

Electrotechnology

The subject of electrotechnology covers simpler installations and electrical work at electricity facilities, as well as ordinary engineering work in the area. In all work with electricity, safety issues are paramount since a mistake can cause major damage to both people and property. Carrying out electrical work thus requires in most cases special authorisation.

Aim of the subject

Teaching in the subject of electrotechnology should aim at helping students develop knowledge of planning and carrying out electrical, engineering and mechanical work, and different welding technologies, as well as skills in handling materials, tools and equipment. It should also help students understand the importance of energy efficiency and of carrying out electrical work safely, and being able to implement regulations, standards and requirements in the area. Teaching should also give students the opportunity to develop the ability to rectify faults and maintain electricity facilities. Teaching should help students develop the ability to use diagrams and plans when performing electrical and engineering work. Students should be given the opportunity to plan tasks, and to develop the ability to use materials and equipment in a responsible manner. By working with tasks both in theory and in practice, students should be given the opportunity to train their ability to work ergonomically, environmentally, aesthetically and in professional and ethical ways.

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

- 1) The ability to carry out electrical work, engineering work, installations, mechanical work and welding.
- 2) Skills in using drawings, diagrams, instructions, standards and regulations.
- 3) The ability to choose and use different tools, instruments, materials and other equipment used in the area.
- 4) Knowledge of laws and regulations in the area.
- 5) Skills in rectifying faults and maintaining electricity facilities.
- 6) The ability to work safely, with due regard to the working environment, ergonomically and aesthetically.
- 7) The ability to document their work.

Courses in the subject

- Electromechanics, 100 credits.
- Electrical power technology, 100 credits.
- Aerial and cable TV technology, 100 credits, which builds on the course, electric power engineering.
- Computing and media networks, 100 credits, which builds on the course, electric power engineering.

Electromechanics

The course, electromechanics, covers points 1–4 and 6–7 under the heading Aim of the subject. The course covers basic knowledge in the subject.

Core content

Teaching in the course should cover the following core content:

- Electricity work, e.g. disconnecting and connecting apparatuses, and also function testing.
- Simpler workshop work, e.g. soldering, screw joints and blind riveting.
- Reading drawings in engineering mechanics.
- Press tools for different types of contacts used in the professional area.
- Adhesive techniques, knowledge of materials and mechanical measurement.
- Manual tools used in different professional areas.
- Electrical safety for persons and property.
- Personal checks, ergonomics, safe electrical work, quality requirements, working environment and safety.
- Safety in hot work, erecting scaffolding and working from ladders.

Knowledge requirements

Grade E

Students carry out with **some** skills simple electrical work, workshop work, mechanical work and welding in the area. Students draw up a **simple** work plan based on drawings, diagrams, standards and specifications relevant to the task. Prior to the work, students choose **in consultation** with the supervisor tools, instruments, materials and other equipment for the task, and use these with **some** skills in environmentally friendly ways.

Students carry out work in a way which is safe for themselves and others, and also with due account of the working environment, ergonomics and aesthetics. Students draw up **simple** documentation of their work.

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 carry out with **good** skills simple electrical work, workshop work, mechanical work and welding in the area. Students draw up a **coherent** plan of the work based on drawings, diagrams, standards and regulations relevant to the task. Prior to their work, students choose **after consultation** with the supervisor tools, instruments, materials and other equipment for the task, and use this with **good** skills in environmentally friendly ways.

Students carry out work in a way which is safe for themselves and others, and also with due account of the working environment, ergonomics and aesthetics. Students draw up **detailed** documentation of their work.

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 carry out with **very good** skills simple, **and also more advanced**, electrical work, workshop work, mechanical work and welding in the area. Students draw up a **coherent** plan of the work based on drawings, diagrams, standards and regulations relevant to the task. Prior to their work, students choose **after consultation** with the supervisor tools, instruments, materials and other equipment for the task, and use this with **very good** skills in environmentally friendly ways.

Students carry out work in a way which is safe for themselves and others, and also with due account of the working environment, ergonomics and aesthetics. Students draw up **accurate and detailed** documentation of their work.

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

Electric power engineering

The course, electric power engineering, covers points 1–7 under the heading Aim of the subject. The course covers basic knowledge in the subject.

Core content

Teaching in the course should cover the following core content:

- Connecting, disconnecting and testing functions of apparatuses and equipment.
- Installing and moving existing groups of cables.
- Electric motors with simple peripheral start equipment.
- Terminal equipment, control panels and simpler control equipment.
- Laying and connecting cables.
- Drawing and reading diagrams in the area.
- Regulations, standards and provisions in accordance with eligibility requirements.
- Properties of different materials and categories of sealing.
- Measuring common electrical units.
- The concept of electricity quality and electromagnetic compatibility.
- Fault tracing and maintenance of existing electricity equipment.
- Personal protection when working with and close to objects subjected to voltage, and also practical electricity for people and property.
- Checking prior to start up.

Knowledge requirements

Grade E

Students carry out with **some** skills simple electrical work in the area. Students draw up a **simple** work plan based on drawings, diagrams, standards and specifications relevant to the task. Prior to the work, students choose **in consultation** with the supervisor tools, instruments, materials and other equipment for the task, and use these with **some** skills in environmentally friendly ways.

During the work, students identify possible problems and faults in not only new, but also existing electricity installations, and also solve and repair them **in consultation with** the supervisor.

Students carry out work in a way which is safe for themselves and others, and also with due account of the working environment, ergonomics and aesthetics. Students check safety with

satisfactory results, provide **simple** documentation of their work and start the electricity installation.

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 carry out with **good** skills simple electrical work in the area. Students draw up a **coherent** plan of the work based on drawings, diagrams, standards and regulations relevant to the task. Prior to their work, students choose **after consultation** with the supervisor tools, instruments, materials and other equipment for the task, and use this with **good** skills in environmentally friendly ways.

During their work, students identify possible problems and faults in both new and existing electricity installations, and solve and repair them **after consultation** with the supervisor.

Students carry out work in a way which is safe for themselves and others, and also with due account of the working environment, ergonomics and aesthetics. Students check safety with **satisfactory** results, provide **accurate** documentation of their work and start the electricity installation.

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 carry out with **very good** skills simple, **and also more advanced** electrical work in the area. Students draw up a **coherent** plan of the work based on drawings, diagrams, standards and regulations relevant to the task. Prior to their work, students choose **after consultation** with the supervisor tools, instruments, materials and other equipment for the task, and use this with **very good** skills in environmentally friendly ways.

During their work, students identify possible problems and faults in both new and existing electricity installations, and solve and repair them **after consultation** with the supervisor.

Students carry out work in a way which is safe for themselves and others, and also with due account of the working environment, ergonomics and aesthetics. Students check safety with **good** results, provide **accurate and detailed** documentation of their work and start the electricity installation.

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

Aerial and cable TV technology

The course, aerial and cable TV technology, covers points 1–7 under the heading Aim of the subject. The course covers advanced knowledge in the subject.

Core content

Teaching in the course should cover the following core content:

- Planning, installing and operations, and also maintenance of aerial and cable TV facilities for terrestrial and satellite distributed TV.
- Digital TV technology and TV signals for satellite and cable broadcasting.
- Build-up and functional modes of broadband multifunctional networks for properties (BMF networks), and hybrid, fibre and coaxial networks (HFC networks).
- Use and interpretation of the measurement concepts of decibels, attenuation and amplification, and intermodulation distance and carrier to noise (C/N).
- Scaling of cables and assembling contacts.
- Standards, norms and system requirements for aerial and cable TV facilities.
- Requirements of European norms for distribution systems of television and radio.
- Requirement for radiation immunity of components and cables to reduce cable-related disturbances.
- Aerials, reception equipment and measuring instruments for satellite reception.
- Aerials for TV reception and measuring instruments for checking signal level and quality.
- Fault tracing and repairs of aerial and cable TV facilities.
- Measurement checking and signal level adjustments in cable TV facilities.
- Registration of measurement data and documentation of work.

Knowledge requirements

Grade E

Students carry out with **some** skills simple installations of aerial and cable TVs. Students draw up a **simple** work plan based on drawings, diagrams, standards and specifications relevant to the task. Prior to the work, students choose **in consultation** with the supervisor tools, instruments,

materials and other equipment for the task, and use these with **some** skills in environmentally friendly ways.

During their work, students detect possible problems and errors in not only new but also existing installations, and solve and repair them **in consultation with** the supervisor.

Students carry out work in a way which is safe for themselves and others, and also with due account of the working environment, ergonomics and aesthetics. Students check safety with **satisfactory** results, create **simple** documentation of their work and start the installation.

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 carry out with **good** skills simple installations of aerial and cable TVs. Students draw up a **coherent** plan of the work based on drawings, diagrams, standards and regulations relevant to the task. Prior to their work, students choose **after consultation** with the supervisor tools, instruments, materials and other equipment for the task, and use this with **good** skills in environmentally friendly ways.

During their work, students identify possible problems and errors in both new and existing installations, and solve and repair these **after consultation** with the supervisor.

Students carry out work in a way which is safe for themselves and others, and also with due account of the working environment, ergonomics and aesthetics. Students check safety with **satisfactory** results, create **thorough** documentation of their work and start the installation.

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 carry out with **very good** skills simple, **and also more advanced**, installations of aerial and cable TVs. Students draw up a **coherent** plan of the work based on drawings, diagrams, standards and regulations relevant to the task. Prior to their work, students choose **after consultation** with the supervisor tools, instruments, materials and other equipment for the task, and use this with **very good** skills in environmentally friendly ways.

During their work, students identify possible problems and errors in both new and existing installations, and solve and repair these **after consultation** with the supervisor.

Students carry out work in a way which is safe for themselves and others, and also with due account of the working environment, ergonomics and aesthetics. Students check safety with **good** results, provide **accurate and detailed** documentation of their work and start the installation.

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

Computing and media networks

The course, computing and media networks, covers points 1–7 under the heading Aim of the subject. The course covers advanced knowledge in the subject.

Core content

Teaching in the course should cover the following core content:

- Planning, installation, starting and registering, and also maintenance of data and media network installations.
- Functions and structures of computers and media networks.
- Build-up and functional modes of broadband multifunctional networks for properties (BMF networks), and hybrid, fibre and coaxial networks (HFC networks).
- Foundations of data communication technology.
- Connecting fibre boxes and user outlets.
- Cable laying and rules for multiple cable laying.
- Splicing and installing fibre optic cables.
- Joining fibre cables and category 5 and 6 networks.
- Measuring techniques and instruments for measuring and testing in fibre networks.
- Techniques for repairs and fault tracing in computer and media networks.
- Measurement and fault tracing techniques in fibre networks.

Knowledge requirements

Grade E

Students carry out with **some** skills simple installations of computer and media networks. Students draw up a **simple** work plan based on drawings, diagrams, standards and specifications relevant to the task. Prior to the work, students choose **in consultation** with the supervisor tools, instruments, materials and other equipment for the task, and use these with **some** skills in environmentally friendly ways.

During their work, students detect possible problems and errors in not only new but also existing installations, and solve and repair them **in consultation with** the supervisor.

Students carry out work in a way which is safe for themselves and others, and also with due account of the working environment, ergonomics and aesthetics. Students check safety with **satisfactory** results, create **simple** documentation of their work and start the installation.

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 carry out with **good** skills simple installations of computer and media networks. Students draw up a **coherent** plan of the work based on drawings, diagrams, standards and regulations relevant to the task. Prior to their work, students choose **after consultation** with the supervisor tools, instruments, materials and other equipment for the task, and use this with **good** skills in environmentally friendly ways.

During their work, students identify possible problems and errors in both new and existing installations, and solve and repair these **after consultation** with the supervisor.

Students carry out work in a way which is safe for themselves and others, and also with due account of the working environment, ergonomics and aesthetics. Students check safety with **satisfactory** results, create **thorough** documentation of their work and start the installation.

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 carry out with **very good** skills simple, **and also more advanced**, installation work in computer and media networks. Students draw up a **coherent** plan of the work based on drawings, diagrams, standards and regulations relevant to the task. Prior to their work, students choose **after consultation** with the supervisor tools, instruments, materials and other equipment for the task, and use this with **very good** skills in environmentally friendly ways.

During their work, students identify possible problems and errors in both new and existing installations, and solve and repair these **after consultation** with the supervisor.

Students carry out work in a way which is safe for themselves and others, and also with due account of the working environment, ergonomics and aesthetics. Students check safety with **good** results, provide **accurate and detailed** documentation of their work and start the installation.

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