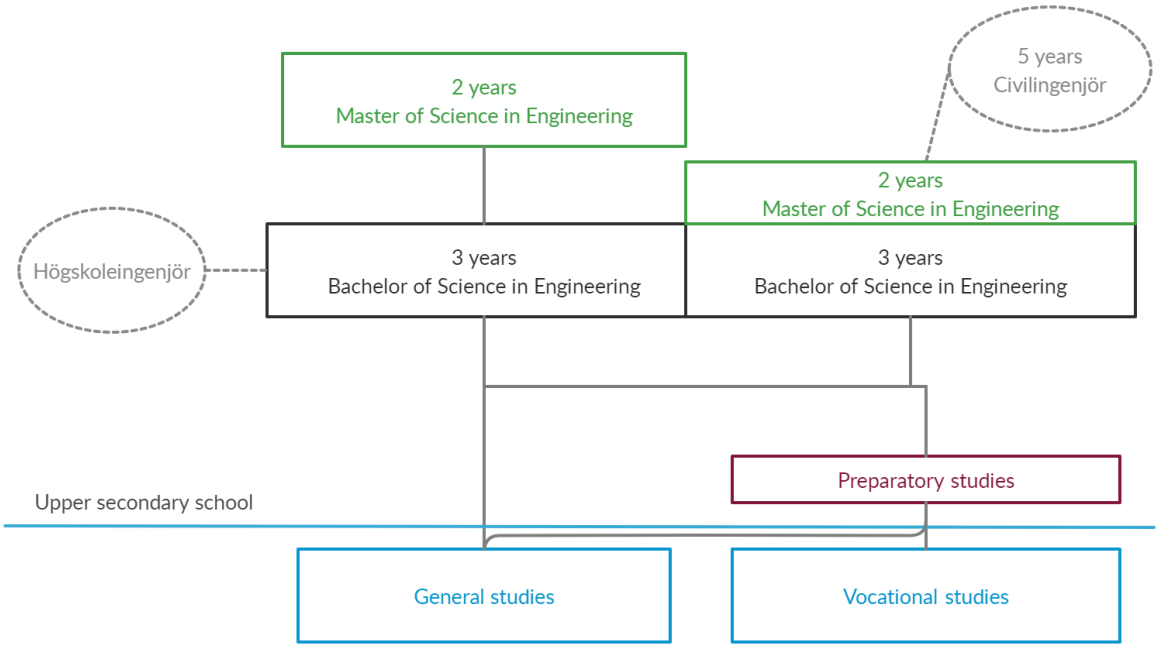


**Figure 11: The structure of engineering studies in Sweden.**

## Application and preparation

General entry requirements for bachelor programs taught in English are a matriculation exam and proficiency in English. General entry requirements for master programs taught in English are a bachelor's degree and proficiency in English. To apply and to be admitted to programs taught in Swedish, international students must have passed the Swedish language test TISUS. To demonstrate proficiency in English an English proficiency test (e.g. TOEFL, IELTS) is required. For bachelor programs in engineering certain levels of mathematics, physics and chemistry from upper secondary school are required. For 5-year integrated master programs (civilingenjör) the following upper secondary school levels are required:

1. Mathematics 4
2. Physics 2
3. Chemistry 1

For 3-year bachelor programs (högskoleingenjör) the following upper secondary school levels are required:

1. Mathematics 3c
2. Physics 2
3. Chemistry 1

The upper secondary education programs that offer the necessary subject levels are the technology program and the natural science program, so these are the optimal programs for students aiming for engineering programs at university level.

Master programs often require a CV and a motivational letter. Application is done digitally and students can apply to different programs in all universities with the same application.

The Swedish Council of Higher Education administers admission to study programs on behalf of the higher education institutions. Programs only have a certain amount of study places available, so meeting the program requirements does not necessarily guarantee a study place. If there are more applicants than study places, applicants are split into three groups where they compete against other applicants for study places. In the first group students are ranked based on their average point score from their upper secondary education. This evaluation is used for at least ⅓ of study places. In the second group, applicants are ranked based on their grade from the Swedish Scholastic Aptitude Test, a standardised test used as one of the means to gain admission to higher education. Students in this application group must also fulfil the entry requirements since the test does not grant permission to programs. This evaluation is used for at least ⅓ of study places. Universities have the right to organize specific tests for certain programs that the applicants can take. In the last group, applicants are ranked based on their results from these tests. Universities can allocate up to ⅓ of study places to this type of evaluation.

## Discussion

Engineering is a broad field including many diverse specialties and it offers chances to work with and develop new technologies. Engineers have a background in mathematics, science and critical thinking and many works to design new products that can influence everyday life and make it more efficient. Usually, engineers focus in one area, such as electrical, aerospace, or mechanical engineering with knowledge of the latest technology and developments in their specialties. In all the Nordic countries, as in most other countries in the world, there is a high demand for engineers, so unemployment rates are lower than in most other professions.

The engineering programs in the Nordic countries are similar in some respect but also very different with variation in structure, entry requirements and subject focus.

Subject levels are different between countries and the following subject conversion table can be useful when comparing subject levels in the Nordic countries: Conversion table (pdf).

# Appendix 1

In this appendix, some information of engineering education in the Baltic countries are provided.

# Estonia

## The School system

In Estonia local governments maintain preschool childcare institutions, basic schools, the majority of upper secondary schools, and some of the VET schools. Vocational schools are mostly state owned and universities are institutions in public law. Local governments provide all children from 1.5 to 7 years the opportunity to attend a preschool childcare institution. There are also other childcare services for the youngest children, not provided by local governments. Basic education is compulsory from grades one to nine or until a student is 17 years old. Secondary education can be acquired in secondary schools or vocational schools. The length of secondary education is 3 years. Upper secondary education gives the right to study at a higher educational level. In order to graduate from upper secondary education, students take three state examinations in Estonian language, mathematics and foreign language. At higher education there are vocational schools, institutions of professional higher education and universities. Figure 12 shows the structure of the school system in Estonia.

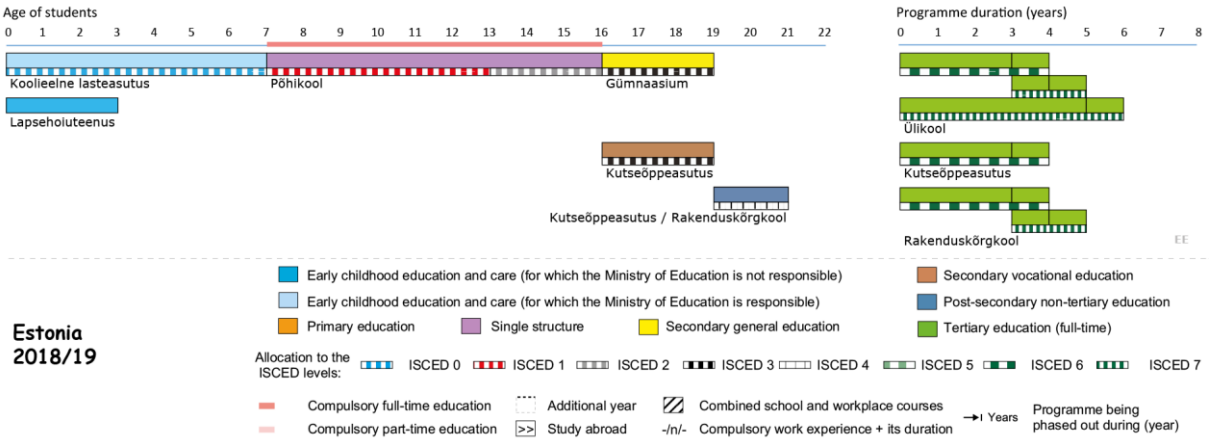


**Figure 12: The structure of the Estonian school system. (https://eacea.ec.europa.eu/national-policies/eurydice/content/estonia_en)**

## Engineering education

Engineering programs in Estonia are 3-year bachelor programs and 2-year master programs. University of Tartu and Tallinn University of Technology and Estonian University of Life Sciences offer engineering programs. Programs are taught in Estonian or English.

### Application and preparation

There are different requirements for Estonian and international students. Admission for Estonian students is usually based on results from the state exams. Passing entrance exams and/or a motivational letter may also be required. The requirements for applying to bachelor programs taught in English are:

1. A matriculation exam or equivalent.
2. English language proficiency

3. Motivational letter.
4. Entrance test
5. Interview

Requirements for applying to master programs taught in English are:

1. Bachelor's degree or equivalent qualification
2. English language proficiency
3. Motivational letter
4. Entrance test
5. Interview

Application is digital, via the National Admission Information Systems for Estonian students and using the DreamApply system for international students. An application fee is required for the application to be processed and enables students to apply for two programs. After passing the entrance tests and interviews, certain documents have to be sent to the university by post.

# Lithuania

## The School system

Pre-school education is provided for children from birth to pre-primary education. Pre-school is not compulsory but pre-primary education, from age 6 to 7, is compulsory. Pre-school and pre-primary educational institutions fall under the authority of local governments. Primary and lower secondary education is compulsory until students reach 16 years of age. Primary education lasts for 4 years and lower secondary education lasts for 6 years. After that, students can take a 2-year upper secondary education in gymnasiums with or without additional vocational education and training which lasts for 1 to 2 years. At higher education level, there are universities and colleges. Figure 13 shows the structure of the Lithuanian school system.

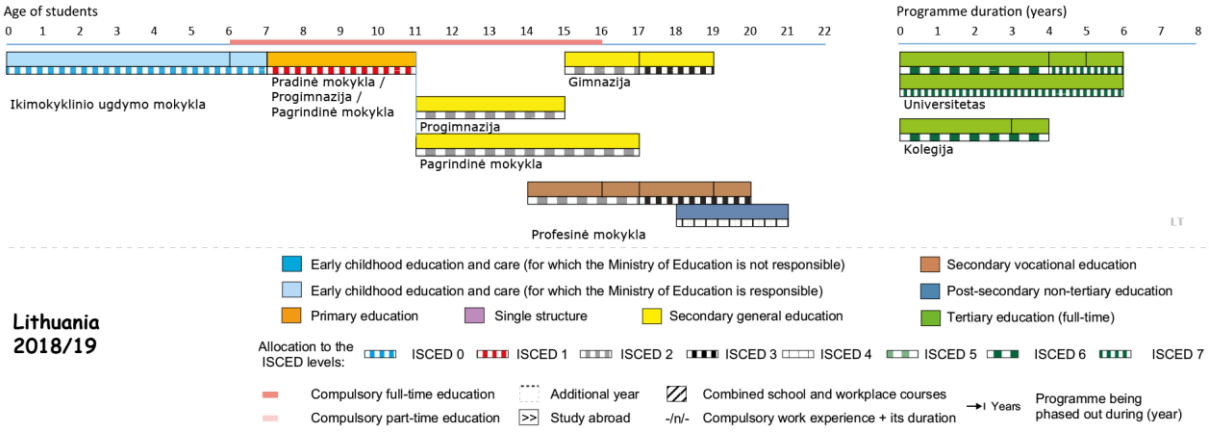


**Figure 13: The structure of the Lithuanian school system. (https://eacea.ec.europa.eu/national-policies/eurydice/content/lithuania_en)**

## Engineering education

Universities offer 3.5- to 4-year bachelor and 2-year master programs in engineering and universities of applied sciences offer professional bachelor programs in engineering.

### Universities

Universities offer both bachelor and master engineering programs. The bachelor programs take 4 years and master programs take 2 years. Kaunas University of Technology, Vilnius Gediminas Technical University, Klaipeda University, Vilnius University and Vytautas Magnus University offer bachelor and master programs. Programs are taught in Lithuanian or English.

### Colleges/Universities of applied sciences

Colleges focus on practical training for particular professions. The engineering programs take 3 to 4 years and end with a professional bachelor's degree. Kaunas University of Applied Sciences offers professional bachelor programs taught in Lithuanian and Vilnius University of Applied Sciences offer professional bachelor programs taught in Lithuanian or English.

## Application and preparation

The requirement for applying to bachelor programs is a matriculation exam. Requirement for applying to master programs is a bachelor's degree or professional bachelor's degree. Proof of English language knowledge (e.g. TOEFL, IELTS) and an application fee is required for all programs. For master programs entrance exams, a motivational letter and/or a skype interview are required. Applications are digital through the universities' websites.

# Latvia

## The School system

Children from 1.5 years of age have a legal entitlement to early childhood education and care. Municipalities are obliged to ensure that children in their municipality are able to attend the institution closest to their home. Primary and lower secondary education are compulsory for nine years, starting at the age of 7. Upper secondary education divides into general and vocational upper secondary education. Upper secondary education begins at 16 years. General upper secondary education takes 3 years to complete while vocational upper secondary education programs may vary in length, from 2 to 4 years. Rather autonomous public and private higher education institutions (universities) provide higher education. Figure 14 shows the structure of the Latvian school system.

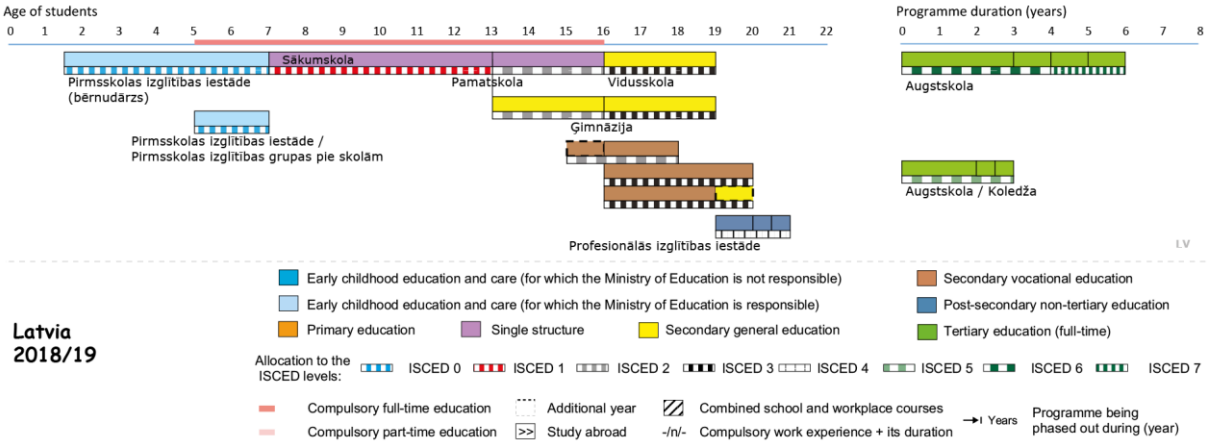


**Figure 14: The structure of the Latvian school system. (https://eacea.ec.europa.eu/national-policies/eurydice/content/latvia_en)**

## Engineering education

Higher education programs in Latvia are divided into three: academic bachelor study programs, professional bachelor study programs and first and second level professional higher education study programs. Academic programs are often more research-oriented and theoretical while professional programs are more practical-oriented.

### Academic study programs

Academic study programs are 3- to 4-year bachelor programs (180-240 ECTS) and 2-year master programs (120 ECTS). Finishing a bachelor program grants access to both academic and professional master programs but the total combined study time of bachelor and master programs must be at least 5 years in total. University of Latvia offers academic bachelor programs. Riga Technical University offers academic bachelor and master programs. Latvia University of Life Sciences and Technologies offers academic bachelor and master programs.

### Professional study programs

Professional study programs are 4-year bachelor programs (min 240 ECTS) and 1- to 2-year master programs (min 60 ECTS). Finishing a bachelor program grants access to both academic and professional master programs but the total combined study time of bachelor and master programs must be at least 5 years in total. University of Latvia offers professional bachelor programs. Riga Technical University offers professional bachelor and master programs. Rezekne University of Applied Sciences offers professional bachelor and master programs.

### Application and preparation

Study programs are either in Latvian or English. Requirements for applying to academic and professional bachelor programs are:

1. General or vocational secondary education
2. Proof of English language knowledge (e.g. TOEFL, IELTS)

Requirements for applying to an academic or professional master program are:

1. Bachelor's degree
2. Proof of English language knowledge (e.g. TOEFL, IELTS).

Some universities require a skype interview before final admission, application fee or CV and motivational letter. Applications are digital through the universities' websites.