Chapter 9

The education specific part of the curriculum for

Bachelor (BSc) i teknisk videnskab (produktudvikling og innovation)

Bachelor of Science (BSc) in Engineering

(Product Development and Innovation)

Curriculum 2014, Version 1.1

Applicable to students admitted September 2014 onwards

The curriculum is divided into general provisions (Chapters 1-8), a programme specific part (Chapter 9) and the module descriptions for the subjects studied for each programme. Students should familiarise themselves with all three parts in order to acquire a full overview of the rules that apply throughout the study programme.

§1 Job profile

The PDI bachelor will be qualified for jobs such as:

- Project manager
- Product planner
- Product developer
- Business developer
- Coordinator in innovation and idea development
- Market research analyst
- Developer of global supply chains.

Moreover, the graduate will be able to understand and manage development and innovation projects, cooperating interdisciplinary.

§2 PDI – The competency profile of the study programme

The BSc in Engineering (PDI) will have:

Competences within:

- Have a holistic view of the whole product development process. From idea creation over market analyses to product design, engineering, manufacturing and introduction to the market;
- Have a wide knowledge of how to initiate and carry out innovation, business-generating processes and development tasks, as well as being able to resolve technical and market-oriented problems by applying technical and marketing research results, and personal qualifications;
- Have a wide knowledge of how to acquire new knowledge in relevant engineering and business fields and be capable of performing engineering and business tasks connected to generating new business opportunities;
- Have a deep and detailed knowledge of how to identify market research problems, carry out the market research and match the results with the product and marketing strategy of the firm;
- Have a wide and deep knowledge of how to plan, implement and manage complex innovation projects and development tasks involving creative idea-generating tasks with respect to social relations;
- Have a wide knowledge of how to organise the business activities and analyse the organisational structures with respect to global product development, production and sourcing activities;
- Be able to establish and join managerial, team-working and process-related contexts, including interdisciplinary project teams whose participants come from a variety of educational, linguistic and cultural backgrounds.

Skills within:

- Have a deep and detailed knowledge of the design of technical products including knowledge about mechanics, mechatronics, stress analysis and selecting engineering materials;
- Have a wide knowledge of manufacturing processes like shaping, joining and finishing of materials;
- Have a wide knowledge of how to establish and organise manufacturing facilities with respect to technological processes, automation and cost level;
- Be able to communicate clearly in writing, verbally and visually in drawings and models, as well as being able to negotiate in English in technical and business spheres.

Qualification Matrix

	1st semester		2nd semester		3rd semester		4th semester				5th semester		6th semester			
	SET1	BAS1	SET2	BAS2	SET3	BAS3	SET4	Science Theory	Supply Chain Management	Sensors and Electronics	Software Design	Experts in Teams	Market research and Organisation	Robotics	Prok'jekt Management	Bachelor Project
Have a holistic view of the whole product development process. From idea creation over mar-ket analyses to product design, engineering, manufacturing and introduction to the market;	X		X		X	X	X		X				X		X	X
• Have a wide knowledge of how to initiate and carry out innovation, business-generating pro-cesses and development tasks, as well as being able to resolve technical and market-oriented problems by applying technical and marketing research results, and personal qualifications;	X		X	X	X	X	X		X						X	X
• Have a wide knowledge of how to acquire new knowledge in relevant engineering and business fields and be capable of performing engineering and business tasks connected to generating new business opportunities;			X		X		X									X
• Have a deep and detailed knowledge of how to identify market research problems, carry out the market research and match the results with the product and marketing strategy of the firm;						X							X			
• Have a wide and deep knowledge of how to plan, implement and manage complex innovation projects and development tasks involving creative idea-generating tasks with respect to social relations;			X					X				X			X	
• Have a wide knowledge of how to organise the business activities and analyse the organisa-tional structures with respect to global product development, production and sourcing activities;									X			X	X			X
• Be able to establish and join managerial, team-working and process-related contexts, including interdisciplinary project teams whose participants come from a variety of educational, linguistic and cultural backgrounds;	X		X		X		X	X				X			X	X
• Have a deep and detailed knowledge of the design of technical products including knowledge about mechanics, mechatronics, stress analysis and selecting engineering materials;		X		X	X		X			X	X			X		X
• Have a wide knowledge of manufacturing processes like shaping, joining and finishing of mate-rials;		X		X	X											
• Have a wide knowledge of how to establish and organise manufacturing facilities with respect to technological processes, automation and cost level; and									X					X		
• Be able to communicate clearly in writing, verbally and visually in drawings and models, as well as being able to negotiate in English in technical and business spheres;	X		X	X	X		X					X				X

§3 The constituent subject columns

The qualifications of the students are developed by studying the topics from five subject columns.

There are progressions within all topics which lead to the final qualifications.

During the semesters the elements are linked together in semester themes relating to the semester project and in theoretical courses.

Before completing the study programme it will be possible to go more deeply into specific areas by electing additional courses and by means of the final bachelor project.

The subject columns are:

- Product Development and Innovation
- Engineering Design and Manufacturing
- Marketing and Business
- Basic Engineering Tools
- Personal and Learning Skills

The subject column: Product Development and Innovation

The purpose of this subject column is to give the students knowledge of basic as well as more advanced product development theories and methods. The column provides the students with an advanced understanding of innovation as a key process for developing the business.

The subject column includes the following elements:

- Innovation management
- Front end of innovation
- New product development processes (NPD) and time to market
- Stage gate models
- Creativity and idea development
- Free hand sketching techniques
- Design theory, Design Tools and Design Tasks
- Model making and prototyping
- Product models, life cycle and Design for X methods
- Artificial design versus engineering design
- The role of the project manager / leader
- Teambuilding of high performance teams
- Risk management

The subject column: Engineering Design and Manufacturing

The purpose of this subject column is to give the students knowledge about engineering design, methods and techniques for mechanical, electronic and software elements embedded in products. Furthermore, the students acquire knowledge enabling them to choose the right materials and manufacturing processes according to design, technology and cost.

The requisite competencies in mathematics, physics, and IT that are not covered by preceding courses are included in the courses as and when necessary.

The subject column includes the following elements:

- Statics and Mathematics
    - Scalars and vectors
    - Force systems
    - Equilibrium conditions
    - Structures and frames
    - Area moments
    - Beams, external loading and reactions
    - Internal effects, shear, bending, torsion
    - Problem solving software, e.g. Mathcad

- Stress Analysis and Mechanical Design
    - Stress analysis
    - Deflections of beams
    - Fundamentals of machine elements, springs, fastening elements, bearings and transmissions

- Sensors and Electronics
    - Sensors
    - Fundamentals of power electronic systems

- Software Architecture and Design

- Robotics
    - Fundamentals of robotic systems and vision technology
    - Applications for robotics
    - Economic considerations when selecting robotic systems
    - Project management when implementing robotic applications

- Materials and Processes
    - Design specifications
    - An overview of engineering materials and processes
    - Material structures – forming and shaping
    - Stresses and strains
    - Material test methods
    - Mechanical properties of materials
    - Phase diagrams and heat treatment of metals
    - Casting and moulding processes
    - Bulk deformation processes
    - Sheet forming processes
    - Joining processes
    - Surface modification for wear resistance
    - Criteria for choosing materials and processes
    - Work study techniques
    - Quality planning and control
    - TQM

- Six sigma
- ISO 9000
- TPM

The subject column: Marketing and Business

The purpose of this subject column is to qualify the students to do advanced marketing planning and set out a strategy based on a fundamental understanding of business economic concepts and finance. The subject column therefore qualifies the students to assess a business idea based on an invention and associated marketing aspects, incorporate the economic consequences into the business plan, draw up an overall plan for bringing the product to market and define a long-term strategy.

The subject column includes the following elements:

- Behaviour and Markets
  - Introduction of the market concept including the stakeholders in the market
  - Models of competitor analysis e.g. Porters Five Forces
  - Introducing suppliers and the role suppliers play in the business activities
  - Introducing consumer behavior
  - Introducing industrial buying behaviour
  - Fundamental models of buying behaviour

- Market Research
  - Formulation of market research problems
  - Secondary data collection – including available data sources from the library
  - Primary data collection methods
  - Techniques for developing questionnaires
  - Techniques for setting up interview guides and focus groups
  - Analysis and interpretation of collected data
  - Formulating a report on the market research problem

- Business Economics and Cost Management
  - Product costs and cost concepts
  - Capital investments decisions
  - Cost-volume-profit relationships
  - Pricing methods
  - Activity-based costing and activity-based management

- Product Management
  - Basic understanding of products
  - Marketing planning
  - Advanced competitor analysis
  - Advanced customer analysis
  - Product strategy
  - Pricing principles – including value-based pricing
  - Advertising and promotions
  - Financial analysis for product management

- Supply Chain Management
    - Production planning
    - Master production system scheduling
    - Material requirements planning
    - Capacity Management
    - Inventory fundamentals

- Project management
    - The project task
    - 5x5 analysis
    - Interested parties
    - Situation analysis
    - Project planning, scheduling and budgeting
    - Risk analysis and management
    - Project organisation
    - The role of the project manager
    - Managing NPD projects in an innovative and international environment

The subject column: Basic Engineering Tools

Basic engineering tools cover a range of general competencies which are basic knowledge or tools to be used by PDI Engineers. This area includes Statistics, Technical Drawings, CAD, IT skills and basic project competencies for carrying out project work.

The subject column includes the following elements:

- IT Skills
    - Advanced usage of word processing and spreadsheets

- Statistics
    - Descriptive statistics
    - Probability calculations
    - Stochastic variables
    - Probability distribution
    - Point estimation
    - Correlation analysis
    - Confident interval
    - Hypothesis test
    - Regression analysis
    - Statistical methods in market analysis
    - Statistical methods in machine capabilities

- Computer Aided Design
    - 3D + 2D drawings and models for manufacturing specifications
    - Adaptive features, parts, subassemblies and parts lists.
    - Geometrics, surfaces, tolerances, calculations and dimensioning
    - International standards for technical drawings

- Project Competencies in Student Project Work
    - Defining the project task
    - Setting up a project schedule
    - Organising meetings, working meetings and steering meetings
    - Following up on progress
    - The role of the project coordinator and the project members
    - Reporting
    - The social milieu of the group

The subject column: Personal and Learning Qualifications

The students must, during their study period, go through a personal development which will lead towards personal responsibility for studying. They must improve in terms of oral and written communication as well as the ability to cooperate and function as part of a team. It is of the utmost importance that PDI students are able to fit in and work as members and/or managers in cross-cultural project organisations and are able to take part in the planning and organisation of projects. Well-developed intuition and adaptability are necessary for the students to form a viable cross border cooperation.

For most parts of this subject, there will be no separate teaching or courses. It will be an integrated part of a number of activities during the programme.

The subject column includes the following elements:

- Learning Qualifications
    - Determine personal study technique
    - Reading technique, including reading in depth
    - Note-taking technique
    - Searching information and literature
    - Evaluating sources of information
    - Absorption of knowledge
    - Reflection
    - Creativity and generation of ideas
    - Evaluating personal result from learning sessions
    - Plan personal learning

- Personal Qualifications
    - Oral and written presentation in order to transmit and interpret knowledge and ideas
    - Participating in teamwork, both cross-cultural and interdisciplinary
    - Understanding the different team roles and how they interact
    - Evaluating own and others' behaviour in connection with teamwork
    - Ability to supervise, direct and guide individuals and groups in the completion of tasks and fulfilment of goals
    - Planning, formulating and solving independent tasks
    - Entering and being a part of discussions
    - Developing intuition and adaptability in cross-cultural contexts
    - High level of independence to adapt to changes in environment
    - Being able to create an environment where creativity and innovation are developed

§4 PDI – Semester Themes

Semester	Semester theme
6	From Product Innovation to Market Implementation/Bachelor Project
5	Study Abroad/Follow Your Interests
4	From Design to Manufacturing
3	From Concept to Design
2	Creativity and Idea Development
1	The Innovation Process

During the fifth semester, students are recommended to study at a university abroad or participate in an international and cross-disciplinary project team in collaboration with students from partner universities abroad.

§5 Programme structure and modules

Semester	Modules																													
6.	**PDXMRPDI** Advanced Market Research and Innovation Strategy (5 ECTS)										**PDXROB1** Robotics (5 ECTS)								**PDXPM** Project Management (5 ECTS)								**PDXBT** Bachelor Project (15 ECTS)			
5. (a) *or*	Study abroad at a partner university[1]																													
5. (b)	**Elective** (5 ECTS)										**Elective** (5 ECTS)								**Elective** (5 ECTS)								**SB-ISE** Introduction to Software Engineering (5 ECTS)			
4.	**PDXSCT** Science Theory (3 ECTS)										**X-SCM1** Supply Chain Management (5 ECTS)								**PDXSE1** Sensors and Electronics (5 ECTS)								**PDXSET4** Semester Theme 4 (17 ECTS)			
3.	**PDXBAS3** Basic Applied Science 3 (8 ECTS)																		**PDXSET3** Semester Theme 3 (22 ECTS)											
2.	**PDXBAS2** Basic Applied Science 2 (9 ECTS)																				**PDXSET2** Semester Theme 2 (21 ECTS)										
1.	**PDXBAS1** Basic Applied Science 1 (10 ECTS)																						**PDXSET1** Semester Theme 1 (20 ECTS)									
ECTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

1) Students are encouraged to complete the fifth semester at a foreign university. Please note that the courses must be approved by the Academic Study Board of the Faculty of Engineering.

Colour codes	Compulsory courses	Elective courses	Study abroad

§6 Description of 1st semester

SEMESTER THEME

The Innovation Process

VALUE ARGUMENT

The overall objective of the semester is to give the students a holistic approach to the field of New Product Development and Innovation.

The semester offers an introduction to the business case in order to enable the students to identify and analyse a number of common business economic problems in a product development project which is important for the success of the new product development process.

Working on a project while receiving lectures that support technical, product development and innovation theory provides a theoretical and practical approach to the semester's subjects.

The semester activities will give the students skills in solving problems individually and in teams, as well as providing an overall understanding of the basic conditions for a global production company.

Special focus will be on developing the students' teambuilding skills at the same time as they perform a simple product design task and relate the technical product description to an overall view of the innovation process in the company.

The following semesters will follow up on this focus so that by the end of the sixth semester, the students will have gained an understanding of the entire value chain from market analysis, product engineering design and manufacturing to sales and distribution.

COMPETENCY GOALS

The students will be able to:

- Achieve a basic understanding of the product development process as a part of the business innovation process;
- Set up an appropriate stage gate plan for a product development process and understand interaction with related business processes;
- Achieve competencies in working in and managing a high performance team consisting of students from different cultures;
- Have a basic knowledge of engineering materials and manufacturing processes
- Have a basic knowledge of prototyping in a product development context
- Set up and present a semester project report in the English language by means of an oral presentation as well as a written and graphic presentation;
- Find, evaluate and use technical information from textbooks, handbooks, the internet etc
- Understand the fundamentals of a business case
- Apply a business case in their project work
- Apply appropriate mathematics to simple static problems in a conceptual design;

- Evaluate stress levels in and dimensions of simple mechanical elements in a product; and
- Develop and describe a simple conceptual mechanical design

MODULES

PDXBAS1 – Basic Applied Science 1 (10 ECTS)
PDXSET1 – Semester Theme 1 (20 ECTS)

The modules are obligatory and together they constitute part of the first-year examination.

CONTEXT

First and second semester courses will build on the skills within natural sciences, English and social sciences the student has achieved from his high school education

The module PDXBAS1 includes the courses: Statics and Mathematics and Materials & Processes.

These technical elements are basic to the semester theme and also lay the groundwork for the instruction provided in subsequent semesters.

The module PDXSET1 includes the courses: Project Competencies, IT-Qualifications, Literature research competencies, Business Case, Computer Aided Design 1, Product Development & Innovation 1 and the semester project work in teams.

The module will give the students basic knowledge of how to work in teams according to the project model concept and develop an innovative business solution for a given product idea.

The students will experience and develop their own personal skills in team-working and how to improve the performance of the team.

The students will use elements from the courses taught during the project work and bring these into a professional engineering context. The module will give the student a holistic view of the whole business development process.

The wide knowledge from this project work will be the basis for further educational work during the coming semesters.

§7 Description of 2nd semester

SEMESTER THEME

Creativity and Idea Development

VALUE ARGUMENT

The overall objective of the semester is to give the students a deep knowledge of the idea development process and how this process is linked to technologies. The students will discuss and evaluate questions such as: how can creative ideas be fostered in a structured way? How are ideas selected and evaluated? How do ideas, technologies and products interact? These are important questions which have an impact on the overall innovation process and the new product development process.

It is important for the PDI engineers to know the importance of technologies. The concept of technologies and how technologies develop is a core topic in the semester. In particular, tools for identifying trends and patterns of technological development need to be combined with the content of the conceptual phase. This phase is where the product's most significant competitive parameters are outlined and sketched – e.g. technical functionality, aesthetic design and usability, as well as the associated needs on the customer side.

Creative work methods and the validation of solution proposals are the subjects of intense study within this semester.

The foundation for applying these creative methods and developing new ideas is a fundamental insight into the behaviour and interests of the market, in particular customers, consumers, competitors, suppliers and other stakeholders surrounding the business.

The course module on Business economics and Finance will give an introduction to the business economic themes in order to enable the students to identify and analyse a number of common business economic problems in an organisation which is important for the success of the new product development process.

The students will learn more about the basic engineering design of a simple product in order to bring the PDI competencies and the basic engineering competencies into interaction during the project work.

Working on a project while receiving lectures that support technical, marketing, product development and innovation theories provide a theoretical and practical approach to the semester's subjects.

The semester activities will give the students skills in establishing a creative environment for teams and provide an overall understanding of the basic conditions for a global innovative organisation.

COMPETENCY GOALS

The students will be able to:

- Identify, trace and map technology developments in particular technological areas;
- Define a technology and understand the technological foundation for a conceptual design;
- Understand the fundamental concept of and differences between creativity and innovation processes;
- Understand how to build the foundation of a creative platform inside the organisation;
- Understand barriers and preconditions for a creative environment in the organisation;

- Use tools for fostering, evaluating and selecting ideas;
- Analyse the competitive situation within a specified market;
- Understand consumers' behaviour in an individual, social and cultural perspective;
- Describe how segmentation on both B2B and B2C markets can be achieved;
- Identify the most relevant theories for explaining behaviour for further market research and the product innovation process in general;
- Apply 2D and 3D CAD when formulating a product description
- Understand the importance of management and cost accounting in the organisation
- Evaluate and choose between different investment alternatives
- Calculate and analyse cost – volume - profit relationships

MODULES

PDXBAS2 – Basic Applied Science 2 (9 ECTS)
PDXSET2 – Semester Theme 2 (21 ECTS)

Both modules are obligatory. PDXSET2 constitutes part of the first year examination, together with the first semester modules.

CONTEXT

The module PDXBAS2 includes the courses: Computer Aided Design 2 Materials and Processes 2 and Business Economics and Finance

These technical elements are basic to the semester theme and also lay the groundwork for the instruction provided in subsequent semesters.

The module PDXSET2 includes the courses: Product Development & Innovation 2, Creativity and Idea Development, Behavior and Markets and the semester project work in teams.

PDXSET2, PDXSET1 and PDXBAS1 constitute the first year examination on the PDI education and must be passed before the student start 2nd year of study.

§8 Description of 3rd semester

SEMESTER THEME

From Concept to Design

VALUE ARGUMENT

The overall objective of the semester is to give the students a deep knowledge of how to bring the ideas of a new product and the conceptual design to a more detailed and embodied design stage.

This means that the students must now delve deeper into the technical matters in order to verify the objectives set up in the discovery and concept stage of the product development process.

On the other hand, it is important to maintain a holistic view of the process and consider the financial issues as well as the marketing issues.

During this semester the students will gain a deeper understanding of the importance of driving a new product development process as a concurrent engineering process where engineering design activities, marketing activities, manufacturing issues and financial considerations go hand in hand with the overall aim of successfully launching a new reliable product onto the market.

One main focus area will be how to specify and document a mechanical technical solution to a product specification. This involves selecting and specifying machine elements from a functional and material point of view.It is also important to focus on how to manage risks at product and project level to ensure that the best and most feasible solutions are chosen.

The course in Introduction to Industrial Design will give the student a basic introduction to the discipline of industrial design and how to apply the subject in the product development process.

In addition, the students are provided with the necessary insights to identify a market research problem, seek information, evaluate information and perform the most basic market research analyses to understand the behaviour of key decision-makers and users in the product development process. In relation to market analysis the student is introduced to statistical methods as foundation for analysing the market research results, but also for use in the manufacturing context.

COMPETENCY GOALS

The students will be able to:

- Develop a conceptual design to a detailed mechanical design level;
- Describe the most basic market research analyses to describe the behavior of key decision-makers and users in the product development process;
- Specify the interfacing between different parts in a mechanical product in order to design a product which meets the functional requirements;
- Select and specify the most appropriate mechanical machine elements for the detailed design which meet the functional objectives set in the conceptual design;
- Select and use appropriate methods to analyse, assess and treat risks in products;
- Describe a product specification; and

- Have a fundamental understanding of statistics within science and manufacturing capabilities
- Understand the role of industrial design in the product development process
- Apply design theories in the PDI context

MODULES

PDXBAS3 – Basic Applied Science 3 (8 ECTS)
PDXSET3 – Semester Theme 3 (22 ECTS)

Both modules are obligatory.

CONTEXT

The module PDXBAS3 includes the courses: Market Research 1 and Statistics. The module PDXSET3 includes the courses: Product Development & Innovation 3, Stress Analysis and Mechanical Design, Introduction to Industrial Design, and the semester project work in teams.

§9 Description of 4th semester

SEMESTER THEME

From Design to Manufacturing

VALUE ARGUMENT

The overall objective of the semester is to give the students a deep knowledge of how to handle a product development process with focus on the phase where the product concept based on market inputs is developed to a more detailed design based on analysis of the product's life cycle phases.

The students will understand how development projects are embedded into the context of the company's business development and how the creation of platform based product architecture can be instrumental to achieve a good fit between manufacturing, market and user-related requirements respectively.

The student will gain a basic understanding of the total supply chain as well as the basics of production planning and control.

In addition, the students are provided with a detailed understanding of the management of products including pricing theory so that the students can act as qualified and competent partners to the company's new product management or key analyst in marketing. As a result, the students will understand how new products can successfully replace existing products.

As a further development of the students' skills in different areas of technology, a course in Sensors and Electronics will be incorporated into the semester. The aim of this is to develop the students' understanding of technological aspects in new product development as a natural progression of their understanding of mechanical engineering taught in the previous semesters.

In this semester the student will also be introduced to science theory and the methods that are used. These include ethics and how science can be applied to the field of engineering.

COMPETENCY GOALS

The student will be able to:

- Manage a complex semester project by setting goals, structures and controlling the progress;
- Characterise and discuss what modularity is and how it is linked to product development;
- Apply Design for X methods in project works;
- Understand different product quality dimensions and their relations to product life phases;
- Identify strategic barriers and opportunities related to using modular architectures and the implications for the marketing process;
- Assess the architectural implication on manufacturing properties, assembly properties, marketing properties and functional properties;
- Define product management and explain the link between product, marketing and management;
- Set up and assess the market potential of a potential product;

- Draw up a technical specification for a product;
- Assess the consequences of end-of-life decisions with particular focus on recycling and new product management;
- Understand and describe the basic principles of sensors;
- Understand and describe the basic principles of signal conversion, signal amplification and filtering;
- Understand the role of sensors in engineering applications;
- Explain the central terms and models of explanation used in science theory;
- Distinguish between objectivism and subjectivism in science; and
- Explain fundamental ethical problems in relation to science;

MODULES

PDXSET4 – Semester Theme 4 (17 ECTS)
X-SCM1 – Supply Chain Management (5 ECTS)
PDXSCT – Science Theory (3 ECTS)
PDXSE1 – Sensors and Electronics (5 ECTS)

All modules are obligatory.

CONTEXT

The module PDXSET4 includes the courses: Product Development and Innovation 4, Product Management and the semester project work in teams.

The module PDXSCT will give a basic introduction to science theory in order to be able to implement the theory in the following courses.

X-SCM1 and PDXSE1 will give a basic introduction of to a broader technical field, which is important for a PDI engineer.

§10 Description of 5th semester

SEMESTER THEME

Study Abroad/Follow Your Interests

The students can choose between studying at a foreign university during the semester (on courses preapproved by Academic Board of Studies) or to study at the University of Southern Denmark as below:

VALUE ARGUMENT

The students develop an understanding of working together with students from other programs in the semester project "Experts in teams". As a part of the project work, elements of innovation and entrepreneurship as well as preparation of market analysis and a business plan will be incorporated.

To form their own profile, the students will have the opportunity to choose optional courses within their areas of special interests and in line with their PDI profile.

To develop the students' understanding of the complexity of technology in products and processes there will be course in software design.

COMPETENCY GOALS

The students will be able to:

- Participate in a group in such a way that it can form a quorum, handle and solve conflicts and identify and describe interdisciplinary problems
- Prepare problem statements in connection with interdisciplinary projects
- Set up and follow a project plan with milestones, detailed timetable and project delimitation
- Describe and delimit an interdisciplinary project subject, divide it into parts and define the boundaries between the disciplines
- Acquaint themselves with other academic disciplines in an interdisciplinary group and apply this knowledge in the joint project work in order to think through realizable solutions for specific problems in the project
- Choose, apply and document models and tools from theory to solve the assignment
- Document results and consequences of the suggested solution, especially regarding the interdisciplinary subjects
- Reflect on own experiences with interdisciplinary collaboration with a view to future interdisciplinary collaboration
- Understand and describe Software engineering

MODULES

F-EIT5 – Semester Project, Experts in Teams (10 ECTS)
SB-ISE – Introduction to Software Engineering (5 ECTS)

The above mentioned two modules are mandatory. Additionally, the semester contains electives corresponding to 15 ECTS.

CONTEXT

The module F-EIT5 will give the students an understanding of how to manage a cross functional team, which is a logic extension of project management skills learnt at the previous semester projects.

SB-ISE introduce to the field of software development which is an important technical area for a PDI engineer.

STUDY ABROAD

Students are encouraged to complete the fifth semester at a foreign university, if the courses in question can be approved by the Academic Study Board of the Faculty of Engineering.

§11 Description of 6th semester

SEMESTER THEME

From Product Innovation to Market Implementation/Bachelor Project

VALUE ARGUMENT

The semester is centred around the Bachelor Thesis.

The bachelor project is a working process that shall document the students individual engineering-specific competencies attained during the process within a limited, course-relevant, interdisciplinary and engineering-specific subject. The selected problem can be investigated from a theoretical, experimental or a practical point of view. The project should be organized in cooperation with an external partner which could be a company, an organization or other interested parties.

Compulsory courses give the students a practical insight into the most important types of market research techniques and into the ways market research analysis could be used by the key decision-makers and managers involved in the product development and innovation process. Further the students will get an understanding of how firms formulate themselves at a strategic level.

The course on Robotics will introduce the student to functionalities of robots and their application and use robots as an illustration of the interfacing between software, mechanical components and sensors.

The compulsory course in Project Management will sum up the experiences the students have done in managing their semester projects with different partners and will further develop their competences in investigating the perspectives of managing interdisciplinary projects in a global business context.

COMPETENCE GOALS

The students will be able to:

- Describe the main elements of strategy and the strategy process
- Analyse and develop an innovation strategy and discuss the main implementation challenges
- Be able to analyse advanced market research reports to capture insights relevant to the product development and innovation
- Be able to use market research techniques to collect data that is relevant for the PDI
- Decision making process
- Understand the concepts of robot-technology, the connection between sensors, hardware and software
- Reflect on theories, methods and practice in execution of the project work
- Apply scientific methods and tools within the subject area of the study programme
- Assess theoretical and practical problems and apply relevant analysis and problem-solving models
- Understand the challenges and managerial tasks related to project deliveries in organizations and be capable of setting up a plan for executing a project.

- Manage a discipline-specific and cross-disciplinary cooperation and to assume a professional approach in the collaboration with external partners.

MODULES

PDXROB – Robotics (5 ECTS)
PDXMRPDI – Advanced Market Research and Innovation Strategy (5 ECTS)
PDXPM – Project Management (5 ECTS)
PDXBT – Bachelor Project (15 ECTS)

All the above mentioned four modules are mandatory.

CONTEXT

The project shall demonstrate the students qualified skills in expressing, analysing and processing problems within a limited, course-relevant and engineering-specific and interdisciplinary subject.

The course in Project management will give the student competences in planning and executing projects in a business context, and will be a basis for more advanced courses at Master level. At the same time it will support a bachelor project executed in cooperation with external partners.

The course on market research and innovation strategy builds upon the previous courses in market research and product development and innovation.

PDXROB introduces the student to robotics.

§12 External examiners and Study Board

The study programme belongs under the Academic Study Board of the Faculty of Engineering and the Danish corps of external examiners for engineering education.

§13 Entry into Force and Amendments

1. Approved by the Academic Study Board of the Faculty of Engineering and the Director of Studies on behalf of the Dean of the Faculty of Engineering 20 August 2010.

2. The 2013 curriculum is approved by the Academic Study Board of the Faculty of Engineering and the Director of Studies on behalf of the Dean of the Faculty of Engineering 18 April 2013.

3. Curriculum 2013 is approved by the Academic Study Board of the Faculty of Engineering and the Director of Studies on behalf of the Dean of the Faculty of Engineering 17 September 2013 (Version 1.1).

4. Amendments approved by the Academic Study Board of the Faculty of Engineering and the Director of Studies on behalf of the Dean of the Faculty of Engineering 10 April 2014 (Version 1.2).

5. Curriculum 2014 is approved by the Academic Study Board of the Faculty of Engineering and the Director of Studies on behalf of the Dean of the Faculty of Engineering 23 June 2014 (Version 1.0).

6. Amendments approved by the Academic Study Board of the Faculty of Engineering and the Director of Studies on behalf of the Dean of the Faculty of Engineering 18 March 2015 (Version 1.1).

7. Amendments approved by the Academic Study Board of the Faculty of Engineering and the Director of Studies on behalf of the Dean of the Faculty of Engineering 28 January 2016 (Version 1.1).