CURRICULUM

for the

Bachelor's Degree Programme in Product Development and Integrative Technology

National Part

Commencement 1 August 2018

Revised 16 August 2018

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This national part of the curriculum for the Bachelor's Degree Programme in Product Development and Integrative Technology has been issued pursuant to section 18 (1) of the Ministerial Order on Technical and Commercial Academy Profession Programmes and Professional Bachelor Programmes. This curriculum is supplemented by the institution-specific part of the curriculum, which is laid down by the individual institution offering the programme.

The curriculum has been prepared by the educational network for the Bachelor's Degree Programme in Product Development and Integrative Technology and approved by the board of directors of all the institutions offering the programme - or by their rectors subject to authorisation - and following consultations with the institutions' education committees and the chairmanship of co-examiners for the programme.

1. The programme's intended learning outcome

The intended learning outcomes include the knowledge, skills and competencies that a student in Product Development and Integrative Technology must achieve during the bachelor's degree programme.

Knowledge
The graduate has acquired:

- development-based knowledge of theory and practice in product development and integrative technology based on a technological concept encompassing the following elements: technique, knowledge, organisation and product.
- an understanding of practice and key theories and methods in relation to the relevant theory of science and ethical issues in product development and integrative technology.
- an ability to reflect on practice and the application of key theories and methods of the profession based on their own qualifications with a special focus on the environment, safety and sustainability.

Skills
The graduate has acquired the skills needed to:

- assess practice-oriented and theoretical issues as well as justify and select relevant methods and tools for product development, construction and technical planning as well as integrative technology.
- master methods for the development of products and complex technical solutions in their own profession.
- assess practise-oriented and theoretical issues in relation to energy, the environment, ethics and sustainability - specifically and practically - for the development of products and technical solutions as well as justify and select relevant solutions.
- use relevant knowledge from research and development in product development and integrative technology.
- communicate practise-oriented and professional issues and solutions to customers, partners, as well as internally in the company.

Competencies
The graduate has acquired the competencies needed to:

- manage complex product development, construction and technical planning relying on knowledge of the development of the product or service, its production, use, disposal or discontinuation.
- independently engage in academic and interdisciplinary collaboration with internal and external business partners and customers and assume responsibility within the framework of a professional code of ethics for the development process.
- identify their own learning requirements and develop their own knowledge, skills and competencies in relation to the profession.

1.1 Learning objectives for the individual specialisations

The programme consists of three specialisations, each of which equates to 10 ECTS points:

1) IT and Electronics
2) Installation and Automation
3) Products and Production

1.1.1 Additional learning objectives for the IT and Electronics specialisation

Knowledge
The graduate has acquired:

- development-based knowledge of environmental aspects and sustainability in electronics, data construction and network project planning.
- an understanding of practice, specific methods and theories of IT and network solution development, as well as electronic and computerised systems, and an ability to reflect on practice and the application of theories and methods.

Skills
The graduate has acquired the skills needed to:

- apply methods and tools in complex IT and networking solutions as well as electronic and computerised systems and master the further development and adaptation of solutions.
- assess practice-oriented and theoretical issues as well as justify and select relevant solutions to ensure sustainability in the choice of technology and materials.
- communicate practice-oriented and professional issues and solutions to partners and users.

Competencies
The graduate has acquired the competencies needed to:

- handle innovative, complex and development-oriented solutions for the design and application of IT solutions in an industrial context.
- independently engage in academic and interdisciplinary collaboration with other professional groups on complex IT and networking solutions as well as electronic and computerised systems to be integrated in interdisciplinary projects and assume responsibility within the framework of a code of professional ethics.
- identify their own learning requirements and develop their own knowledge, skills and competencies - academically, methodically and across disciplines - in the area of complex IT and networking solutions as well as electronic and computerised systems in relation to the development of interdisciplinary technical solutions.

1.1.2 Additional learning objectives for the Installation and Automation specialisation

Knowledge
The graduate has acquired:

- development-based knowledge of environmental aspects and sustainability in complex construction and industrial installations, as well as optimisation and operation of automatic systems.
- an understanding of practice, discipline-specific methods and theories of development in complex construction and industrial installations, as well as optimisation and operation of automatic systems, and an ability to reflect on practice and the application of theories and methods.

Skills
The graduate has acquired the skills needed to:

- apply methods and tools for the optimisation of complex construction and industrial installations and operation of automatic systems and master the further development and adaptation of solutions.
- assess practice-oriented and theoretical issues as well as justify and select relevant solutions to ensure sustainability in the choice of technology and materials.
- communicate practice-oriented and professional issues and solutions to partners and users.

Competencies
The graduate has acquired the competencies needed to:

- handle innovative, complex and development-oriented solutions for the design and application of automated solutions in an industrial context.
- independently engage in academic and interdisciplinary collaboration with other professional groups for the optimisation of complex construction and industrial installations and operation of automatic systems and assume responsibility within the framework of a code of professional ethics.
- identify their own learning requirements and develop their own knowledge, skills and competencies - academically, methodically and across disciplines - in construction and industrial installation optimisation and operation of automatic systems in the development of interdisciplinary technical solutions.

1.1.3 Additional learning objectives for the Products and Productions specialisation

Knowledge
The graduate has acquired:

- development-based knowledge of environmental aspects and sustainability in relation to the company's business and production.
- an understanding of practice, discipline-specific methods and theories of development and planning applied in the design and construction of industrial products as well as optimisation, operation and integration of production systems, and an ability to reflect on practice and the application of theories and methods.

Skills
The graduate has acquired the skills needed to:

- apply methods and tools for the design and construction of industrial products and optimisation and operation of production systems and master the further development and adaptation of solutions.
- assess practice-oriented and theoretical issues as well as justify and select relevant solutions to ensure sustainability in the choice of technology and materials.
- communicate practice-oriented and professional issues and solutions to partners and users.

Competencies
The graduate has acquired the competencies needed to:

- handle innovative, complex and development-oriented design solutions and apply technological solutions in an industrial context.
- independently engage in academic and interdisciplinary collaboration with other professional groups on the design of industrial products and optimisation and operation of production systems to be integrated in interdisciplinary projects and assume responsibility within the framework of a code of professional ethics.
- identify their own learning requirements and develop their own knowledge, skills and competencies - academically, methodically and across disciplines - in the areas of design and construction of industrial products and optimisation and operation of production systems in relation to the development of interdisciplinary technical solutions.

2. The programme includes the following national programme elements

2.1 Common programme elements

2.1.1 Integrative Technology

Content
Essential to the programme element is an understanding of the concept of technology, research in new technologies and how to apply them - in a commercial context that will allow students to work with integration, exploitation and implementation of technology and concepts in a cross-organisational perspective. The programme element also includes methods and tools for consultative purposes as well as management of interdisciplinary development activities.

Learning objectives for Integrative Technology

Knowledge
The student has acquired:

- development-based knowledge of essential practical and theoretical aspects of product and system integration as well as management, planning and evaluation tools in the field of the environment, including environmental management, environmental management systems and philosophies of sustainability.

- an understanding of practice, applied theories and methods for product development and innovation in relation to a company's organisation, and an ability to reflect on how they are used in a commercial context.

Skills
The student has acquired the skills needed to:

- apply methods and tools for the identification and analysis of important technological aspects pertaining to the relation between a product's design, production and use as well as master the assessment of significant practical and theoretical aspects of the integration of products and systems including the relations between technology, technique, knowledge and organisation(s).
- assess practice-oriented and theoretical issues in the implementation processes associated with the use of new technologies across the organisation and identify their strengths and weaknesses as well as justify and select relevant solutions.
- communicate practice-oriented and academic issues and solutions to business partners and users, including the application of relevant IT tools in the preparation and presentation of projects, concepts and solutions.

Competencies
The student has acquired the competencies needed to:

- handle aspects of complex product and technology development, including modification of products and systems.
- independently engage in academic and interdisciplinary collaboration for the purpose of implementing technologies and concepts and assume responsibility within the framework of a professional code of ethics, including management of technical development projects.
- identify their own learning requirements and develop their own knowledge, skills and competencies in relation to the development, implementation and management of the integration of technologies.

Number of ECTS points
The programme element Integrative Technology equates to 15 ECTS points.

2.1.2 Product Development

Content
The programme element covers product development and process optimisation from a business perspective and how to identify and involve experts and users in the development and optimisation processes. Focus is on interdisciplinary cooperation and on how to identify, collect, process and further develop data in a product and process development context.

Learning objectives for Product Development

Knowledge
The student has acquired:

- development-based knowledge of the practical as well as the theoretical and methodological structure of technological project work.
- an understanding of practice, theories and methodology applied to the product development processes – including the project's financial impact during production/construction and operation, and an ability to reflect on how they are used in a commercial context.

Skills
The student has acquired the skills needed to:

- apply methods and tools for the identification and collection of relevant company data so as to contribute to the development and optimisation of processes across the organisation, and master planning of the development work, testing of the product/ the solution (proof of concept) and identify the quality of technological project work compared to the results, validity, reliability, and relevance.
- assess practice-oriented and theoretical issues relative to the meaning and use of concepts in relation to the development of specialist language and technology as well as justify and select relevant concepts.
- communicate practice-oriented and academic issues and solutions to peers, users and partners viewed from a business context, including environmental and sustainability considerations in product development.

Competencies
The student has acquired the competencies needed to:

- handle commercial and technologically appropriate product development and create a project design for technological project work based on the choice, analysis and definition of a problem.
- independently engage in academic and interdisciplinary collaboration across the organisation for the purpose of implementing product development and assume responsibility within the framework of a professional code of ethics.
- identify their own learning requirements and develop their own knowledge, skills and competencies in relation to product development.

Number of ECTS points
The programme element Product Development equates to 15 ECTS points.

2.2 National programme elements within the specialisations

2.2.1 Construction and Sustainability

Content

The programme element focuses on construction and dimensioning. Sustainability is included in relation to the specialisation and the programme's focus on product development and integrative technology.

Learning objectives for Construction and Sustainability

Knowledge

The student has acquired:

- development-based knowledge of practice and applied theory and methods in environmental management, environmental management systems and philosophies of sustainability.
- an understanding of practice, applied theories and methods in construction and product development specific to the specialisation and an ability to reflect on how environmental and sustainability aspects may impact a company's business.

Skills

The student has acquired the skills needed to:

- apply process automation methods and master process optimisation methods specific to the specialisation.
- assess practice-oriented and theoretical issues relating to the construction of solutions as well as justify and select relevant models for the construction of complex solutions based on sustainable technologies.
- communicate practise-oriented and academic issues and solutions to partners and users.

Competencies

The student has acquired the competencies needed to:

- handle the construction of complex and development-oriented solutions specific to the specialisation.
- independently engage in academic and interdisciplinary collaboration to optimise existing solutions in an industrial context and assume responsibility within the framework of a professional code of ethics.
- identify their own learning requirements and develop their own knowledge, skills and competencies in relation to construction and sustainability and specific to the specialisation.

Number of ECTS points

The programme element Construction and Sustainability equates to 5 ECTS points

2.2.2 Innovation and Industrial Design

Content

The programme element focuses on innovation in general and systematic innovation in product development and process optimisation based on an understanding of the relevant industry and its conditions.

Learning objectives for Innovation and Industrial Design

Knowledge

The student has acquired:

- development-based knowledge of practice and applied theories and methods in technological solutions relevant to the industry in question.
- an understanding of practice, the philosophy, theories and methods applied when technology is applied in an industrial context.
- an ability to reflect on alternative uses of methods and technology and associated ethical issues.

Skills

The student has acquired the skills needed to:

- apply methods for the optimisation of existing solutions specific to the specialisation and master methods for the application of technologies in the solutions specific to the specialisation.
- assess practice-oriented and theoretical issues relating to innovation and design in specific solutions as well as justify and select relevant methods for the design of solutions.
- communicate practise-oriented and academic models and solutions to industrial partners and users.

Competencies

The student has acquired the competencies needed to:

- handle innovative methods for solutions to complex and development-oriented industrial situations specific to the specialisation.
- independently engage in academic and interdisciplinary collaboration for the design of new, innovative solutions in an industrial context and assume responsibility within the framework of a professional code of ethics.
- identify their own learning requirements and develop their own knowledge, skills and competencies in relation to innovation and industrial design and specific to the specialisation.

Number of ECTS points

The programme element Innovation and Industrial Design equates to 5 ECTS points.

2.3 Number of exams in the national programme elements

For the national programme elements, there is one exam with an external co-examiner and two exams with an internal examiner. In addition to this, the exam in the bachelor project is with an external co-examiner.

For the number of internship exams, see section 3.

For a comprehensive overview of all exams in the programme, see the institutional part of the curriculum. The national programme elements described in this curriculum can be examined together with programme elements laid down in the institutional part of the curriculum.

3. Internship

Learning objectives for the internship

Knowledge
The student has acquired:

- development-based knowledge of product development and integrative technology as applied in the company in question.
- an understanding of practice, theories and methodology applied in the company in terms of its financial and organisational conditions, its products and markets, and an ability to reflect on the company's use of innovation, product development and technology as well as sustainability.

Skills
The student has acquired the skills needed to:

- apply methods and tools for the planning of systematic development tasks in the company, including interdisciplinary process elements, and master the management of these tasks
- assess practice-oriented and theoretical issues in product development, optimisation and integration of technology as well as justify and select relevant theoretical and analytical working methods associated with development within the profession.
- communicate practise-oriented and professional issues and solutions to partners, the company and users.

Competencies
The student has acquired the competencies needed to:

- manage complex and development-oriented situations in the company in question.
- independently engage in academic and interdisciplinary collaboration and assume responsibility within the framework of a professional code of ethics.

- identify their own learning requirements and develop their own knowledge, skills and competencies in relation to the profession and the requirements of the company in question.

Number of ECTS points
The internship equates to 15 ECTS points.

Number of exams
The internship concludes with an exam with an internal examiner.

4. Requirements for the bachelor project

The learning objectives for the bachelor project are identical to the learning objectives for the programme listed under 1.

The bachelor project must document the student's understanding of and ability to reflect on the practice of the profession and apply theories and methods in relation to a practice-oriented problem. The identified problem, which must be central to the programme and the profession, is formulated by the student, possibly in cooperation with a private or public company. The institution approves the problem definition.

The project, which constitutes the written part of the exam, must contain:

- Front page and title
- Table of contents
- Introduction, inc. presentation of the problem, problem statement and approaches
- Background, theory, methodology, analysis, including a description and justification of the choice of any empirical data in reply to the problem statement
- Conclusion
- Perspective
- Bibliography (including all sources referenced in the project)
- Appendices

The final exam project must make up between 20 and 30 standard pages. For each additional student who participates in the final exam project, 10-20 standard pages will be added.

Group size	Minimum	Maximum
One student	20 pages	30 pages
Two students	30 pages	40 pages
Three students	40 pages	50 pages

Front page, table of contents, bibliography and appendices are not included in the required number of pages. Appendices will not be assessed.

Bachelor's project exam
The exam project in the final semester concludes the programme when all other exams have been passed.

Number of ECTS points
The final exam project equates to 15 ECTS points.

Exam form
The exam consists of an oral and a written exam with an external co-examiner. Students are awarded an individual overall grade according to the 7-point grading scale for the written project and the oral performance.

5. Credit transfer rules

Successfully completed programme elements are equivalent to the corresponding programme elements at other educational institutions offering the programme.

Students are obliged to provide information on completed programme elements from other Danish or foreign higher education programmes and on any employment for which credit transfer may be granted.

On a case-by-case basis, the educational institution approves credit transfers based on completed programme elements and job experience comparable to subjects, programme elements and internships.

The decision is based on an academic evaluation.

In case of pre-approval of a period of study in Denmark or abroad, the student is obliged, after completing the period of study, to document the programme elements completed during the approved period of study.

Upon obtaining the pre-approval, the student must consent to the institution requesting the necessary information after the student has completed the period of study.

If a credit transfer is granted as described above, programme elements are deemed to have been completed if they have been passed in accordance with the rules applicable to the programme in question.

6. Effective date and transitional arrangements

Effective date
This national part of the curriculum takes effect on 1 August 2018 and applies to students enrolled on the programme after 1 June 2018; however, exams initiated before 1 August 2018 may be concluded under the previous curriculum until 1 February 2019.