

## **Programme area for automation - Curriculum for common programme subject Vg2**

Dette er en oversettelse av den fastsatte læreplanteksten. Læreplanen er fastsatt på Bokmål

Laid down as a regulation by the Norwegian Directorate for Education and Training on 6 December 2006, as delegated in a letter of 26 September 2005 from the Ministry of Education and Research pursuant to the Act of 17 July 1998 no. 61 relating to primary and secondary education (Education Act) Section 3-4 first paragraph.

Valid from 01.08.2007

Valid to 31.07.2018



## **Purpose**

Learning in *Automation* shall contribute to developing competence in automated systems for the oil and gas industries, processing and workshop industries, and for the business sector. The programme subjects shall contribute to increased productivity, quality and safety for personnel and the outdoor environment. Product quality and dependability are significant factors. Highly qualified skilled labour in the field of automation is important to ensuring this.

Learning in the subjects shall promote skills like understanding systems and equipment, analytic abilities, restructuring, entrepreneurship, and innovation. Learning in the subjects shall also promote understanding safety factors and the ability to see consequences of choices related to environment, health and safety. The programme subjects shall raise awareness of environmental challenges related to utilisation of resources and sustainable development.

Learning in the subjects shall emphasize insight and awareness of choices related to automation systems and equipment. An understanding of safety and an application of basic rules and regulations shall be central elements of learning in the subjects. Learning in the subjects shall promote independence and cooperation with others within the same field, and with those in other professional fields. Furthermore, service-mindedness and the ability to communicate with users, support personnel and colleagues shall be upheld. Precision, creativity and problem-solving are thought processes involved in carrying out this kind of work, and are central elements in the subjects.

Learning basic planning competence and understanding systems and equipment, as well as developing learning strategies for down-to-earth, holistic, interdisciplinary learning assignments shall form the basis of more in-depth work and specialisation.

## **Structure**

The programme area *Automation* consists of two programme subject. Programme subjects complement each other, and should be viewed in relation to one another.

### **Overview of the programme subjects:**

<b>Year level</b>	<b>Programme subjects</b>	
Vg2	Automation systems	Electrical power systems

## Description of the programme subjects

### Automation systems

The programme subject *Automation systems* covers electric, hydraulic, pneumatic and programmable logic controller systems, measuring and technical regulating systems, and routines for supervision and maintenance of systems and equipment. Integrated into the programme subject are electrical safety, quality control, internal control, and electrotechnical and mechanical calculations and concepts. Mechanical work, functions testing, measuring techniques, troubleshooting, communication, use of digital tools and entrepreneurship are integrated into this subject.

### Electrical power systems

The programme subject *Electrical power systems* covers electrical distribution panels, electric installation systems, electric motor drives, and routines for supervision and maintenance of systems and equipment. Integrated into the programme subject are electrical safety, quality control, internal control, and electrotechnical calculations and concepts. Functions testing, measuring techniques, troubleshooting, communication, and use of digital tools are also integrated into this subject.

## Teaching hours

Teaching hours are given in 60-minute units.

Vg2

Automation systems 337 teaching hours per year

Electrical power systems 140 teaching hours per year

## Basic skills

Basic skills are integrated into the competence aims for this course in areas where they contribute to the development of and are a part of the basic subject competence. In *Automation*, basic skills are understood as follows:

*Being able to express oneself orally and in writing* in Automation involves relating to customers, colleagues and professionals from other fields. It also means discussing safety and choosing professional solutions, planning, guidance, documenting and user training. This involves developing precise use of language and good communication so that misunderstandings and dangerous situations are avoided.

*Being able to read* in Automation involves understanding different kinds of professional texts to ensure that work is always done in line with current regulations, trade specific standards, the manufacturer's technical documentation, and the customer's needs.

*Numeracy* in Automation involves doing calculations for planning and documentation, evaluating measurement results, dimensions and optimisation, and understanding the relationship between electric, hydraulic and pneumatic systems and circuits.

*Digital literacy* in Automation involves doing information searches and producing technical documents for systems and units, as well as assisting in troubleshooting. This also involves programming, configuring, troubleshooting and documenting using digital tools.

## Competence aims

### Automation systems

*The aims of the studies are to enable pupils to*

- plan, install, activate, and document programmable logical controller systems for digital and analogue signal handling related to electric, hydraulic and pneumatic systems, and using digital tools for programming, configuration and troubleshooting
- plan and document control loops for temperature, pressure, RPMs, levels and amounts, and install and activate at least two of these
- plan and document the installation and start-up of regulating valves with appurtenant actuators
- optimise automation systems by using automatic and manual methods based on processing needs
- assemble, present, adapt, unite and do function testing on mechanical parts for automation systems based on material properties and the manufacturer's technical documentation
- read and explain process charts with appurtenant instrumentation
- use digital tools to produce charts, diagrams and mechanical drawings related to electric, pneumatic and hydraulic controls and regulating systems
- plan, execute and document control and maintenance of measuring systems for temperature, pressure, RPMs, levels and amounts

- plan, execute and document controls, maintenance and repairs to control valves, and perform mechanical work related to these
- plan, execute and document control, maintenance and repairs to hydraulic and pneumatic equipment with piping systems related to these
- plan, execute and document control, maintenance and repairs to machine armaments and equipment
- consider sources of electric noise in work with automation systems and equipment
- give users guidance on automation systems and equipment
- do functions testing on automation systems and equipment, and elaborate on the principle manners of operation
- measure electrical capacities of automation systems and equipment, and evaluate the results of these measurements
- troubleshoot automation systems and equipment after connection and operation errors, and log troubleshooting work
- do risk assessments and final control checks to work done, and evaluate the quality of own work
- describe the different maintenance systems for automation systems
- use precise terminology specific to the trade regarding automation systems and equipment, adapted for understanding by users, support personnel, colleagues and representatives from other trades
- carry out work on automation systems and equipment in a professional and precise manner in accordance with current laws, regulations, standards, and the manufacturer's technical documentation
- carry out work with automation systems and equipment in accordance with current safety regulations
- carry out work in accordance with quality control and internal control routines
- evaluate and test out ideas for products that can promote entrepreneurship

## Electrical power systems

*The aims of the studies are to enable pupils to*

- plan, install, activate and document electrical distribution panels for small industrial plants based on different voltage systems and installation methods with appurtenant grounding
- evaluate the different starting and regulating methods of a three-phase asynchronous motor, and plan install, document and activate at least two of these starting methods
- plan, install, activate and document electric systems powered by a transformer connected to various load types
- give users guidance on electrical power systems and equipment
- use digital tools to produce diagrams and drawings
- measure electrical capacities of electrical power systems and equipment, and evaluate the results of these measurements
- troubleshoot electrical power systems and equipment from connection and operation errors, and log troubleshooting work
- do risk assessments and final control checks to work done, and evaluate the quality of own work
- use precise terminology specific to the trade regarding electrical power systems and equipment, adapted for understanding by users, support personnel, colleagues and representatives from other trades
- carry out work on electrical power systems and equipment in a professional and precise manner in accordance with current laws, regulations, standards, and the manufacturer's technical documentation
- carry out work with electrical power systems and equipment in accordance with current safety regulations
- carry out work in accordance with quality control and internal control routines

## Assessment

### Vg2 Automation

Provisions for final assessment:

**Overall achievement marks**

<b>Programme subjects</b>	<b>Provisions</b>
Automation systems Electrical power systems	The pupils shall have an overall achievement mark in each programme subject.

**Examination for pupils**

<b>Programme subjects</b>	<b>Provisions</b>
Automation systems Electrical power systems	Pupils shall also sit for an interdisciplinary practical examination that covers the common programme subjects. The interdisciplinary practical examination shall among other things contain testing of competence aims for electrical safety. The examination is prepared and marked locally.

**Examination for external candidates**

<b>Programme subjects</b>	<b>Provisions</b>
Automation systems Electrical power systems	The external candidates shall sit for a written examination in each programme subject. External candidates shall also sit for an interdisciplinary practical examination that covers the common programme subjects. The interdisciplinary practical examination shall among other things contain testing of competence aims for electrical safety. The examination is prepared and marked locally.

The provisions for assessment are stipulated in the regulations of the Norwegian Education Act.