# Curriculum for Bachelor's Degree Programme in Procuct Development and Technology Integration

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# The purpose of the curriculum is:

– to frame the structure and content of the educational programme
– to ensure a homogenous quality of the students’ educational gains across the educational institutions that provide the educational programme
– to ensure the development of the educational programme on the basis of the development in the educational needs of the students and clients
– to frame cross-institutional and crossdisciplinary knowledge-sharing within the area of the profession

# 1. The purpose of the educational programme

The purpose of the educational programme is to qualify the student to integrate different technologies and modes of knowledge, in an independent and professional manner, in connection with assignments within development and construction of technical systems and products, both nationally and internationally, in accordance with the technological, scientific and societal advancement. Additionally, the fully qualified BA must be able to handle crossdisciplinary, technically oriented, managerial tasks. The educational programme must also qualify the student for further education.

# 2. Profile for bachelor of product development and technology integration

The educational programme is profession and development-based with the students' academy profession background as the point of departure. The basis of the educational programme in profession and development is ensured by cooperation with clients, research institutions, and other relevant participants. The educational programme draws upon national and international research results.

The basis in profession implies that the educational programme has a profession-oriented goal of fulfilling special demands and expectations that are generally associated with professions. The basis in development implies that, within the educational programme, there is a focus on technology development, and also construction and development tasks, in a special integration perspective, in view of handling these tasks broadly in different types of company.

The role as integrator

The educational programme addresses tasks of development and construction from the following two perspectives.

- A perspective in which the focus is on the role as integrator across the company's organisation, and in the relations between the company, its clients and suppliers.
- A perspective in which the role as integrator is tied to the combination of different techniques and technologies across prevailing professional boundaries with a view to developing and constructing systems, solutions and products.

A broad product term

The profile of the educational programme is tied to the use of a broad product term with two meanings:

- A produced commodity – meaning a physical product with some kind of shape.
- The result of a work effort, an endeavour or a development.

Furthermore, the profile of the educational programme is tied to the use of a broad term for construction. In this connection, to construct means to draft and organise products, systems, and solutions.

The knowledge base of the educational programme

Generally seen, the profile of the educational programme is founded in professional practical knowledge, development knowledge, and research knowledge. During the educational programme, knowledge about the methods, theories, values and conditions of the profession are conveyed and developed. The professional knowledge content of the educational programme builds on and expands the student's background in the qualifying academy profession educations.

# 2.1 Areas of specialisation within the educational programme

The educational programme contains three areas of specialisation, each corresponding to the content of the qualifying academy profession educations. The areas of specialisation frame a continuation of the professional progression from the qualifying academy profession educations towards the level of bachelor. A short and general description of the content of the three areas of specialisation can be seen below. The objectives for each area of specialisation are described later in the curriculum. In the educational programme's overall objective for the educational gains in appendix 1 in the Ministerial Order, the objectives for each of the areas of specialisation are also included.

**IT and electronics**

This area of specialisation covers the following areas:

Development of complex IT and network solutions, including

- Technical contracts within IT and network systems.
- Design and projecting of IT and network solutions.
- Implementation, administration and operation/supervision of IT and network solutions.

Development of electronic and computerized systems at block and system/component level, including

- Design, construction, test and documentation of electronic and computerized systems at component level.
- Set up test models, test and assess results from electronic and computerized systems at block level.
- Design, construction, test and documentation of embedded systems.

**Installation and automation**

This area of specialisation covers the following areas:

Installations, including

- New construction contracts and facility management
- Projecting, consultancy, installation and management/maintenance/service
- Specialised installation tasks and costumer solutions within the IT and telecommunication industry, alarms and safety, intelligent construction, and the energy and supply sector
- Quality assurance in connection with authorization.

Energy-technical building and industry installations, including

- Technical contracts within indoor climate and production.
- Projecting, consultancy, and adjustment of installations.
- Energy-technical consultancy and optimization of installations and control systems.

Development and optimization of operating systems for automatic installations and technical systems, including

- Integration, automatization and optimization of technical systems and installations – both electrical and interfacing mechanical systems.
- Planning, development and commissioning of automatization systems within industrial production, energy installations and processing plants.
- Optimization and supervision of processing plants with an eye to production flow and energy.

**Development of products and productions**

This area of specialisation covers the following areas:

Development and optimization of production systems, which typically takes place in the departments of production engineering and operational engineering in manufacturing industries, including

- Analysis and development tasks within production engineering in connection with optimization of the overall supply chain.
- Tasks within production planning in relation to implementation and use of the company's ERP system (Enterprise Resource Planning)
- Handling practical development tasks within production engineering across professional boundaries and company's organisation, including project management.
- Coordinate internal quality tasks, including supervision, measurement of processes and securing of process capability.

Development, fashioning and construction of industrial products. The educational programme takes its starting point in an integrated view of product development, including an organisational integration, which ensures that all parties involved in the product's life cycle are brought together from phase one. This especially concerns those who handle the supply of materials, manufacturing, distribution and service. The following activities and tasks are included in the area of profession:

- Tasks within idea development, concept development and modelling, closely connected to the company's business development
- Coordination of tasks within product development and construction across professional groups from inside and outside the company, among these in projects and development groups.
- Conducting complex practical construction tasks that involve choice of materials and production technologies under consideration of environment and sustainability, among other things.

# 2.2 Knowledge base and methods

**Knowledge base**

Knowledge is characterised by the possession of a comprehensive and coherent expertise as the foundation for conducting the job. This is the hallmark of professions. The knowledge-based preconditions of the profession are knowledge about the interaction between technology development and the societal development, as well as understanding the integration of different technologies in connection with the development of technological solutions. This expertise is based on knowledge from technical areas of profession linked with knowledge from scientific areas of profession, and also theory of science and method.

**Method base**

In working with different types of technology integration and development tasks within construction of technical systems and products, theoretical knowledge is combined with practical experience in view of achieving the optimum solution. The method base of the educational programme is therefore composed in the following way:

- Task-specific methods are methods in relation to development, construction, dimensioning, projecting, consultancy and documentation, among other things
- Process-specific methods are methods in relation to technical managerial tasks, project management, production management, quality control and environmental management, among other things
- Reflection methods are methods for considering the use of theory and methods in connection with development tasks.
- Research-related methods, including knowledge of how to apply scientific theories and methods to the development of technology

# 2.3 The professional grounding of the educational programme

The professional competences of the profession are composed of an enhancement of the professional competences characteristic of the academy profession background and an crossdisciplinarity that, to a great extent, supports the development of the role as integrator.

## 2.3.1 Development of the professional competences

It is crucial that the educational institution organises the educational programme in such a way that the student can achieve an educational progression in relation to the academy profession background, and thus promotes the fact that the bachelor's degree programme builds on the academy profession degree programme. Knowledge, skills and professional competences should all be further developed within the area of profession corresponding to the academy profession background.

## 2.3.2 Development of the crossdisciplinarity in the bachelor's degree programme.

It is also crucial that the vertical progression of the educational programme, which builds on the academy profession background, is supplemented with a horizontal progression, ensuring crossdisciplinarity. The crossdisciplinarity is of great importance for handling tasks that require an integration of several areas of profession.

The educational institution must ensure that projects included in the educational course not only builds on the student's academy profession background, but also that they are crossdisciplinary in nature. It is crucial that the academy profession background, and the further development of this, is brought into play in new ways by means of placing crossdisciplinary demands on the student.

The crossdisciplinarity in the educational programme aims at enabling the student to develop solutions in cooperation with other profession groups on the basis of a broader perspective on technique and professional competences. A joint conceptual framework is crucial to a profitable crossdisciplinary cooperation. The elements of technique, knowledge, organisation, and product each represent an overall, but at the same time demarcated, professional framework, which the students must be able to work with and communicate within.

**Technique**

The category technique delimits an area of profession that is tied to the use of materials, tools and man power. The category is composed of:

Materials, covering raw materials for manufacturing products, and components for building devices, installations and systems. The professional competences are tied to the student's knowledge and skills in the use of materials in connection with development and construction tasks, and also tasks within technology integration.

Tools, covering work mediums, including hand tools, machine tools, measuring instruments, computers, construction programs, etc. The professional competences are tied to the student's knowledge and skills in the use and development of tools in connection with development and construction tasks, and also tasks within technology integration.

Man power, covering machines, robots and co-workers. The professional competences are tied to the student's knowledge and skills in the use and development of machines and robots in connection with development and construction tasks, and also tasks within technology integration. Furthermore, the professional competences are tied to technical management of co-workers, including project management.

**Knowledge:**

The category knowledge is tied to the development of the profession and the use of different types of professional knowledge. The category also covers knowledge about knowledge creation/knowledge development in the form of a theory of science. The category is composed of:

Experience, covering knowledge gained as experience through work, including tacit knowledge. The professional competences are tied to the student's awareness about the importance, for the work and for the profession, of knowledge gained through experience.

Creativity, covering properties of a problem-solving process, in which a central characteristic is the combination of existing elements of knowledge in a new and original way. The professional

competences are tied to knowledge and skills in creative methods, and also the student's professional knowledge in general as combined with spontaneity and intuition.

Theory, covering explicit knowledge in Danish and foreign languages, including knowledge in books, periodicals, publications etc. and on the internet. The professional competences are tied to the student's knowledge and skills in searching for, processing and categorizing knowledge in connection with development and construction tasks, and also tasks within technology integration. This also includes the development of the student's insight into basic scientific subjects.

**Organisation:**

The category organisation is tied to the organisation of work processes in connection with the development and manufacturing of products and services.
The professional competences are tied to the student's knowledge about the company's organisation in relation to the development, manufacturing, use and disposal/termination of the product or service. The professional competences also cover knowledge about vertical and horizontal division of labour and management, including project management, and also typical administration and planning activities within the company.

**Product:**

A product is the result of technique, knowledge and organisation. The category product is tied to the knowledge about products within the area of the profession. In the educational programme, a broad product term is used with two meanings:

- A produced commodity – meaning a physical product with some kind of shape.
- The result of a work effort, an endeavour or a development.

The professional competences are tied to the student's knowledge about products and product categories, and also the development, manufacturing, function and use of these.

**Technology**

The term technology is an overall term that covers both the development and the use of technology.
The professional competences are tied to the student's competences in handling complex and development-oriented situations in connection with technology development and technology integration. The professional competences also include knowledge about the dynamic relation between technology development and the development in technique, knowledge, organisation and product within an area of profession.

# 3. The organisation, structure and composition of the programme

The educational programme is divided into three semesters. Each semester contains two project courses. The programme thus contains 6 project courses, each corresponding to 15 ECTS points.

The project courses include one or more topics, as shown in the model on the next page. Each topic is assessed.

## 3.1 The educational course

The first project course is a joint course composed of three topics with the same content for all students. Topic 1 concerns technological project work and project management. Topic 2 concerns scientific theory and method, and topic 3 concerns technology integration. The learning objectives of the topics are described on pages 10, 11, and 12. The educational institutions cooperate in the development and description of the specific content of instruction within the topics, so that the described learning objectives can be reached.

After the first project course, a separate project course for each of the areas of specialisation is conducted, in which the students are divided by academy profession background. IT and electronics technologists complete the educational course within the area of specialisation "IT and electronics". Installation engineers, automation engineers and energy technologists complete the educational course within the area of specialisation "Installation and automation". Production engineers complete the educational course within the area of specialisation "development of products and productions".

The topics in projects courses 2-4 are described in a way so that all students must reach the same learning objectives despite area of specialisation. In this way, it is ensured that the educational programme leads to the same overall profile, even if the educational content of the areas of specialisation are in accordance with the academy profession background. Topic 4, 5 and 6 must be organised as joint projects for more than one area of specialisation, so that the students can cooperate across their differences in professional competences and academy profession backgrounds within each project/topic. This is crucial for the development of the role as integrator in the educational programme. It is required that the student cooperate with students from another area of specialisation or with students from related educational programmes in connection with the completion of topics 4, 5 and 6. This must be included in the assessment.

The instruction within each topic is mostly conducted as project-organised instruction. Within the individual topics, it may prove necessary to arrange short courses in e.g. mathematical or other scientific topics, depending on the needs of the students.

The educational programme does not aim at establishing a well-defined scientific foundation for solving the tasks within the profession. The focus of the educational programme is practice in the form of the topics of the project courses. Scientific topics are brought to the extent that it is necessary for a competent execution of the practice suggested by the topics of the project

courses. The focus of the educational programme on a practical approach as opposed to a scientific approach is ensured by basing the educational project courses on practical issues relevant for companies. Theory in the project courses, including scientific courses, are included with an eye to ensuring that the practical approach can be executed at a high level, corresponding to the categories of bachelor’s degree programmes in the quality framework for higher educational programmes.

## Course model for the educational programme

### 1st semester

**Project course 1 – joint course**

Topic 1: Technological project work – 5 ECTS
Topic 2: Theory of science and method 5 ECTS
Topic 3: Technology integration – 5 ECTS

**Project course 2**

Separate instruction within the individual areas of specialisation – 5 ECTS
Topic 4: Joint project within innovative technology and product development – 10 ECTS

### 2nd semester

**Project course 3**

Separate instruction within the individual areas of specialisation – 5 ECTS
Topic 5: Joint project within construction and projecting – 10 ECTS

**Project course 4**

Separate instruction within the individual areas of specialisation – 5 ECTS

Topic 6: Joint project within environment and sustainability – 10 ECTS

### 3rd semester

**Project course 5**

Practical training course – 15 ECTS.
Practical training is carried out in relation to the student's area of specialisation

**Project course 6**

BA project – 15 ECTS
The BA project is carried out in relation to the student's area of specialisation

Total duration 1 ½ years (90 ECTS)

# 3.2 Project course 1

The first project course in the educational programme is conducted on the basis of 3 topics. Generally seen, the project course must create the foundation for enabling the student to transform his or her academy profession background into an individual educational course, aiming at achieving a bachelor's degree. It is crucial that the individual student's academy profession background is acknowledged as a completed professional qualification, which can be fully included in the bachelor's degree programme. At the same time, it is equally important that the student view the bachelor's degree programme as a superimposed programme building on the academy profession degree, qualitatively adding new, profession-specific dimensions to the professional qualification, as is evident from the quality framework for higher educational programmes.

## 3.2.1 Topic 1 – technological project work

The topic aims at imparting the student with knowledge, skills, and qualifications within problem-oriented and project-oriented types of work and learning in technological projects. The extent of topic 1 amounts to 5 ECTS points.

**Learning objectives**

By the end of the topic, the student is able to:

- Build a project design for a technological project work on the basis of choice and analysis of a problem
- Account for the methodical structure in a technological project work
- Assess the quality of a technological project work in relation to results, validity, reliability and relevance
- Account for a basic knowledge about management, project management and project organisation in connection with the completion of projects in companies.
- Identify and contribute to the fulfilment of his or her own learning needs during the project work
- Write project reports by the common formal rules, including quotation and literature references
- Make use of the language as a tool in the presentation, in a manner of reflection
- Understand the meaning of terms and their use in relation to the development of professional language and technology
- Convey practice-oriented and professional problems and solutions to colleagues, users and partners in company context.
- Apply relevant IT tools in the presentation.

**Assessment**

The project course ends with an *internally* censored oral test, in which the student defends the project. Project and oral defence are assessed equally. The precondition for taking the test is that the student has handed in the project report in due time, and has participated in planned educational activities with reference to local semester descriptions in the curriculum. The student's educational gains are assessed by the 7-point grading scale.

## 3.2.2 Topic 2 – scientific theory and method

The topic aims at imparting the student with knowledge, skills and qualifications within scientific theory and methods for use in connection with accumulation, processing and development of knowledge within the area of profession. The topic also aims at strengthening the student's awareness of method in relation to development-based problem solving in practice.
The extent of topic 2 amounts to 5 ECTS points.

**Educational objectives**

By the end of the topic, the student is able to:

- Account for prevailing scientific approaches relevant for illustrating the practice of the profession.
- Account for scientific methods, including induction, deduction and hypothetical deductive method.
- Account for different types of knowledge used in the professional practice, including explicit knowledge and tacit knowledge.
- Make use of scientific articles, reports and dissertations in connection with the processing of problems and the development of technological solutions within the area of profession.
- Account for the correlation between research and technological development
- Conduct minor analyses within the area of the profession on the basis of a basic knowledge about quantitative and qualitative methods, including reliability and validity.

**Assessment**

The project course ends with an *internally* censored oral test, in which the student defends the project. Project and oral defence are assessed equally. The precondition for taking the test is that the student has handed in the project report in due time, and has participated in planned educational activities with reference to local semester descriptions in the curriculum. The student's educational gains are assessed by 7-point grading scale.

## 3.2.3 Topic 3 – technology integration

The topic aims imparting the student with background knowledge for working with technology integration. The extent of topic 3 amounts to 5 ECTS points.

**Educational objectives**

By the end of the topic, the student is able to:

- Identify and account for essential practical and theoretical aspects of technology integration in connection with products and systems, including the relations between technology, technique, knowledge, organisation and product.
- Demonstrate business know-how in relation to working with technology integration.
- Account for the development in basic production philosophies and their importance for working with quality, productivity and logistics in modern companies.

- Demonstrate a general overview of production technology, involving knowledge of flow, ERP systems, logistics and supply chain management.
- Account for the importance of CSR (Corporate Social Responsibility) in relation to development and manufacturing of products, systems and services.

**Assessment**

The project course ends with an *internally* censored oral test, in which the student defends the project. Project and oral defence are assessed equally. The precondition for taking the test is that the student has handed in the project report in due time, and has participated in planned educational activities with reference to local semester descriptions in the curriculum. The student's educational gains are assessed by the 7-point grading scale.

# 3.3 Project course 2

The project course begins with instruction within the three individual areas of specialisation. The purpose of this is to establish a professional foundation before starting the crossdisciplinary project in topic 4, which concerns innovative product and technology development. The instruction is conducted on the basis of the following learning objectives:

<u>The area of specialisation – IT and electronics</u>

The student is able to:

- Account for knowledge about theory and method, and reflect on practice within innovation, product development, and design of electronic systems, computerized systems and network solutions.
- Account for knowledge about the use and choice of the latest technologies within electronic systems, computerized systems and network solutions.
- Identify the needs for new solutions, and contribute to the development of new technology within the area of profession.
- Make use of advanced electronic components, computerized components, and network components in connection with product development.
- Define and realize a product development that is both commercially and technologically appropriate.
- Conduct the planning of the development effort.

<u>The area of specialisation – Installation and automation</u>

The student is able to:

- Account for knowledge about theory and method, and reflect on practice within innovation and development of automatic systems and installation solutions.
- Account for knowledge about the use and choice of the latest technologies within automatic systems and installation solutions, including technologies interfacing mechanical systems.
- Identify needs for new solutions and contribute to the development of new technology with an eye to optimization of installation solutions and automatic systems.
- Define and realize a development of installation solutions and automatic systems that is both commercially and technologically appropriate.

- Conduct the planning of the development effort.
- Run tests of the product/solution.

The area of specialisation – development of products and productions

The student is able to:

- Account for knowledge about theory and method, and reflect on practice within innovation, product development and fashioning of industrial products, and within development of production systems.
- Account for knowledge about the use and choice of materials and technologies in connection with product development and fashioning of industrial products, and within development of production systems.
- Identify needs for new solutions, and contribute to the development of new products and new technologies within the area of profession.
- Make use of advanced electronic components, computerized components, and network components in connection with product development.
- Define and realize a development of products and production systems that is both commercially and technologically appropriate.
- Conduct the planning of the development effort.
- Run tests of the product/solution.

## 3.3.1 Topic 4 – innovative product and technology development

The topic aims at imparting the student with knowledge, skills and qualifications within development of products and complex technical solutions. This is achieved by transforming and applying technical knowledge, methods as well as analytical and practical skills in extension of the completed academy profession degree. The topic is conducted as one or more joint projects across the areas of specialisation within the educational programme. The specific content of the project(s) is determined by the individual educational institution on the basis of the learning objectives listed below. It is required that the project appropriately cover the participating students' areas of specialisation. As far as possible, the students will cooperate with relevant local companies during the project course.
The extent of topic 4 amounts to 10 ECTS points.

**Learning objectives**

By the end of the topic, the student is able to:

- Apply knowledge about methodology within idea development, idea generation and innovation.
- Conceptualise open technological problems with an eye to delimiting solution spaces.
- Conduct analyses of need and function with an eye to product and technology development, also in connection with modifications of products and systems.
- Concretise solutions through simulation, building of models and/or tests.
- Understand how different crossdisciplinary perspectives influence the creation of a product.
- Draw environment and sustainability considerations into the product development.
- Understand the relation between product development and business-creation.

- Understand product development and innovation in relation to the company's organisation
- Conduct innovation and product development in cooperation with people from other professions across the company's organisation.

**Assessment**

The project course ends with an *externally* censored oral test, in which the student defends the project. Project and oral defence are assessed equally. The precondition for taking the test is that the student has handed in the project report in due time, and has participated in planned educational activities with reference to local semester descriptions in the curriculum. The student's educational gains are assessed by the 7-point grading scale.

# 3.4 Project course 3

The project course starts with instruction within each individual area of specialisation with an eye to establishing a professional foundation before starting the crossdisciplinary project in topic 5, which concerns construction and projecting of products, systems and installations. The instruction is conducted on the basis of the following learning objectives:

<u>The area of specialisation – IT and electronics</u>

The student is able to:

- Account for knowledge about theory and method, and reflect on practice within construction of electronics and data, and network projecting.
- Apply CAD/CAE tools in connection with construction and analysis of electronic and computerized systems.
- Analyse network performance and level of operational reliability in relation to specified requirements and expectations.
- Analyse, plan and realize implementation processes tied to the use of new technologies, and identify the strengths and weaknesses of these.
- Communicate professional problems and solution models to colleagues, clients and partners within electronics and data construction and network projecting.
- Participate in professional cooperation regarding the construction of electronic and computerized systems, and projecting of complex networks, across the company's organisation.

<u>The area of specialisation – Installation and automation</u>

The student is able to:

- Account for knowledge about theory and method, and reflect on practice within projecting and optimization of automatic systems and installation solutions.
- Apply CAD/CAE tools in connection with projecting of automatic systems and installation solutions.
- Analyse, plan and realize implementation processes tied to the use of new components and technologies in installations and automatic systems, and identify the strengths and weaknesses of these in relation to operational conditions.

- Communicate professional issues and solution models to colleagues and partners, and advise clients in connection with projecting of installations and automatic systems.
- Participate in professional cooperation regarding projecting of installations and automatic systems, across the company's organisation.

The area of specialisation – Development of products and productions

The student is able to:

- Account for knowledge about theory and method, and reflect on practice within construction of industrial products and projecting of production systems
- Apply CAD/CAE tools in connection with fashioning and construction of industrial products and projecting of production systems.
- Apply ERP-systems and participate in the development/alteration of these.
- Account for knowledge about the use and choice of material and technologies in connection with construction of industrial products and projecting of production systems
- Analyse, plan and realize implementation processes in the production tied to the use of new technologies, and also identify the strengths and weaknesses of these in relation to optimum operational conditions.
- Communicate professional issues and solution models to colleagues, clients and partners within construction of industrial products and projecting of production systems.
- Participate in professional cooperation across the company's organisation, and conduct coordination tasks in relation to construction of industrial products and projecting of production systems.

### 3.4.1 Topic 5 – Construction and projecting of products, systems and installations

The topic aims at imparting the student with knowledge, skills and qualifications within construction of products, machines and instruments, and also projecting of complex technical systems and installations. The topic is conducted as one or more joint projects across the areas of specialization within the educational programme. The specific content of the project(s) is determined by the individual educational institution on the basis of the learning objectives listed below. It is required that the project appropriately cover the participating students' areas of specialisation. As far as possible, the students will cooperate with relevant local companies during the project course.
The extent of topic 5 amounts to 10 ECTS points.

**Learning objectives**

By the end of the topic, the student is able to:

- Conduct a projecting process in all phases – including the ability to document the economic and environmental sustainability of the project during manufacturing/construction as well as during operation.
- Choose plausible/relevant/possible dimensioning methods corresponding to the requirements posed by the project statements.
- Apply knowledge about integration of various technologies to the solution of client-specific tasks

- Conduct construction of products, fulfilling requirements about functionality, production potential and use in practice.
- Analyse a product's structure, construction and nature of material.
- Understand the essential factors in the fashioning and manufacturing of a product, including drawing on knowledge of materials/components and their fabrication/manufacturing in production systems.
- Identify and analyse significant conditions regarding the construction, manufacturing and use of a product.
- Draw up suggestions for product changes that are functionally or expressionally optimised.
- Choose materials/software/components in connection with technical construction.
- Choose production technologies corresponding to the requirements posed by the project statements.
- Apply knowledge about constructions that integrate various technologies on the basis of client needs, e.g. mechatronics
- Apply knowledge about productivity and quality control in connection with projecting tasks, including conducting projects examination.
- Independently participate in professional and crossdisciplinary cooperation with colleagues, clients and partners in connection with conducting projecting tasks.
- Communicate professional issues and projecting solutions to operators, users and partners.
- Apply knowledge about operational conditions, including productivity and quality control in relation to construction and projecting tasks.
- Build test systems in connection with the testing of products and systems.

**Assessment**

The project course ends with an *internally* censored oral test, in which the student defends the project. Project and oral defence are assessed equally. The precondition for taking the test is that the student has handed in the project report in due time, and has participated in planned educational activities with reference to local semester descriptions in the curriculum. The student's educational gains are assessed by the 7-point grading scale.

# 3.5 Project course 4

Climatic and environmental considerations are naturally included in sustainable solutions. However, the concept of sustainability covers a wider area, and also includes ethical and social considerations. In a broad sense, sustainability is the key word in working with strategic responsibility.
The project course begins with instruction within the individual areas of specialisation with an eye to establishing a professional foundation before starting the crossdisciplinary project in topic 6 concerning development of sustainable products and technological solutions.
The instruction is conducted on the basis of the following learning objectives:

The area of specialisation – IT and electronics

The student is able to:

- Account for knowledge about environmental and sustainability aspects of network installations, electronic constructions and computerized constructions, including energy consumption, effect and environmental considerations regarding materials and components.
- Conduct a life cycle assessment (LCA) of network installations, electronic and computerized products, and also direct procedures ensuring the optimum environmental effort.
- Conduct analysis and alterations of electronic, computerized instruments and network components/products by using the latest technologies with an eye to reducing energy consumption and environmental impact in general.
- Account for the rules of energy labelling in the EU.

The area of specialisation – Installation and automation

The student is able to:

- Account for knowledge about the environmental and sustainability aspects of installations and automatic systems, including energy consumption, EMC, effect and environmental considerations regarding materials and components.
- Conduct a life cycle assessment (LCA) of installations and automatic systems, and also direct procedures ensuring the optimum environmental effort.
- Conduct analysis and alterations of existing installations and automatic systems by use of the latest technologies and components with an eye to reducing energy consumption and environmental impact in general.
- Account for the rules of energy labelling in the EU.

The area of specialisation – development of products and productions

The student is able to:

- Account for a general knowledge of the environmental and sustainability aspects of industrial products.
- Account for knowledge about the environmental and sustainability aspects of production systems, including energy consumption, waste and environmental considerations regarding the cleaning and use of materials and processing aids in the production.
- Conduct a life cycle assessment (LCA) of industrial products, and also direct procedures ensuring the optimum environmental effort.
- Conduct analysis and alterations of existing products and production plants with an eye to reducing energy consumption and environmental impact in general.

### 3.5.1 Topic 6 – environment and sustainability

The topic aims at imparting the student with knowledge, skills and qualification within development of sustainable and energy efficient products and technological solutions in light of the integration of various technologies. The topic is conducted as one or more joint projects across the areas of specialisation of the educational programme. The specific content of the project(s) is determined by the individual educational institution on the basis of the learning objectives listed below. It is required that the project appropriately cover the participating students' areas of

specialisation. As far as possible, the students will cooperate with relevant local companies during the project course.
The extent of topic 6 amounts to 10 ECTS points.

**Learning objectives**

By the end of the topic, the student is able to:

- Apply knowledge about CSR (Corporate Social Responsibility), climate, and environment to development, construction and manufacturing of sustainable products and technical solutions.
- Apply knowledge about the life cycle of a product to the construction work or to the projecting.
- Apply knowledge about various methods and tools to choosing materials and production technologies in an environment and sustainability perspective.
- Understand how the environment and sustainability perspective influences company business.
- Understand how the company's energy consumption influences the development of the environmental and societal development.
- Apply knowledge about environmental management in connection with development, construction and manufacturing of products and solutions.
- Apply general knowledge about management, planning and assessment tools to the environmental area, including environmental management, standardized environmental management system by ISO 14001 and EMAS (Eco-Management and Audit Scheme).

**Assessment**

The project course ends with an *externally* censored oral test, in which the student defends the project. Project and oral defence are assessed equally. The precondition for taking the test is that the student has handed in the project report in due time, and has participated in planned educational activities with reference to local semester descriptions in the curriculum. The student's educational gains are assessed by the 7-point grading scale.

# 3.6 Project course 5 – practical training project

The student must participate in practical training in one or more company. The practical training is unpaid, and the total extent of the training amounts to 15 ECTS-points, corresponding to 10 weeks. For Danish students, the practical training period is legitimate for state education grant (SU).
The practical training period is placed in the third semester. In this way, the practical training helps ensure a good progression of the educational course. The practical training must be conducted in companies that are relevant to the student's area of specialisation. This provides a good foundation for the student's choice of final bachelor's project.

The practical training aims at future occupation as BA within product development and technology integration. The practical training is organised on the basis of the conditions and need for qualifications within the profession. In this way, the practical training, in combination with the

other educational elements, contributes to the student's development of professional qualifications.

The student's practical training is assessed by the rule of approved participation. It is the student's own responsibility to procure a place of practical training, but the educational institution coordinates the students' search for places of practical training and approves agreements. The practical training agreement between the student, the company, and the school must contain the following points:

- Learning objectives and content description for the practical training
- Terms
- Practical conditions
- Approval of the practical training

Learning objectives and content description for the practical training is devised with an eye to the following overall practical training objectives for the educational programme.

The student is able to:

1) Reflect on practice in companies on the basis of knowledge about technology as an interaction between technique, knowledge, organisation, and product.
2) Apply methods and tools to product development, construction/technical projecting, and technology integration.
3) Develop own skills within construction/technical projecting and development of products, and also complex technical solutions in relations to the area of specialisation.
4) Draw issues of energy environment and sustainability into the development of products and technical solutions.
5) Gather relevant knowledge from publications within research and development in order to illustrate issues within product development and technology integration
6) Communicate technical issues and solution options to colleagues in the company's organisation.
7) Identify own learning needs within knowledge, skill and qualifications on the basis of the practical training period, and also devise a strategy/plan for meeting the need.
8) Independently participate in professional and crossdisciplinary cooperation with colleagues across the company's organisation.

**Assessment**

The practical training course ends with an internal assessment of a written report of the practical training course. The student's educational gains are assessed as approved/not approved.

# 3.7 Project course 6 – the BA project

The BA project must document that the student has achieved the final level of the educational programme in relation to the overall gains of the educational programme and the progression model in chapter 4. The student must display abilities for analytically and methodically processing and communicating a complex and practice-oriented issue in relation to a concrete assignment within the purpose of the educational programme.

**Assessment**

The project course ends with and *externally* censored oral project defence on the basis of the student's project report. The precondition for taking the test is that the student has handed in the project report in due time, and has participated in planned educational activities with reference to local semester descriptions in the curriculum.

The student's educational gains are assessed by the 7-point grading scale.

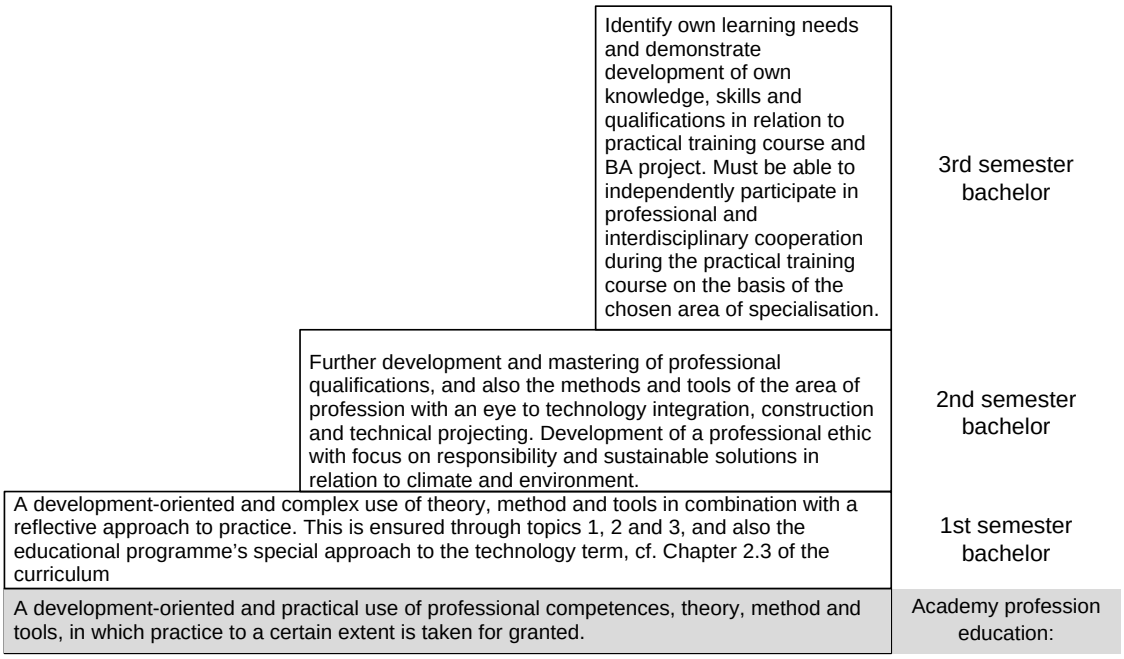
# 4. Instruction and working methods

Throughout the educational programme, learning requirements are created so that the student can develop professional qualifications for functioning independently within the various areas of the profession. Learning processes are organised with an eye to the student's acquirement and development of independence, interpersonal skills, ability for reflexion and creating professional renewal.

The student's educational gains in form of knowledge, skills and qualifications are developed and performed through various types of study and practice, and through various combinations of professionally relevant knowledge and skill areas. This involves that the educational institution, in each topic of the educational programme, must describe the material and working methods best suited for the student to reach optimum educational gains. The educational institution chooses study forms with an eye to promoting the student's educational gains in each of the project courses.

The educational programme is organised with a progression from the beginning to the end of the educational course, with special attention to the individual student's background in a qualifying academy profession degree education.

**Progression model:**




Throughout the educational programme, the development of study qualifications are in focus, in relation to the student's ability to independently search for, apply, and critically assess knowledge with an eye to life-long learning.

The student's responsibility in relation to his or her own learning, and in relation to contributing to a study-promoting environment, is emphasised.

# 4.1 Organisation of the instruction

The learning activities in the instruction are organised in a way, so that the form of the instruction supports the professional content, and the educational gains that the student is meant to achieve.

The instruction is comprised of:

- Lectures
- Class instruction, problem-based learning, case work, and project work including presentation and opponent activities.
- Guidance in connection with individual and joint tasks, e.g. in relation to project work.
- Reading groups, study groups and workshops.

# 4.2 Information technology

Use of information technology in the search, mediation and communication of knowledge supports the instruction and working methods of the educational programme.

## 4.3 Professional guidance

The purpose of professional guidance is taking the students' individual professional basis and needs into consideration, so that the educational programme can be organised with varying forms of instruction, which consider the student's learning style and motivation, and also supports completion of the educational programme. The professional guidance can support the individual student and differentiated student groups, for instance through structured conversations in relation to projects, topics, method, theoretical instruction, individual syllabus, contact teacher function and so on.

## 4.4 Student counselling

The student counselling must support the student in the educational course, from the choice to the completion of educational programme, and it requires active participation from the students' councillor, professional councillors and the student.

The objective of student counselling is to help the student create transparency in the educational programme, and improve the possibility for making substantiated choices in relation to the student's own learning and well-being. Furthermore, student counselling focuses on helping the student in relation to:

– Commencement of study and the first topics of the educational programme,
– Coherence between theoretical instruction and practice, and also learning within different contexts,
– Study and work habits, time planning, overview, and optimum use of time.

The purpose of student counselling is:

- To give factual information and guidance, so that the student is able to independently make qualified choices in professional and study-related situations.
- To inform and guide in relation to admission, commencement of study, completion of the educational programme, and career planning.

Counselling is organised by the educational institution as individual and collective counselling, mutually supporting and supplementing each other. The counselling effort is aimed at study technique, study tools, study and work habits, and study environment with an eye to increasing the student's awareness of learning, study requirements and completion. Furthermore, the counselling effort aims at helping the student learn how to study in both theoretical and practical learning situations. This involves the student planning his or her own time, choosing learning and instruction methods, developing learning styles, and establishing study groups.

Student councillors and students actively and systematically make use of experiences and evaluations/self-evaluations with an eye to increasing learning options and quality development in both theoretical instruction and in practice.

Career planning aims at both organisation of learning and education courses, and also information and counselling on job seeking, continued and further education options, change of studies, and international exchange programs.

# 5. Options for an international education

The purpose of including options for an international education in the educational programme is to educate the student in acting professionally within the area of profession in a globalized world.

The internationalisation is additionally strengthened through cooperation with international partners in relation to education development and the inter-cultural and international qualifications of the employees, for instance by teacher exchange.

It is possible for the students to complete part of the education abroad without an extension of the time of study, by approval from the educational institution. The individual educational institution enters into agreement with foreign educational institutions on cooperation. Agreements and procedures are described in the local addition to the curriculum.

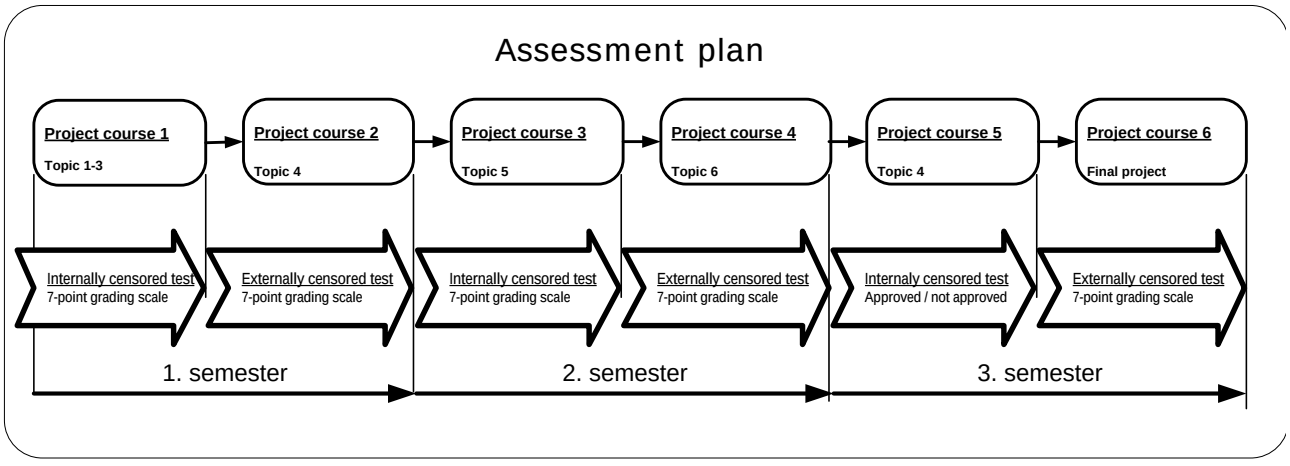
# 6. Tests and assessments

After each topic, an assessment of the student's educational gains is performed. The assessment may be carried out as an internally or externally censored test.
Externally censored tests are assessed by the examiner and censors. The censors are appointed by the Ministry of Education. Internally censored tests are assessed by the examiner and at least one internal censor from the educational institution.
The individual institution can set out rules about test conditions in the individual modules that are only used in the institution in question. Test conditions, in this connection, should be understood as the handing in of assignments and projects etc., and the fulfilment of compulsory attendance in the theoretical instruction.

## 6.1 Outline of the educational assessments

Test form – project exam: The assessment is based on an overall evaluation of the content of the completed project, and also of the student's defence of the project at the oral exam.

1. Project course – internally censored test – the 7-point grading scale
2. Project course – externally censored test – the 7-point grading scale
3. Project course – internally censored test – the 7-point grading scale
4. Project course – externally censored test – the 7-point grading scale
5. Project course – internal – approved/not approved
6. Project course – externally censored test – the 7-point grading scale



## 6.2 Guidelines for tests

The externally and internally censored tests in the first two semesters must be passed before the student can finish the BA project.

For more guidelines, please see the exam regulations of the individual educational institution, as well as local additions to the curriculum.

## 6.3 Special test conditions

Students, that meet the requirements for this, can be offered special test conditions according to the law of special pedagogical support at higher education programmes.

# 7. Compulsory attendance and Level of studying activity

The students are obliged to show that they are active in their studies all the way through the 4 semesters of the course as well as in the fields of study.

The students' level of activity is assessed regularly on the basis of:

• Level of attendance

• Handing in of assignments

• Participation in group activities

• Participation in presentation of assignments

**Level of attendance**

There is no compulsory attendance during the education. The level of attendance is nevertheless included in the total assessment of studying activity.

Each teacher can define own rules of attendance to the class.

**Handing in of assignments**

The student is under the obligation to hand in all defined assignments at the appointed time.

**Participation in group activities**

The student must actively take part in the solution of group assignments.

**Participation in presentation of assignments**

When making a presentation of a group assignment or an individual one, the student is obliged to participate in the presentation at the appointed time.

When making group presentations, the entire number of group members are obliged to participate.

**Consequences**

If the student shows a lack of studying activity, he/she is not eligible to sit for the examination.

In case of a lack of studying activity, the following procedure will be launched:

1. The student is called for a meeting in which possible problems may be critically examined and possible solutions may be discussed.

2. If, in the course of two weeks, the first conversation does not lead to any noticeable improvement in studying activity, the student is called for a second interview. From the interview it must appear which points the student is to improve in order to be regarded as active. On the basis of the interview, a note is made and handed to the student as a warning.
3. If, in the course of two weeks, the written warning does not lead to any noticeable improvement in studying activity, the student is called for yet another interview.
   The interview must end up in one of the following conclusions:

    a. The student continues. It must be stated precisely what the college expects from the student for the rest of the semester and what will be the consequences if the agreement is not respected. Observance of the agreement is evaluated every two weeks.
    b. The student cannot enroll for the exam and must repeat the semester.
    c. The student decides to leave the college

In case of absence due to illness or likewise, individual considerations are to be taken into account. For instance an agreement may be that the student gets the possibility of handing in one or more of the written assignments as a compensation for the lack of attendance or participation in projects

# 8. Exemption (transfer of credits)

It is possible to achieve exemption from parts of the educational programme on the basis of credits/qualifications that have already been achieved. Exemption is given on the basis of documented completed instruction or occupation, corresponding to the parts of the educational programme for which exemption is applied.

Exemption is given on the basis of the institution's assessment of two things: Whether previously completed educational courses correspond to theoretical parts of the educational programme, and also whether qualifications achieved through occupation correspond to the objectives specified for the practical training course of the educational programme.

The assessment is carried out on the basis of documented completed instruction and occupation. Documentation for completed instruction will be formal test and exam certificates, and also course and education certificates. In relation to occupation, the documentation will normally be employment contracts, statements or something similar.

Exemption is given as an actual time reduction of the educational programme, or as exemption from parts of the educational programme. The decision about exemption is made by the educational institution.

# 9. Dispensation

The educational institution can grant a dispensation from the local addition to the curriculum, if unusual conditions exist.