Dokumentdato:	15. maj 2014
Dokumentansvarlig:	JCK
Senest revideret:	4. juni 2014
Senest revideret af:	JCK
Sagsnr.:	–

Studieordning professionsbacheloruddannelsen Produktudvikling og Teknisk integration - Fælles del

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1. Curriculum framework

This curriculum constitutes the national section of the curriculum for the top-up programme in Product Development & Integrative Technology, cf. Ministerial Order no. 892 of 8 July 2010 on the Bachelor's Degree Programme in Product Development and Integrative Technology.
Link to the order (in Danish): https://www.retsinformation.dk/Forms/R0710.aspx?id=132829

The objective of the bachelor's degree programme in Product Development & Integrative Technology is to qualify the students to independently and professionally integrate various technologies and forms of knowledge through development and construction of technical systems and products in industrial, production and installation companies, nationally as well as internationally. Further, the graduates should be able to handle interdisciplinary technical managerial tasks.

The study programme is a full-time programme designed as an independent top-up programme to the academy profession degree programmes in Service Engineering, IT Network & Electronics Technology, Production Technology, Energy Technology and Automation Engineering and is worth 90 ECTS credits. 60 ECTS credits correspond to the work of a full-time student in one year.

The programme entitles the graduate to use the Danish title **Professionsbachelor i produktudvikling og teknisk integration**.

The English title is **Bachelor of Product Development and Integrative Technology.**

2. Study programme core areas and ECTS credits

The programme has three core areas (in the following referred to as interdisciplinary core areas) which cover all fields of study in the programme and three core areas that are characteristic of each of the three fields of study.

2.1 The programme consists of the following interdisciplinary core areas:

1. Technological project work (15 ECTS)
2. Philosophy of science and methodologies (10 ECTS)
3. Technical integration (15 ECTS)

A total of 40 ECTS credits

2.2 The programme has the following core areas within each of the three fields of study:

For the **IT and electronics** field of study:

1. Innovation and product development (5 ECTS)
2. Construction and project planning (5 ECTS)
3. Sustainability and environment (5 ECTS)

A total of 15 ECTS credits

For the **Installation and automation** field of study:

1. Innovation and product development (5 ECTS)
2. Construction and project planning (5 ECTS)
3. Sustainability and environment (5 ECTS)

A total of 15 ECTS credits

For the **Product development and production** field of study:

1. Innovation and product development (5 ECTS)
2. Construction and project planning (5 ECTS)
3. Sustainability and environment (5 ECTS)

A total of 15 ECTS credits

2.3 Technological project work core area

Contents

The objective of the Technological project work core area is to give the students knowledge, skills and competences within problem-oriented and project-organised work and learning forms while carrying out technological projects.

ECTS credits

15 ECTS credits

Learning outcomes

Knowledge

The students should be able to account for

- the methodical structure in technological project work;
- a basic knowledge of management, project management and project organisation in implementing projects in enterprises; and
- a project development process in all its phases – including documenting the economic impact during production/construction and operation.

Skills

The students should be able to

- assess the quality of technological project work in relation to results, validity, reliability and relevance;
- identify and contribute to fulfilling own learning needs during the project work;
- understand the meaning and use of concepts in connection with developments in technical terminology and technology;

- lay down and realise a commercial as well as technologically appropriate product development; and
- write project reports according to common formal rules, including rules of references to quotes and literature.

Competences

The students should be able to

- build up a product design for technological project work based on choice and analysis of a problem statement;
- communicate practice-oriented and academic issues and solution models to peers, users and collaboration partners in a business context;
- use language as a tool to communicate in a reflective way;
- conceptualise open technological issues with a view to identifying solution space; and
- use relevant IT tools in communication.

2.4 Philosophy of science and methodologies core area

Contents

The objective of the Philosophy of science and methodologies core area is to give the students knowledge, skills and competences within collection, processing and development of knowledge within the profession area.

Also, the area focuses on strengthening the students' method awareness in relation to a development-based resolution of problems and issues in practice.

ECTS credits

10 ECTS credits

Learning outcomes

Knowledge

The students should be able to account for

- common scientific approaches relevant to illustrate the practice of the profession;
- science-based methods, including induction, deduction and hypothetical deductive method;
- different forms of knowledge used in the practice of the profession, including explicit and tacit knowledge and the development of technological solutions within the area of the profession; and
- the connection between research and technological development.

Skills

The students should be able to

- conduct minor analyses within the area of the profession based on a fundamental knowledge of quantitative and qualitative methods, including reliability and validity.

Competences

The students should be able to

- use scientific articles, reports and dissertations in their addressing problem statements.

2.5 Technical integration core area

Contents

The objective of the Technical integration core area is to give the students background knowledge of the work on technical integration, based on the professional bachelor's integrator role, across the organisation and common professional boundaries as well as in relation to the enterprise's surroundings, including competitors, customers and suppliers.

ECTS credits

15 ECTS credits

Learning outcomes

Knowledge

The students should be able to account for

- significant practical and theoretical aspects of integration in connection with projects and systems, including relations between technology, technique, knowledge, organisation and product.

Skills

The students should be able to

- identify significant practical and theoretical aspects of integration in connection with projects and systems, including relations between technology, technique, knowledge, organisation and product;
- be familiar with underlying business principles in relation to working with technical integration;
- understand product development and innovation in the context of the enterprise's organisation; and
- identify and analyse significant matters concerning a product's construction, manufacture and use.

Competences

The students should be able to

- conduct needs and functional analyses with a view to product and technology development, including in connection with modifications of products and systems; and
- use knowledge of integrating several technologies to solve customer-specific tasks.

2.6 Innovation and product development core area, under the fields of study

Contents

The objective of the Innovation and product development core area is to give the students knowledge, skills and competences within development of products and complex technical solutions by converting and using technical knowledge, methods and analytical and practical skills in continuation of the completed academy profession degree programme.

ECTS credits

5 ECTS credits

2.6.1 For the IT and electronics field of study:

Learning outcomes

Knowledge

The students should be able to account for

- knowledge of theory and method as well as reflect on practice within innovation, product development and design of electronic systems, IT technology systems and network solutions; and
- knowledge of the use and choice of state-of-the-art technologies within electronic systems, data processing systems and network solutions.

Skills

The students should be able to

- identify needs for new solutions and participate in developing new technology within the field of the profession; and
- use sophisticated electronic components, data technical components and network components in connection with product development.

Competences

The students should be able to

- lay down and realise a commercial as well as technologically appropriate product development of electronic systems, computer systems and network solutions;
- plan the development work; and
- plan and test the product/solution (proof of concept).

2.6.2 For the Installation and automation field of study:

Learning outcomes

Knowledge

The students should be able to account for

- knowledge of theory and method as well as reflect on practice within innovation and development of automatic systems and installation solutions; and
- knowledge of use and choice of state-of-the-art technologies within automatic systems and installation solutions, including technologies with interfaces to mechanical systems.

Skills

The students should be able to

- identify needs for new solutions and participate in developing new technology with a view to optimising installation solutions and automatic systems; and
- use sophisticated components in connection with development of installation solutions and automatic systems.

Competences

The students should be able to

- lay down and realise a commercial as well as technologically appropriate development of installation solutions and automatic systems;
- plan the development work; and
- plan and test the developed system/installation solution (proof of concept).

2.6.3 For the Product development and production field of study:

Learning outcomes

Knowledge

The students should be able to account for

- knowledge of theory and method as well as reflect on practice within innovation, product development and design of industrial products as well as within development of production systems; and
- knowledge of use and choice of materials and technologies in connection with product development and design of industrial products as well as within development of production systems.

Skills

The students should be able to

- identify needs for new solutions and participate in developing new products and new technology within the field of the profession; and
- use sophisticated components in connection with development of new products and new technology within the field of the profession.

Competences

The students should be able to

- lay down and realise a commercial as well as technologically appropriate product development and production systems;
- plan the development work; and
- plan and test the product/solution (proof of concept).

2.7 Construction and project planning core area, under the fields of study

Contents

The objective of the Construction and project planning core area is to give the students knowledge, skills and competences within construction of products, machines and apparatus as well as project planning of complex technical systems and installations.

ECTS credits

5 ECTS credits

2.7.1 For the IT and electronics field of study:

Learning outcomes

Knowledge

The students should be able to account for

- knowledge of theory and method as well as reflect on practice within electronics and data construction as well as network planning.

Skills

The students should be able to

- use CAD/CAE tools to construct and analyse electronic and data processing systems; and
- analyse, plan and realise implementation processes connected with the use of new technologies as well as identify strengths and weaknesses in these.

Competences

The students should be able to

- choose plausible/relevant/possible dimensioning methods corresponding to the requirements of the project formulations;
- cooperate professionally across enterprise networks concerning construction of electronic and data processing systems as well as planning of complex networks; and
- communicate academic issues and solution models to peers, users and collaboration partners within electronics and data construction as well as network planning.

2.7.2 For the Installation and automation field of study:

Learning outcomes

Knowledge

The students should be able to account for

- knowledge about theory and method as well as reflect on practice within project planning and optimisation of automatic systems and installation solutions.

Skills

The students should be able to

- use CAD/CAE tools to plan automatic systems and installation solutions; and
- analyse, plan and realise implementation processes connected with the use of new components and technologies in installations and automatic systems as well as identify strengths and weaknesses in these in the light of operating conditions.

Competences

The students should be able to

- choose plausible/relevant/possible dimensioning methods corresponding to the requirements of the project formulations;
- cooperate professionally across enterprise organisations on planning of installations and automatic systems; and
- communicate professional issues and solution models to peers, customers and collaboration partners and advise customers on planning of installations and automatic systems.

2.7.3 For the Product development and production field of study:

Learning outcomes

Knowledge

The students should be able to account for

- knowledge of theory and method as well as reflect on practice within construction of industrial products as well as planning of production systems.

Skills

The students should be able to

- use CAD/CAE tools to design and construct industrial products as well as plan production systems;
- use ERP systems and contribute to developing/changing these; and
- analyse, plan and realise implementation processes in production connected with the use of new technologies as well as identify strengths and weaknesses in these in the light of optimum operating conditions.

Competences

The students should be able to

- choose plausible/relevant/possible dimensioning methods corresponding to the requirements of the project formulations;
- cooperate professionally across enterprise organisations and perform coordination tasks concerning construction of industrial products and planning of production systems; and
- communicate professional issues and solution models to peers, customers and collaboration partners within construction of industrial products as well as production system planning.

2.8 Environment and sustainability core area, under the fields of study

Contents

The objective of the Environment and sustainability core area is to give the students knowledge, skills and competences within development of sustainable and energy-efficient products and technological solutions in the light of integration of several technologies.

ECTS credits

5 ECTS credits

2.8.1 For the IT and electronics field of study:

Learning outcomes

Knowledge

The students should be able to

- account for knowledge of the environmental and sustainability aspects of electronics and data structures, including energy consumption, EMC, effect and environmental considerations concerning materials and components;
- understand how the environmental and sustainability perspective comes into play in respect of an enterprise's business;
- demonstrate general knowledge of management, planning and assessment tools in the environmental area, including environmental control, environmental management systems and sustainability philosophies; and
- account for EU energy labelling regulations.

Skills

The students should be able to

- conduct a life-cycle assessment (LCA) on network installations and electronics and data engineering products as well as indicate procedures to ensure optimum environmental actions; and
- involve environmental and sustainability considerations in product development.

Competences

The students should be able to

- analyse and change electronic and data apparatus and network components/products through state-of-the-art technologies with a view to holistically reducing energy consumption and the environmental impact;
- use knowledge of Corporate Social Responsibility (CSR) as well as climate and environment for development, construction and production of sustainable products and technical solutions; and
- use knowledge of a product's life cycle for construction work or in project planning.

2.8.2 For the Installation and automation field of study:

Learning outcomes

Knowledge

The students should be able to

- account for knowledge of the environmental and sustainability aspects of installations and automatic systems, including energy consumption, EMC, effect and environmental considerations concerning materials and components;
- understand how the environmental and sustainability perspective comes into play in respect of an enterprise's business;
- demonstrate general knowledge of management, planning and assessment tools in the environmental area, including environmental control, environmental management systems and sustainability philosophies; and
- account for EU energy labelling regulations.

Skills

The students should be able to

- conduct a life-cycle assessment (LCA) on installations and automatic systems as well as indicate procedures to ensure optimum environmental actions; and
- involve environmental and sustainability considerations in product development.

Competences

The students should be able to

- analyse and change existing installations and automatic systems through state-of-the-art technologies with a view to holistically reducing energy consumption and the environmental impact;
- use knowledge of Corporate Social Responsibility (CSR) as well as climate and environment for development and construction as well as production of sustainable products and technical solutions; and
- use knowledge of a product's life cycle for construction work or in project planning.

2.8.3 For the Product development and production field of study

Learning outcomes

Knowledge

The students should be able to

- account for a general knowledge of the environmental and sustainability aspects of industrial products;
- account for knowledge of the environmental and sustainability aspects of production systems, including energy consumption, waste and environmental considerations concerning cleaning and use of materials and subsidiary materials in production;
- understand how the environmental and sustainability perspective comes into play in respect of an enterprise's business;
- demonstrate general knowledge of management, planning and assessment tools in the environmental area, including environmental control, environmental management systems and sustainability philosophies; and
- account for EU energy labelling regulations.

Skills

The students should be able to

- conduct a life-cycle assessment (LCA) on industrial products as well as indicate procedures to ensure optimum environmental actions; and
- involve environmental and sustainability considerations in product development.

Competences

The students should be able to

- analyse and change existing products and production systems through state-of-the-art technologies and components with a view to holistically reducing energy consumption and the environmental impact;
- use knowledge of Corporate Social Responsibility (CSR) and climate as well as environment for development and construction as well as production of sustainable products and technical solutions; and
- use knowledge of a product's life cycle for construction work or in project planning.

3. Compulsory educational components within the study programme's core areas

To support the programme objective of integrated product development between the professional competences, the core areas of the field of study are integrated into interdisciplinary educational components where they are implemented in parallel to the learning outcome for the interdisciplinary core areas of the programme.

To ensure that the individual field of study comes across clearly, the learning outcomes are included separately, enabling individual examination for each field of study.

3.1 Compulsory educational components:

Theoretical product development and design	(15 ECTS)
Discipline-specific product development and design	(6 ECTS)
Interdisciplinary product development and design	(15 ECTS)
Environment and sustainability	(4 ECTS)

A total of 40 ECTS credits

3.2 Inclusion of the core areas of the fields of study in the compulsory educational components

Further for the **IT & Electronics** field of study:

Discipline-specific product development and design	(9 ECTS)
Interdisciplinary product development and design	(3 ECTS)
Environment and sustainability	(3 ECTS)

A total of 15 ECTS credits

Further for the **Installation and automation** field of study:

Discipline-specific product development and design	(9 ECTS)
Interdisciplinary product development and design	(3 ECTS)
Environment and sustainability	3 ECTS)

A total of 15 ECTS credits

Further for the **Product development and production** field of study:

Discipline-specific product development and design	(9 ECTS)
Interdisciplinary product development and design	(3 ECTS)
Environment and sustainability	(3 ECTS)

A total of 15 ECTS credits

All compulsory educational components are concluded with an exam. Examinations are held separately for the interdisciplinary core areas of the educational components and core areas attached to the fields of study.

The below table gives an overview of the connection between interdisciplinary core areas, field of study core areas and the compulsory educational components.

Compulsory educational components	Theoretical product development	Discipline-specific product development and design	Interdisciplinary product development and design	Sustainable product development	
Core areas					
Technological project work 15 ECTS	5	4	4	2	**15 ECTS**
Philosophy of science and methodologies 10 ECTS	5	1 1	2	1	**10 ECTS**
Technical integration 15 ECTS	5		9	1	**15 ECTS**
A total of 40 ECTS	**15 ECTS**	**6 ECTS**	**15 ECTS**	**4 ECTS**	**40 ECTS**
Core areas within each field of study					
Innovation and product development 5 ECTS		4	1		**5 ECTS**
Construction and project planning 5 ECTS		4	1		**5 ECTS**
Environment and sustainability 5 ECTS		1	1	3	**5 ECTS**
A total of 15 ECTS	**0 ECTS**	**9 ECTS**	**3 ECTS**	**3 ECTS**	**A total of 15 ECTS**
A total of 55 ECTS	**15 ECTS**	**15 ECTS**	**18 ECTS**	**7 ECTS**	**55 ECTS**

3.2.1 Compulsory educational component: Theoretical product development

Contents

The first project of the programme will be based on three themes. Overall, the project is to provide a basis for the students to transform their academy profession background into an individual learning process aimed at their becoming professional bachelors. It is decisive for the individual student's academy profession background to be recognised as a completed professional competence which can be fully integrated in the professional bachelor's degree.

Also, it is equally important for the students to see the professional bachelor's degree programme as an extension (top-up) programme which adds new profession-specific dimensions to the professional competence, as can be seen from the qualifications framework for Danish higher education.

ECTS credits
15 ETCS distributed across:

- 5 ECTS from the Technological project work core area
- 5 ECTS from the Philosophy of science and methodologies core area
- 5 ECTS from the Technical integration core area

Learning outcomes

Knowledge
The students should be able to account for

- the methodical structure in technological project work;
- a basic knowledge of management, project management and project organisation in implementing projects in enterprises;
- common scientific approaches relevant to illustrate the practice of the profession;
- science-based methods, including induction, deduction and hypothetical deductive method;
- the connection between research and technological development; and
- significant practical and theoretical aspects of integration in connection with projects and systems, including relations between technology, technique, knowledge, organisation and product.

Skills
The students should be able to

- identify and contribute to fulfilling own learning needs during the project work;
- write project reports according to common formal rules, including rules of references to quotes and literature;
- understand product development and innovation in the context of the enterprise's organisation; and
- be familiar with underlying business principles in relation to working with technical integration.

Competences
The students should be able to

- build up a product design for technological project work based on choice and analysis of an issue; and
- use relevant IT tools in communication.

Assessment
The Theoretical product development and design compulsory educational component is concluded with an exam.

The exam is graded according to the 7-point grading scale and is worth 15 ECTS.

The learning outcomes for the educational component are the same as the learning outcomes for the exam.

Please see the institutional section of this Curriculum for exam form and procedure, etc.

3.2.2 Compulsory educational component: Discipline-specific product development and design

Contents

The objective of the Discipline-specific product development and design educational component is to give the students knowledge, skills and competences within development of products and complex technical solutions by translating and using technical knowledge as well as analytical and practical skills in continuation of the completed academy profession programme. Further, the students should be able to include interdisciplinary issues in drawing up a solution within their own area.

ECTS credits
15 ETCS distributed across:

- 4 ECTS from the Technical project work core area
- 2 ECTS from the Philosophy of science and methodologies core area

Further, separately for the **IT and electronics** field of study:
- 4 ECTS from the Innovation and product development core area
- 4 ECTS from the Construction and project planning core area
- 1 ECTS from the Environment and sustainability core area

Further, separately for the **Installation and automation** field of study:
- 4 ECTS from the Innovation and product development core area
- 4 ECTS from the Construction and project planning core area
- 1 ECTS from the Environment and sustainability core area

Further, separately for the **Product development and production** field of study:
- 4 ECTS from the Innovation and product development core area
- 4 ECTS from the Construction and project planning core area
- 1 ECTS from the Environment and sustainability core area

Learning outcomes

Knowledge
The students should be able to
- account for various form of knowledge used in the practice of the profession, including explicit and tacit knowledge; and
- use knowledge of methodology within idea development, idea generation and innovation.

Further for the **IT and electronics** field of study
- account for knowledge of theory and method as well as reflect on practice within innovation, product development and design of electronic systems, data processing systems and network solutions; and
- account for knowledge of the use and choice of state-of-the-art technologies within electronic systems, data processing systems and network solutions.

Further for the **Installation and automation** field of study

- account for knowledge of theory and method as well as reflect on practice within innovation and development of automatic systems and installation solutions; and
- account for knowledge of use and choice of state-of-the-art technologies within automatic systems and installation solutions, including technologies with interfaces to mechanical systems.

Further for the **Product development and production** field of study

- account for knowledge of theory and method as well as reflect on practice within innovation, product development and design of industrial products as well as within development of production systems; and
- account for knowledge of use and choice of materials and technologies in connection with product development and design of industrial products as well as within development of production systems.

Skills

The students should be able to

- lay down and realise a commercial as well as technologically appropriate product development;
- identify needs for new solutions and participate in developing new technology within the field of the profession;
- conceptualise open technological issues with a view to identifying solution space;
- conduct needs and functional analyses with a view to product and technology development, including in connection with modifications of products and systems; and
- involve environmental and sustainability considerations in product development.

Further for the **IT and electronics** field of study

- use sophisticated electronic components, data-technical components and network components in connection with product development.

Further for the **Installation and automation** field of study

- use sophisticated components in connection with development of installation solutions and automatic systems.

Further for the **Product development and production** field of study

- use sophisticated components for the development of products and production plant in connection with product development.

Competences

The students should be able to

- understand the meaning and use of concepts in connection with developments in technical terminology and technology;
- conduct minor analyses within the area of the profession based on a basic knowledge of quantitative and qualitative methods, including reliability and validity;
- communicate practice-related and discipline-specific issues as well as possible solutions for peers, users and collaboration partners in a business context;
- plan the development work; and
- plan test of product/solution.

Assessment
The compulsory educational component is concluded with an exam.

The exam is graded according to the 7-point grading scale.

The learning outcomes for the educational component are the same as the learning outcomes for the exam.

Please see the institutional section of this Curriculum for exam form and procedure, etc.

3.2.3 Compulsory educational component: Interdisciplinary product development and design

Contents
The objective of the Interdisciplinary product development and design educational component is to give the students knowledge, skills and competences within development of products and complex technical solutions by converting and applying technical knowledge and methods as well as analytical and practical skills. The weight is on interdisciplinarity and the specific use of the core areas in the context of a problem statement.

ECTS credits
18 ETCS distributed across:

- 4 ECTS from the Technological project work core area
- 2 ECTS from the Philosophy of science and methodologies core area
- 9 ECTS from the Technical integration core area

Further, separately for the **IT and electronics** field of study:
- 1 ECTS from the Innovation and product development core area
- 1 ECTS from the Construction and project planning core area
- 1 ECTS from the Environment and sustainability core area

Further, separately for the **Installation and automation** field of study:
- 1 ECTS from the Innovation and product development core area
- 1 ECTS from the Construction and project planning core area
- 1 ECTS from the Environment and sustainability core area

Further, separately for the **Product development and production** field of study:
- 1 ECTS from the Innovation and product development core area
- 1 ECTS from the Construction and project planning core area
- 1 ECTS from the Environment and sustainability core area

Learning outcomes

Knowledge
The students should be able to account for
- a project development process in all its phases – including documenting the economic impact during production/construction and operation; and
- the connection between research and technological development.

Further for the **IT and electronics** field of study

- knowledge of theory and method and reflect on practice within electronics and data construction and network planning.

Further for the **Installation and automation** field of study

- theory and method as well as reflect on practice within project planning and optimisation of automatic systems and installation solutions.

Further for the **Product development and production** field of study

- theory and method as well as reflect on practice within construction of industrial products and planning of production systems.

Skills

The students should be able to

- identify and analyse significant matters concerning a product's construction, manufacture and use;
- identify significant practical and theoretical aspects of integration in connection with projects and systems, including relations between technology, technique, knowledge, organisation and product; and
- assess the quality of technological project work in relation to results, validity, reliability and relevance.

Further for the **IT and electronics** field of study

- analyse, plan and realise implementation processes connected with the use of new technologies as well as identify strengths and weaknesses in these; and
- use CAD/CAE tools to construct and analyse electronic and data processing systems.

Further for the **Installation and automation** field of study

- analyse, plan and realise implementation processes connected with the use of new components and technologies in installations and automatic systems as well as identify strengths and weaknesses in these in the light of operating conditions.
- use CAD/CAE tools to plan of automatic systems and installation solutions.

Further for the **Product development and production** field of study

- analyse, plan and realise implementation processes in production connected with the use of new technologies as well as identify strengths and weaknesses in these in the light of optimum operating conditions.
- use CAD/CAE tools to design and construct industrial products as well as plan production systems; and
- use ERP systems and contribute to developing/changing these.

Competences

The students should be able to

- use scientific articles, reports and dissertations in their addressing problem statements.
- conduct parts of a project planning process relative to the phase in which the project is situated, in relation to requirements conditional on the project formulation – including be able to document the financial consequence of the project phase during production/construction as well as operation;
- choose plausible/relevant/possible dimensioning methods corresponding to the requirements of the project formulations;
- cooperate professionally across enterprise organisations and perform coordination tasks; and

- use knowledge of integration of several technologies to solve customer-specific tasks.

Further for the **IT and electronics** field of study

- communicate professional issues and solution models to peers, customers and collaboration partners within electronics and data construction as well as network planning; and
- lay down and realise a commercial as well as technologically appropriate product development; and

Further for the **Installation and automation** field of study

- communicate professional issues and solution models to peers, customers and collaboration partners and advise customers on planning of installations and automatic systems; and
- lay down and realise a commercial as well as technologically appropriate development of installation solutions and automatic systems.

Further for the **Product development and production** field of study

- communicate professional issues and solution models to peers, customers and collaboration partners within construction of industrial products as well as production system planning; and
- lay down and realise a commercial as well as technologically appropriate product development and production systems.

Assessment

The compulsory educational component is concluded with an exam.

The exam is graded according to the 7-point grading scale.

The learning outcomes for the educational component are the same as the learning outcomes for the exam.

Please see the institutional section of this Curriculum for exam form and procedure, etc.

3.2.4 Compulsory educational component: Sustainable product development

Contents

The objective of the Sustainable product development educational component is to give the students knowledge, skills and competences within development of sustainable and energy-efficient products and technological solutions in the light of integration of several technologies. The component is implemented as one or more joint projects across the fields of study of the programme, based on the environmental and sustainability aspects that have been included in the previous learning components.

[Formuleres af netværket]

ECTS credits

7 ETCS distributed across:

- 2 ECTS from the Technological project work core area
- 1 ECTS from the Philosophy of science and methodologies core area
- 1 ECTS from the Technical integration core area

Further, separately for the IT and electronics field of study:

- 3 ECTS from the Environment and sustainability core area

Further, separately for the **Installation and automation** field of study:

- 3 ECTS from the Environment and sustainability core area

Further, separately for the Product development and production field of study:

- 3 ECTS from the Environment and sustainability core area

Learning outcomes

Knowledge

The students should be able to

- account for a general knowledge of the environmental and sustainability aspects of industrial products;
- account for EU energy labelling regulations;
- understand how the environmental and sustainability perspective comes into play in respect of an enterprise's business; and
- demonstrate general knowledge of management, planning and assessment tools in the environmental area, including environmental control, environmental management systems and sustainability philosophies.

Further for the **IT and electronics** field of study

- account for knowledge of the environmental and sustainability aspects of network installations and data structures, including energy consumption, EMC, effect and environmental considerations concerning materials and components.

Further for the **Installation and automation** field of study

- account for knowledge of the environmental and sustainability aspects of installations and automatic systems, including energy consumption, EMC, effect and environmental considerations concerning materials and components.

Further for the **Product development and production** field of study

- account for knowledge of the environmental and sustainability aspects of production systems, including energy consumption, waste and environmental considerations concerning cleaning and use of materials and subsidiary materials in production.

Skills

The students should be able to

- conduct a life cycle assessment (LCA).

Competences

The students should be able to

- use knowledge of Corporate Social Responsibility (CSR) as well as climate and environment for development and construction as well as production of sustainable products and technical solutions;
- use knowledge of a product's life cycle for construction work or in project planning; and
- use language as a tool to communicate in a reflective way.

Further for the **IT and electronics** field of study

- analyse and change electronic data apparatus and network components/products through state-of-the-art technologies with a view to holistically reducing energy consumption and the environmental impact.

Further for the **Installation and automation** field of study

- analyse and change existing installations and automatic systems through state-of-the-art technologies with a view to holistically reducing energy consumption and the environmental impact;

Further for the **Product development and production** field of study

- analyse and change existing products and production systems through state-of-the-art technologies and components with a view to holistically reducing energy consumption and the environmental impact;

Assessment
The compulsory educational component is concluded with an exam.

The exam is graded according to the 7-point grading scale.

The learning outcomes for the educational component are the same as the learning outcomes for the exam.

Please see the institutional section of this Curriculum for exam form and procedure, etc.

4. Internship

ECTS credits
15 ECTS credits
The students will take an internship in one or more enterprises. The internship is unpaid. The internship is aimed at the future employment as a professional bachelor within product development and integrative technology. The internship period is planned based on the trade conditions and competence requirements of the profession so that, in combination with the other educational components, it contributes to the students developing their professional competence.

Learning outcomes and description of contents for the internship will be finally drawn up by the students together with the institution and the place of internship, in consideration of the below internship goals for the study programme.

Learning outcomes

Skills
The students should be able to

- use methods and tools for product development, construction/technical planning and technical integration;
- develop own skills within construction/technical planning and development of products as well as complex technical solutions in relation to the field of the profession;
- include energy, environment and sustainability issues in the development of products and technical solutions;
- gather relevant knowledge from publications within research and development to illustrate practical issues within product development and integrative technology; and
- communicate technical issues and possible solution to colleagues in the enterprise's organisation.

Competences
The students should be able to

- identify own learning needs within knowledge, skills and competences based on the internship as well as draw up a strategy/plan for how to meet the needs;
- independently enter into discipline-specific and interdisciplinary cooperation with colleagues across the enterprise's organisation; and

- reflect on practice in enterprises based on knowledge of technology as an interaction between technique, knowledge, organisation and product.

The internship is concluded with an exam.

The assessment basis for the exam are the specific learning outcomes agreed between the contract parties – the students and the places of internship – and approved by the institution.

Please see the institutional section of this Curriculum for exam form, procedure, etc.

5. The bachelor's degree project

ECTS credits

The bachelor project is worth 15 ECTS credits.

5.1 Bachelor's degree project requirements

The bachelor's degree project must substantiate that the students have reached the final level of the programme in relation to the overall objective for the learning outcome of the programme. The students must demonstrate their ability to analytically and methodically address and communicate a complex, practical problem or issue related to a specific task within the objective of the programme.

The project, which constitutes the written part of the examination, must as a minimum feature:

- **Cover page** with title
- **Table of contents**
- **Introduction**, incl. presentation of problem statement, research question and approaches
- **Research method** section, including a description of and reason for the choice of empiricism, if any.[1]
- **Analysis** section for collection, processing and summing up of data about the problem statement
- **Solution** section, including answer to the problem statement and research question
- **Conclusion**
- **Reference list** (including all sources referred to in the project)
- **Appendices** (include only appendices central to the report)

The bachelor's degree project must total at least 25 standard pages and may not exceed 60 standard pages. If the project is made in a group, it must be increased by at least ten standard pages and no more than 20 standard pages for each additional student apart from one.

Said pages are exclusive of cover page, table of contents, reference list and appendices. Appendices will not be assessed.

A standard page is 2,400 characters, including spaces and footnotes.

[1] *"Empirical material is material that is subject to investigation and which can be referred to (observations, data, statements, texts, sources)." Rienecker L. & Jørgensen P.S. 2005 Den gode opgave – opgaveskrivning på videregående uddannelser (The good assignment – writing assignments in higher education). 3. ed. Frederiksberg: Samfundslitteratur.*

It is expected that a report makes use of relevant forms of visual communication (sketches, figures, diagrams, etc.).

Writing and spelling skills
In addition to the academic contents of the bachelor's degree project, assessments must also consider the student's writing and spelling skills in a communication context. The weight is 10 % on writing and spelling and 90% on the discipline-specific content.

Learning outcomes

The bachelor's degree project must substantiate that the students have achieved the final level of the study programme, cf. appendix 1 in Ministerial Order of 8 July 2010 on the Bachelor's Degree Programme in Product Development and Integrative Technology.

The goals for the learning outcomes comprise the knowledge, skills and competences that Product Development and Integrative Technology bachelors must achieve during their education.

Knowledge

1) The graduates should be able to reflect on the profession's theory and practice within product development and integrative technology based on a technology concept that comprises the elements of technique, knowledge, organisation and product; and they should have knowledge of

2) and be able to combine relevant philosophy of science with technical and technological issues within product development and integrative technology;

3) the programme's separate professional competences in respect of product development, construction and technical planning as well as technical integration in various forms of enterprises; and

4) the importance of ethical issues in connection with product development and integrative technology with a special view to environment, safety and sustainability.

The **IT and electronics** graduates further have

trade-specific knowledge of methods and theory for development, planning and use within IT and network solutions as well as electronic and data processing systems.

The **Installation and automation** graduates further have

trade-specific knowledge of methods and theory for development, planning and use within complex building and industrial installations as well as optimisation and operation of automatic systems.

The **Product development and production** graduates further have

trade-specific knowledge of methods and theory for development, planning and use within design and construction of industrial products as well as optimisation and operation of production systems.

Skills
The graduates should be able to

1) assess, select and use methods and tools for product development, construction and technical planning as well as technical integration;

2) use methods for development of products and complex technical solutions within the profession;
3) assess and include issues within energy, environment, ethics and sustainability specifically and in practice, in the development of products and technical solutions;
4) gather and communicate relevant knowledge within research and development as well as assess and use results from this within product development and technical integration; and
5) communicate technical issues and possible solutions to customers, collaboration partners and suppliers as well as internally at the enterprise.

The **IT and electronics** graduates are further able to

assess, select and substantiate the choice of methods within complex IT and network solutions as well as electronic and data processing systems.

The **Installation and automation** graduates are further able to

assess, select and substantiate the choice of methods within complex building and industrial installations as well as optimisation and operation of automatic systems.

The **Product development and production** graduates are further able to

assess, select and substantiate the choice of methods within design and construction of industrial products as well as optimisation and operation of production systems.

Competences

the graduates should be able to

1) handle product development, construction and technical planning, involving internal and external collaboration partners and customers in respect of the development, manufacture, use and removal or end of the product or service;
2) independently and in cooperation with others handle complex development-oriented situations across professional boundaries and the organisation of the enterprise;
3) handle technical interdisciplinary management tasks, including project management; and
4) identify own learning needs and draw up a strategy or plan for meeting the needs within knowledge, skills or competences.

The **IT and electronics** graduates are further able to

1) cooperate with other trade groups in connection with complex IT and network solutions as well as electronic and data processing systems to be integrated into interdisciplinary projects; and
2) further develop their own discipline-specific, interdisciplinary and methodical knowledge as well as skills and competences within complex IT and network solutions and electronic and data processing systems in relation to development of interdisciplinary technical solutions.

The **Installation and automation** graduates are further able to

1) cooperate with other trade groups in connection with complex building and industrial installations as well as optimisation and operation of automatic systems; and
2) further develop their own discipline-specific, interdisciplinary and methodical knowledge as well as skills and competences within complex building and industrial installations and optimisation and operation of automatic systems in relation to interdisciplinary technical solutions.

The **Product development and production** graduates are further able to

1) cooperate with other trade groups in connection with design and construction of industrial products as well as optimisation and operation of production systems to be integrated in interdisciplinary projects; and
2) further develop their own discipline-specific, interdisciplinary and methodical knowledge as well as skills and competences within design and construction of industrial products as well as optimisation and operation of production systems in relation to development of interdisciplinary technical solutions.

Assessment

The exam is externally assessed and graded according to the 7-point grading scale.

The exam is made up of a project and an oral examination. The students will receive a single, joint grade. The exam cannot take place until the internship exam and other exams of the study programme have been passed.

Please see the institutional section of this Curriculum for exam form, procedure, etc.

6. Overview of the exams

Overview of all exams and their order

Exam	**90 ECTS credits distributed across exams**	**Assessment**
1. Academic aptitude examination, if any[2]	-	Pass/fail
2. Theoretical product development	15	7-point grading scale
3. Discipline-specific product development and design	15	7-point grading scale
4. Interdisciplinary product development and design	18	7-point grading scale
5. Sustainable product development	7	7-point grading scale
6. Elective component exam(s)[3]	5	7-point grading scale
7. Internship examination	15	7-point grading scale
8. The bachelor's degree project	15	7-point grading scale

7. Credit transfer

Passed educational components are equivalent to the corresponding educational components offered by other educational institutions that offer the programme.

The students must provide information on completed educational components from another Danish or international further education and on employment assumed to result in credit transfer. In each case the edu-

2. An academic aptitude examination, if any, will be described in the institutional section of this Curriculum.
3. Elective components and exams are described in the institutional section of this Curriculum.

cational institution approves credit transfer based on completed educational components and employment that match up to subjects, educational components and internship components. The decision is made based on a professional assessment.

7.1 Pre-approved credit transfer

The students can apply for pre-approved credit transfer. Upon pre-approval of a study period in Denmark or abroad the students must, after conclusion of their study, document the completed educational components of the approved study. In connection with the pre-approval the students must give their consent to the institution obtaining the necessary information following completed study.

For the final approval of pre-approved credit transfer, the educational component is considered completed if it is passed in accordance with the regulations applying to the study programme.

7.2 Credit agreements

The individual providers may introduce local credit agreements.

8. Exemption

The institution may grant exemption from the rules in this national section of the curriculum that are laid down solely by the institutions, when found substantiated in exceptional circumstances. The institution co-operates on a uniform exemption practice.

Students who can document a relevant specific disability may apply for exemption from the requirement of writing and spelling skills being included in the assessment of the bachelor's project. The application is to be submitted to the study programme and directed to the attention of the programme director not later than four weeks before the exam is to be held.

9. Effective date and transition provisions

This national section of the curriculum enters into force on 1 September 2014 with effect for all students who are and will be registered for the study programme and for exams commenced on said date or thereafter.

The national section of this Curriculum of September 2013 is revoked with effect from 31 August 2014. However, exams started before 1 September 2014 will be carried out according to this national section of the curriculum not later than 30 September 2014.