Mechatronics

Mechatronics is the combination of mechanics and electronics. The two technology areas are combined to enable the study of common technological devices that integrate electrical and mechanical functions.

The subject of mechatronics covers interaction between different areas of technology in products and processes. The subject can be divided into two parts – product mechatronics and process mechatronics. Product mechatronics covers product structure, and process mechatronics covers building up processes for producing these products.

Aim of the subject

Teaching in the subject of mechatronics should aim at helping students develop the ability to build mechatronic systems, and knowledge of how mechanical structure, electrotechnology and control technology interact in technical systems in people's everyday lives. Teaching should also help students develop knowledge of how to describe scientific principles using mathematical formulae. Teaching should also give students the opportunity to develop knowledge of how technical systems can be broken down into subsystems.

Teaching should give students the opportunity to develop their understanding of technology in daily life. Teaching should give students the opportunity to work with different tasks both theoretically and practically. Teaching should also give students the opportunity to train their ability to plan these tasks.

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

1) The ability to plan, build and document mechatronic systems which combine mechanical structure, electrical engineering and control technology.
2) The ability to use drawings and manuals and also cooperate with others.
3) Skills in using information technology to support building and programming of mechatronic systems.
4) Knowledge of how mechanical structures, electro-technology, and also control and process technologies can be brought together into a system.
5) Understanding of how mathematics and physics can be used to describe principles in electricity and mechanics.

Courses in the subject

- Mechatronics 1, 100 credits.
- Mechatronics 2, 100 credits, which builds on the course, mechatronics 1.

Mechatronics 1

The course, mechatronics 1, covers points 1–2 and 4–5 under the heading Aim of the subject. The course covers basic knowledge in the subject from both production and process perspectives in mechatronics.

Core content

Teaching in the course should cover the following core content:

- Electrical work, mechanical work and basic programming of control units.
- Understanding drawings and manuals.
- Structure of mechatronic systems covering sensors, via control units to actuators.
- How basic logical functions can be used for different control technology solutions.
- Technical solutions in daily life for converting energy, matter or data.
- Basic mechanical concepts, such as leverage, pulleys, inclined planes, frameworks and beams.
- Basic electrical units and concepts, such as charging, current, voltage, resistance, and closed circuits.
- Measuring different mechanical and electrical units.

Knowledge requirements

Grade E

Students plan and build **in consultation** with the supervisor **one or** several mechatronics systems which bring together mechanical structures, electrotechnology and control technology. In their work, students use **with some certainty** drawings and manuals, and also cooperate **with some certainty** with others. Students draw up **simple** documentation of their work.

With examples from both industry and everyday life, students describe **in basic terms** how a **simple** mechatronic system is built. With the help of concepts from mathematics and physics, students describe **in basic terms** the principles of physics for different mechatronic applications.

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 plan and carry out **after consultation** with the supervisor **one or** several mechatronics systems which bring together mechanical structures, electro-technology and control technology. In their work, students use **with some certainty** drawings and manuals, and also cooperate **with some certainty** with others. Students draw up **detailed** documentation of their work.

With examples from both industry and everyday life, students describe **in detail** how a mechatronic system is built. With the help of concepts from mathematics and physics, students describe **in basic terms** the principles of physics for different mechatronic applications.

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 plan and carry out **after consultation** with the supervisor one or several mechatronics systems which bring together mechanical structures, electro-technology and control technology. In their work, students use **with certainty** drawings and manuals, and also cooperate **with certainty** with others. Students draw up **accurate and detailed** documentation of their work.

With examples from both industry and everyday life, students describe **in detail and in a balanced way** how a **complex** mechatronic system is built. With the help of concepts from mathematics and physics, students describe **in detail and in a balanced way** the principles of physics for different mechatronic applications.

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

Mechatronics 2

The course, mechatronics 2, covers points 1–5 under the heading Aim of the subject. The course covers advanced knowledge in the subject from both production and process perspectives in mechatronics.

Core content

Teaching in the course should cover the following core content:

- Mechatronic systems and mechatronic processes.
- In-depth interpretation of drawings and manuals.
- Information technology to support the building and programming of mechatronic systems, e.g. CAD software with support for strength testing at different loads, and programming tools for current steering systems.
- Methods for integrating mechanical structures, electro-technology and process controls when building mechatronic systems in terms of both products and manufacturing systems.
- The concepts of process and systems.
- Modularisation and demodularising of manufacturing systems and technical systems in everyday life.
- Concepts of mathematics and physics when working with mechatronic systems e.g. levers, moments, force, inertia, sustainability, rigidity and equilibrium.

Knowledge requirements

Grade E

Students plan and build **in consultation** with the supervisor **one or** several mechatronics systems which bring together mechanical structures, electrotechnology and control technology. In their work, students use **with some certainty** drawings, manuals and information technology. In addition, students cooperate **with some certainty** with others. Students draw up **simple** documentation of their work, and also evaluate it in **simple** assessments.

With examples from both industry and everyday life, students describe **in basic terms** how a **simple** mechatronic system is built. With the help of concepts from mathematics and physics, students describe **in basic terms** the principles of physics for different mechatronic applications.

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 plan and carry out **after consultation** with the supervisor **one or** several mechatronics systems which bring together mechanical structures, electro-technology and control technology. In their work, students use **with some certainty** drawings, manuals and information technology. In addition, students cooperate **with some certainty** with others. Students also draw up **accurate** documentation of their work, and also evaluate it in **balanced** assessments.

With examples from both industry and everyday life, students describe **in detail** how a mechatronic system is built. With the help of concepts from mathematics and physics, students describe **in basic terms** the principles of physics for different mechatronic applications.

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 plan and carry out **after consultation** with the supervisor one or several mechatronics systems which bring together mechanical structures, electro-technology and control technology. In their work, students use **with certainty** drawings, manuals, and information technology. In addition, students cooperate **with certainty** with others. Students also draw up **accurate and detailed** documentation of their work, and also evaluate it in **balanced** assessments. **In addition, students make proposals on how the system can be improved**.

With examples from both industry and everyday life, students describe **in detail and in a balanced way** how a **complex** mechatronic system is built. With the help of concepts from mathematics and physics, students describe **in detail and in a balanced way** the principles of physics for different mechatronic applications.

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