

## Technology

The subject of technology is by its nature interdisciplinary. Technology involves fulfilling human needs and preferences by transforming the physical resources of nature or immaterial assets in products, processes, facilities and systems. The subject focuses on the role of technology in societal development and the interaction between people and nature.

### Aim of the subject

Teaching in the subject of technology should aim at helping students develop knowledge of technology, technological sciences and technological development processes. It should lead to students developing an understanding of processes and the whole chain from idea and model, product or service to using and recycling. Teaching should give students the opportunity to develop knowledge of existing technology and the development of new technologies contributing to a more sustainable society.

Teaching should give an insight into how technology has developed and is developing in interaction with surrounding society. Students should also be given the opportunity to develop knowledge of gender perceptions in relation to technology. In addition, students should be given the opportunity to develop knowledge about people's different conditions with regard to and accessibility to technology and technological development.

Teaching should prepare students to actively take part in and influence technological development from an ethical perspective. In addition, teaching should contribute to students developing knowledge of entrepreneurship by developing their ability to act, innovate and solve problems. By means of teaching, students should be given the opportunity to develop knowledge of technological concepts, and also give knowledge in communicating about technology.

Teaching should give students the opportunity to develop technological knowledge by working with measurements, observations, experiments, technical calculations, mathematical modelling, and also risk and feasibility assessments. Teaching should also lead to students developing skills for analysis and assessment. Students should also be given opportunities to work in projects.

### Teaching in the subject of technology should give students the opportunities to develop the following:

- 1) Knowledge of technological development processes and understanding of the relationships between their different parts.
- 2) The ability to analyse and assess technological solutions taking into account sustainable societies.
- 3) The ability to solve technological problems.
- 4) The ability to use the methods, concepts and theories of technology.

- 5) The ability to use relevant models and tools for analysis, calculation, feasibility assessments, documentation, presentation and information.
- 6) Knowledge of how technology has developed and is developing in interaction with society, and also knowledge of existing technology and current technological development.
- 7) Knowledge about the role and driving forces of technology from ethical perspectives.
- 8) Knowledge of how attitudes and traditions in the area of technology shape our understanding of gender perceptions and how this has affected and affects technology and technological development.
- 9) The ability to communicate in the technological area and also communicate about technology.

### **Courses in the subject**

- Technology 1, 150 credits.
- Technology 2, 100 credits, which builds on the course, technology 1.
- Technology – specialisation, 100 credits, which builds on the course, technology 1. The course can be studied several times with different contents.

## Technology 1

The course, technology 1 covers points 1–9 under the heading Aim of the subject.

### Core content

*Teaching in the course should cover the following core content:*

- All parts of the technological development process from idea and model, product or service, to the use and reuse with practical applications of technology and technological development in one or more areas of technology.
- Conditions and prerequisites for entrepreneurship in relation to innovative and creative processes.
- Technical properties of materials, e.g. thermal, electrical, mechanical and chemical, and also the possibilities and limitations of materials based on different areas of use.
- The role of technology and technicians with a focus on technologies of the future and a sustainable society with a starting point based on efficient use of energy.
- Quality work, e.g. quality assurance, environmental certification, working environment and risk analysis.
- Reading drawings and sketching and drawing techniques with an introduction to using CAD programs.
- Work with projects, communication, presentation and models e.g. digital media and software, manuals and instructions, oral and written communications, and also digital and manual techniques for creating models.
- Technical concepts, theories and models covering calculations and feasibility assessments.
- The history of technology and the importance of technological development for society, and also introduction to current development areas in technology.
- Basic technological philosophy: ethical values and gender structures, and also how they have affected and affect technology, its use and accessibility. How technology's attributes relate to gender.
- Communication, computer and network technologies for learning and dissemination of technology and information.

### Knowledge requirements

## Grade E

Students describe **in basic terms** how technology has developed, and give an account **in basic terms** of relationships between different parts of technological development processes.

Students give an account **in basic terms** of the technical properties of different materials and also of how and when they can be used. In addition, students analyse and evaluate in **simple** assessments technical solutions based on quality, safety and a sustainable society.

Students solve **simple** technical problems, use **in consultation** with the supervisor appropriate working methods, and document their work and results. In their work, students read drawings and technical instructions, and also sketch and draw **with some certainty** both manually and with relevant CAD programs. Students use **with some certainty** technical concepts and theories, carry out **with some certainty** technical calculations and assess the feasibility of their results.

Students give an account **in basic terms** of some historically important technical advances, existing technology and current technological development, and also describe **in basic terms** how society and technology interact. In addition, students evaluate in **simple** assessments from an ethical perspective the functions of technology, its use and accessibility in society. Furthermore, students describe **in basic terms** how attitudes and traditions in the area of technology shape views of what is regarded as masculine and feminine, and how this has affected and affects technology and technological development. Students make **simple** proposals on how the area of technology can be made equally accessible to men and women.

Students use **with some certainty** computers as tools for communication, documentation and information. In addition, students use **with some certainty** different relevant media and software to disseminate and present technology.

In consultation with the supervisor, students assess **with some certainty** their own ability and the requirements of the situation.

## Grade D

Grade D means that the knowledge requirements for grade E and most of C are satisfied.

## Grade C

Students describe **in basic terms** how technology has developed, and give an account **in basic terms** of relationships between different parts of technological development processes.

Students give an account **in detail** of the technical properties of different materials and also of how and when they can be used. In addition, students analyse and evaluate in **simple** assessments technical solutions based on quality, safety and a sustainable society.

Students solve **simple** technical problems, **choose and use after consultation** with the supervisor appropriate working methods, and document their work and results. In their work, students read drawings and technical instructions, and also sketch and draw **with some certainty** both manually and with relevant CAD programs. Students use **with some certainty** technical concepts and theories, carry out **with some certainty** technical calculations and assess the feasibility of their results.

Students give an account **in detail** of some historically important technical advances, existing technology and current technological development, and also describe **in detail** how society and technology interact. In addition, students evaluate in **simple** assessments from an ethical perspective the functions of technology, its use and accessibility in society. Furthermore, students describe **in basic terms** how attitudes and traditions in the area of technology shape views of what is regarded as masculine and feminine, and how this has affected and affects technology and technological development. Students make **well grounded** proposals on how the area of technology can be made equally accessible to men and women.

Students use **with some certainty** computers as tools for communication, documentation and information. In addition, students use **with some certainty** different relevant media and software to disseminate and present technology **and adapt communication to the recipient**.

In consultation with the supervisor, students assess **with some certainty** their own ability and the requirements of the situation.

## **Grade B**

Grade B means that the knowledge requirements for grade C and most of A are satisfied.

## **Grade A**

Students describe **in detail and in a balanced way** how technology has developed, and give an account **in detail and in a balanced way** of relationships between different parts of technological development processes.

Students give an account **in detail and in a balanced way** of the technical properties of different materials and also of how and when they can be used. In addition, students analyse and evaluate in **balanced** assessments technical solutions based on quality, safety and a sustainable society.

Students solve technical problems, **choose and use after consultation** with the supervisor appropriate working methods, and document their work and results. In their work, students read drawings and technical instructions, and also sketch and draw **with certainty** both manually and with relevant CAD programs. Students use **with certainty** technical concepts and theories, carry out **with certainty** technical calculations and assess the feasibility of their results.

Students give an account **in detail and in a balanced way** of some historically important technical advances, existing technology and current technological development, and also describe **in detail and in a balanced way** how society and technology interact. In addition, students evaluate in **balanced** assessments from an ethical perspective the functions of technology, its use and accessibility in society. Furthermore, students describe **in detail and in a balanced way** how attitudes and traditions in the area of technology shape views of what is regarded as masculine and feminine, and how this has affected and affects technology and technological development. Students make **well grounded and balanced** proposals on how the area of technology can be made equally accessible to men and women.

Students use **with certainty** computers as tools for communication, documentation and information. In addition, students use **with certainty** different relevant media and software to disseminate and present technology **and adapt communication to the recipient**.

In consultation with the supervisor, students assess **with certainty** their own ability and the requirements of the situation.

## Technology 2

The course, technology 2, covers points 2–5 and 9 under the heading Aim of the subject.

### **Core content**

*Teaching in the course should cover the following core content:*

- Principles and technologies for measuring and registering performance in mechanical, pneumatic, hydraulic and electrical systems.
- Principles and relationships for the transformation of electrical energy into mechanical energy and vice versa, e.g. motors and generators.
- Principles and relationships for mechanical, hydraulic, pneumatic and electrical transmission systems for energy conversion.
- Conditions and limitations for other forms of energy conversion e.g. fusion, fission and solar, wind and hydro electric power.
- Analysing dimensioning needs and feasibility assessments.
- The preconditions of mathematics and physics and the technological foundations for energy transfer in different systems with emphasis on analysis, calculations, simulations, and feasibility assessments.
- Mathematical models for specific processes.
- Measuring techniques, e.g. principles for measuring transducers and components, measuring different units, use and interpretation of results.
- Planning and carrying out experimental studies, and also how data to be measured is obtained, analyse and reported.
- Visualisation and analysis of technical systems and processes using customised software.

## Knowledge requirements

### **Grade E**

Students give an account **in basic terms** of energy conversion, energy transfer, and also the functions and limitations of different energy systems. In addition, students evaluate **in simple** assessments technical solutions of energy systems based on the system's limitations, safety and a sustainable society.

Students solve **simple** technical problems, use **in consultation** with the supervisor appropriate working methods, and document their work and results. In their work, students use **with some certainty** technical concepts, theories and models. Students carry out calculations and analyses of

**simple** technical systems using calculation software, and also assess the feasibility of their results.

Students study **simple** technical systems concerning functional relationships and limitations, and also give an account **in basic terms** of the study carried out and the results established based on technical, physical and mathematical relationships. In addition, students use **with some certainty** computerised visualisation and simulation programs to calculate, visualise and analyse technical processes and systems.

In consultation with the supervisor, students assess **with some certainty** their own ability and the requirements of the situation.

### **Grade D**

Grade D means that the knowledge requirements for grade E and most of C are satisfied.

### **Grade C**

Students give an account **in detail** of energy conversion, energy transfer, and also the functions and limitations of different energy systems. In addition, students evaluate in **simple** assessments technical solutions of energy systems based on the system's limitations, safety and a sustainable society.

Students solve technical problems, **choose and** use **after consultation** with the supervisor appropriate working methods, and document their work and results. In their work, students use **with some certainty** technical concepts, theories and models. Students carry out calculations and analyses of technical systems using calculation software, and also assess the feasibility of their results.

Students study simple technical systems concerning functional relationships and limitations, and also give an account **in detail** of the study carried out and the results established based on technical, physical and mathematical relationships. In addition, students use **with some certainty** computerised visualisation and simulation programs to calculate, visualise and analyse technical processes and systems.

In consultation with the supervisor, students assess **with some certainty** their own ability and the requirements of the situation.

### **Grade B**

Grade B means that the knowledge requirements for grade C and most of A are satisfied.

### **Grade A**

Students give an account **in detail and in a balanced way** of energy conversion, energy transfer, and also the functions and limitations of different energy systems. In addition, students analyse and evaluate in **balanced** assessments technical solutions of energy systems based on the system's limitations, safety and a sustainable society.

Students solve **advanced** technical problems, **choose and** use **after consultation** with the supervisor appropriate working methods, and document their work and results. In their work,



students use **with certainty** technological concepts theories and models. Students carry out **advanced** calculations and analyses of technical systems using calculation software, and also assess the feasibility of their results.

Students study **advanced** technical systems concerning functional relationships and limitations, and also give an account **in detail and in a balanced way** of the study carried out and the results established based on technical, physical and mathematical relationships. In addition, students use **with certainty** computerised visualisation and simulation programs to calculate, visualise and analyse technical processes and systems.

In consultation with the supervisor, students assess **with certainty** their own ability and the requirements of the situation.

## Technology – specialisation

The course, technology – specialisation, covers points 1–5 and 9 under the heading Aim of the subject. The course covers advanced knowledge in a chosen area of technology.

### Core content

*Teaching in the course should cover the following core content:*

- Technology and technological development in a chosen area e.g. design, product development, information, media, production, electricity and combustion technologies or societal development.
- Practical or theoretical applications in the area of technology.
- Conditions and prerequisites for entrepreneurship.
- Technology in a sustainable society e.g. making effective use of resources and energy.
- Technical problem analysis, problem solutions, feasibility assessments and evaluation of one's own and others' solutions.
- The concepts, theories and models of technology with links to the technological area chosen for the course.
- Equipment e.g. software, machines and tools in a broad sense. Choice of these with due regard to the working environment and safety.
- Technical language, technical communication and documentation in the chosen area.

### Knowledge requirements

#### Grade E

Students describe **in basic terms** how technology has developed, and give an account **in basic terms** of relationships between different parts of technological development processes. In addition, students analyse and evaluate in **simple** assessments technical solutions based on a sustainable society.

Students solve **simple** technical problems in a chosen area technology with **satisfactory** results. In addition, students choose and use **in consultation** with the supervisor appropriate production methods, and solutions for design and construction, and also document their work and results. In their work, students use **with some certainty basic** mathematical and technological concepts, theories and models, and also carry out **simple** calculations and use **simple** strategies for solutions. Students assess the feasibility of their results, and also evaluate their own and others' choice of methods and strategies in **simple** assessments.

Students use **with some certainty** equipment with due regard to the working environment and safety.

Students communicate **with some certainty** their ideas and results using relevant concepts from some of the knowledge areas.

In consultation with the supervisor, students assess **with some certainty** their own ability and the requirements of the situation.

### **Grade D**

Grade D means that the knowledge requirements for grade E and most of C are satisfied.

### **Grade C**

Students describe **in basic terms** how technology has developed, and give an account **in basic terms** of relationships between different parts of technological development processes. In addition, students analyse and evaluate in **simple** assessments technical solutions based on a sustainable society.

Students solve technical problems in a chosen area of technology with **satisfactory** results. In addition, students choose and use **after consultation** with the supervisor appropriate production methods, and solutions for design and construction, and also document their work and results. In their work, students use **with some certainty basic** mathematical and technological concepts, theories and models, and also carry out simple calculations and use simple strategies for solutions. Students assess the feasibility of their results, and also evaluate their own and others' choice of methods and strategies in **balanced** assessments.

Students use **with some certainty** equipment with due regard to the working environment and safety.

Students communicate **with some certainty** their ideas and results using relevant concepts from some of the knowledge areas.

In consultation with the supervisor, students assess **with some certainty** their own ability and the requirements of the situation.

### **Grade B**

Grade B means that the knowledge requirements for grade C and most of A are satisfied.

### **Grade A**

Students describe **in detail and in a balanced way** how technology has developed, and give an account **in detail and in a balanced way** of relationships between different parts of technological development processes. In addition, students analyse and evaluate in **balanced** assessments technical solutions based on quality, and a sustainable society.

Students solve **advanced** technical problems in the chosen area of technology with **good** results. In addition, students choose and use **after consultation** with the supervisor appropriate production methods, and solutions for design and construction, and also document their work and

results. In their work, students use **with certainty** mathematical and technological concepts, theories and models, and also carry out **advanced** calculations, and use **advanced** strategies for solutions. Students assess the feasibility of their results, and also evaluate their own and others' choice of methods and strategies in **balanced** assessments **and also make proposals for alternative choices of methods and strategies**.

Students use **with certainty** equipment with due regard to the working environment and safety.

Students communicate **with certainty** their ideas and results using relevant concepts from some of the knowledge areas.

In consultation with the supervisor, students assess **with certainty** their own ability and the requirements of the situation.