UNIVERSITY OF SOUTHERN DENMARK

Chapter 9
The programme specific part of the curriculum for:

MASTER OF SCIENCE (MSc) IN ENGINEERING (INNOVATION AND BUSINESS)

Curriculum 2015, Version 1.0

Applicable to students admitted September 2015 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 profiles

Innovation and Business is a master of science in engineering that combines innovation, technology and business disciplines and courses. The students become business-oriented engineers (I&B engineer). In a collaborative and participatory way they integrate technology, business and use. The I&B engineer is able to deal with different types of innovation challenges both in small and in larger enterprises (Intrapreneurship) The I&B engineer is also able to discover and create new opportunities and turn them into new businesses. The I&B engineer is internationally oriented and is able to think globally. Thus, he can respond productively to challenges in our complex and rapid evolving society. A master of science in Innovation and Business provides the students with special core competencies within the following areas:

- Creativity, Design and Innovation skills for stimulating innovation in already existing companies or in new start-up firms
- Elaborated skills in Mechatronics related to product and production technologies, systems and corresponding software
- Product and production-driven intra- and entrepreneurship
- Collaborative skills to understand and facilitate the participatory process between stakeholders and organizations
- Competencies in sustainable business development, logistics and production setup
- Knowledge about business administration and marketing for evaluating market and business opportunities

The combination of engineering, business and innovation competences enable the graduate to work in various jobs in modern companies, where interdisciplinary and cross-functionality is a path to success. Understanding the process from development of product ideas to specifying and realising sustainable production and businesses makes the graduate an important link between various functions and specialists within an organization. Emphasizing the international dimension during the education fosters global opportunities. Finally, graduates have the possibility to pursue a career within academia. Possible job profiles for a graduate are:

- **Project manager**
  The project manager is able to work with innovation in companies regarding products, production and businesses. The candidate is able to, understand, analyse and turn complex technology into applications and new solutions. His/Her oral and written communication skills allow him/her to exchange and realize ideas creatively and dynamically within organizations. The profound economic and technological knowledge allows him/her to recognize and realize market and technology-oriented ideas faster and better than the competitors.

- **Innovation Manager**
  The Innovation Manager is able to coordinate and lead the innovation development process based on open and participatory innovation. His communicative, economic and technological skills allow him/her to manage innovation development across different departments and across companies. The candidate is a team player and is able to orchestrate the interdisciplinary and multidimensional process of innovation, independently of whether this process is situated on the institutional or the corporate level.

- **Business Developer**
  The Business Developer/Innovator is able to detect and analyse signals for change and development on the corporate level, as well as on the institutional or regional level, in order to develop bearing strategies that are both economically and technologically sound. His/her

specific communication skills together with knowledge of economies and technology allow him/her to coordinate and mediate between the institutional level and the corporate level.

- **Entrepreneur**
  Entrepreneurs who are willing to combine expertise and entrepreneurship are able to take the challenge to develop, market, and manage their own ideas from the beginning through to the end. Graduates of Innovation and business acquire the needed skills to develop their own products, perform the market research and to setup the logistics and production facilities to realise a business.

- **System Integrator**
  The Innovation and Business candidate has a good overview of mechatronics technologies and when it comes to new solutions in mechatronics (energy solutions, medico, welfare, high tech manufacturing, transportation etc.) the candidate is able to specify and design the solution in a sustainable way combining economic, environmental and social aspects.

- **Operations Engineer and Manager**
  The candidate has the economic and technological knowledge as well as the communicative skills to develop, adjust and coordinate industrial companies' supply chains?, distribution and production, according to demand from global markets. The candidate focuses on sustainability and the circular economy related to the Cradle to Cradle strategies and methods.

- **Researcher (PhD-Student)**
  The graduate is qualified to enter academia and pursue an academic career within university. Society's demand for knowledge and innovation as a means to gain competitive advantage and improve quality of life increases the need for innovation researchers. To develop businesses of the future, research in future products, innovation, production and productivity is crucial.

§2 Competence profile of the education

With a Master of Science in Engineering - Innovation and Business, the graduate possesses solid competences within the field of product and production based business development within mechatronics. The education will enable the students to handle the innovation process from exploring and discovering new ideas to planning, managing and finally specifying and realizing own business ideas or concepts. The students gain the competencies to work as intrapreneurs in existing companies or to start up their own company or to proceed with a career in industry or academia.

The graduate will have acquired the following overall knowledge, skills and competencies.

KNOWLEDGE

- A: Possesses knowledge about the complexity and diversity of developing mechatronic products and production in a quickly changing environment which is based on the highest international research within the areas of product innovation and manufacturing research
- B: Is able to manage innovation projects where technology is turned into new businesses.,.
- C: Is able to work with innovation in practice and collaborate with industry as well as other external stakeholders ..
- D: Is able to understand the innovation process as a dynamic and participatory process with many stakeholders which is based on the highest international research within the areas of open innovation, innovation management and participatory innovation
- E: Is able to reflect on the subject knowledge in the above mentioned fields and address new scientific issues or problems

SKILLS

- A: Is able to evaluate, select and apply theories, models and tools to master the innovation process in order to assess the potential of a promising technology, product and business ideas.
- B: Is able to apply skills in the collaborative and participatory design process including open innovation.
- C: Is able to apply skills regarding product and production development techniques, project management and related working methods.
- D: Is able to understand and apply design thinking and design approaches, including mapping techniques, modelling, games and simulation methods.
- E: Is able to analyse, evaluate and search for business opportunities based on a combination of the market driven and the technology driven approach.
- F: Is able to present and communicate scientific results across various communities both within the university and beyond.

COMPETENCES

- A: Is able to analyse, plan and organize new and complex innovation processes which are unpredictable and which might require new solutions.
- B: Is able to initiate new projects as well as work independently in scientific projects within the university as well as with industrial companies.
- C: Is able to act as a professional and responsibility taking person in relation to the development of the academic and personal proficiency

Qualification Matrix

MSc in Engineering – Innovation and Business	(1.sem) IBITB	(1. sem) IBCDIM	(1.sem.) IBOIM	(1.sem.) IBGPR	(1.sem) MC-SES	(1.sem.) MC-DFPGA	(2.sem) IBPIN	(2.sem) IBHTBV	(2.sem) IBPTECH	(2 sem) MC-MDB1	(3.sem.) MC-VF	(3.sem) IBEST	(3.sem) THS-U1	(3.sem) IBDIN	(3 sem) MC-MDB2	(4.sem.) THS-U2
KNOWLEDGE:																
A	X			X	X	X			X	X			X		X	X
B	X	X					X	X			X	X	X			X
C	X	X	X				X	X			X	X	X			X
D	X		X				X	X				X	X	X		X
E	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SKILLS:																
A	X		X				X	X			X	X	X	X		X
B		X	X				X				X	X	X			X
C				X	X	X			X	X	X	X	X		X	X
D		X		X					X	X	X	X	X		X	X
E	X	X	X	X				X			X	X	X			X
F	X						X	X			X	X	X	X		X
COMPETENCIES:																
A	X		X		X	X	X	X	X	X	X	X	X	X	X	X
B	X			X			X	X		X	X	X	X		X	X
C	X	X					X	X			X	X	X			X

§3 Progression within the programme

The progression within the programme takes place within the following subject columns:

- Mechatronic product development and production
- Entrepreneurship and business development
- Innovation management and participatory innovation

Mechatronics product development and production

The modules that belong to this subject column are IBITB, IBGLP, MC-SES or MC-DFPGA, IBPTECH, MC-MDB1, MC-MDB2 and THS-U1 and THS-U2

The progression will be from the first semester focusing at integrated product development and setting up competitive production and supply chain facilities. The students will get to understand the Glocalized Production approach with global competition plus local design and implementation of adaptive production businesses. Second semester is about designing and building mechatronic products and systems related to industrial companies, the students will get to understand the design process and be able to model mechatronics solutions and research state of the art production technology. In the 3rd semester prototype products and production are in focus to be able to test and discuss functionality, quality and robustness of the mechatronics design. On this semester the scale up production will be considered including manufacturing processes, level of automation to be able to establish a competitive business. Master thesis projects within this domain of high tech mechatronics products and production will be an option at the 4th semester.

Entrepreneurship and business development

The modules that belong to this subject column are IBITB, IBCDIM, IBHTBV, IBEST, THS-U2

The progression in this subject column can be characterized as the increased theoretical understanding and practical experience within the domain. The students learn in the first how the entrepreneurship should work in theory and in the 2nd, and 3rd. semester they apply their knowledge , skills and competencies and experience the case of realizing their own idea. The students make progress on the theoretical ladder and they develop their personal and practical experience which makes them able to undertake and initiate work independently and with many stakeholders. Due to this progression they are finally able to write their master thesis in the 4th semester with the required theoretical and practical depth.

Innovation Management and participatory innovation

The modules that belong to this subject column are IBITB, IBOIM, IBPIN, IBDIN, MC-VF, THS-U1 and THS-U2.

In this subject column, the students get in the 1st. semester acquainted with fundamental issues and perspectives on what innovation means and the challenges of managing an innovation process with many different stakeholders. In the 2nd and 3rd.. semester the students learn more specifically about users as important stakeholders and about institutional barriers for managing innovations, Finally, the students experience innovation practice during their internship which make them able to proceed with their thesis in the 4th semester.

§4 Programme structure

The study programme has on the master level the following semester themes:

- 1st semester: Innovation, technology and business in theory
- 2nd semester: Innovation, technology and business in practice
- 3rd semester: Specialisation or exchange
- 4th semester: Thesis

The four semesters are described in detail in the sections §6-§9.

§5 Semester modules

<table>
<tr><td>4.</td><td colspan="30">THS-U2
Master thesis</td></tr>
<tr><td>3.</td><td colspan="10">IBDIN
Dynamics of Innovation</td><td colspan="15">Elective*
1) THS-U1: Thesis + 10 ECTS Electives
2) MC-VF: In-company period + 5 ECTS Elective
3) IBEST: Entrepreneurship + 5 ECTS Elective
4) Electives 20 ECTS</td><td colspan="5">MC-MDB2
Mechatronics Design and Build 2</td></tr>
<tr><td>2.</td><td colspan="15">IBPIN
Participatory Innovation</td><td colspan="10">IBHTBV
High Tech Business Venturing</td><td colspan="5">IBPTECH
Production Technology</td><td colspan="5">MC-MDB1
Mechatronics Design and Build 1</td></tr>
<tr><td>1.</td><td colspan="10">IBITB
Innovation of Technology and Business Incl. Scientific methods</td><td colspan="5">IBCDIM
Creativity and Design in innovation Management</td><td colspan="5">IBOIM
Open Innovation Management</td><td colspan="5">IBGPR
Glocalized Production</td><td colspan="5">MC-SES
Embedded Software design

OR

MC-DFPGA
Design with Field Programmable Gate Arrays</td></tr>
<tr><td>ECTS POINTS</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td></tr>
</table>

* See § 8 for how to combine the electives.
Students on a 4+4 PhD programme may use 15 ECTS on a 45 ECTS master thesis.

§6 Description of the 1st semester

Semester theme: Innovation, technology and business in theory

The courses on the first semester are organized in a way so that they can adapt to the level of entrance from relevant bachelor programmes – according to the entry requirements mentioned later in this document.

Specifically this means that the students might get assigned readings depending on their backgrounds. If students have a background with more courses in programming and less in innovation management, the lecturers will make sure that they will get additional readings in the nessecary domains. This is to make sure that the students have the samme knowlegde foundation when they enter the second semester.

VALUE ARGUMENT

Today, innovation solutions are often complex and interdisciplinary, for example when it comes to innovation within welfare, medico, energy, where many parties and stakeholders are involved. At this semester, we want to present the journey that takes place when turning technology into innovation..

The 1st semester introduces the students to different theoretical perspectives on innovation and they discover and experience the innovation process. The students learn about innovation theories and methods and how innovation and business is understood and managed in practice. The students work with industrial companies to investigate how professional organisations manage innovation. The students work with technologies in mechatronics from a theoretical point of view through research publications as well as through practical hands-on courses. The students will learn about business development and how to develop an efficient business plan. The students have to perform practical innovation by in a creative way transform researched technology to a physical product and argue for the business potential. In the process, the business development regarding sustainable logistics and manufacturing has to be illustrated and argued. The students will in a practical way discover the entire value chain in business development. The knowledge provided will enhance the students' capabilities within innovation practice as well as enhance their competencies within a specific business or technology subject. This semester prepares them for the coming semesters, where the gained understanding should be used in other related innovation courses as well as in the technical or business courses.

LEARNING OBJECTIVES for the 1st semester are the following

KNOWLEDGE

- Is able to understand the complexity of an innovation process and the management of innovation based on different theoretical perspectives
- Is able to understand core theoretical concepts and methods in creativity used for idea generation.
- Is able to understand different scientific methods and reflect on their choice of methods
- Is able to understand new production paradigms

SKILLS

- Is able to apply relevant methods and tools in the various step of the innovation process
- Is able to To read and interpret technical research publications and by combining this with the practical mechatronics disciplines be able to reflect and creatively work with product, production and business development
- Is able to create business plans and assess the business potential of the idea

COMPETENCES

- Coherent/Holistic view of mechatronics solutions and as a system integrator build basic mechatronics systems and embedded control systems
- Be able to understand and apply scientific methods in performing basic research, and be able to present findings in a structured way to academia and other stake-holders
- Meaningfully combine the different theoretical fields and practices for facilitating and communication of the innovation process

MODULES

The 1st semester contains the following modules:

IBITB - Innovation of Technology and Business (10 ECTS)
IBCDIM – Creativity and Design in Innovation Management (5 ECTS)
IBOIM – Open Innovation Management (5 ECTS)
IBGPR – Glocalized Production (5 ECTS)
MC-SES or MC-DFPGA - Embedded Software design or Design with Field Programmable Gate Arrays (5 ECTS)

The modules (IBITB, IBCDIM, IBOIM, IBGLP and MC-SES or MC-DFPGA) are constituent, obligatory modules.

CONTEXT

The semester provides an advanced theoretical introduction. In the following, this is elaborated for each of the modules.

IBITB: The course will provide students with knowledge and competence in how to work with advanced literature in the domains innovation, technology and business. The students will experience the practice of creating innovation in a multi-disciplinary context, and as “Innovation Engineers”, perform own innovative solutions. The proposed innovative solutions will be assessed from a commercial point of view and presented in a final business plan.

Furthermore, the course will cover introduction to scientific methods and research. The students will learn about researching the process, work with scientific articles, learn how research questions are formulated and how a research design is developed. In relation to the innovation practice the students will learn how to acquire, analyze and disseminate knowledge from various information sources.

IBCDIM: The students should after completing the module be able to understand the core theoretical concepts and methods of creativity and design in innovation management and apply these in practice.

Further, the students learn to understand their own creative capabilities and assess how they create innovative and successful teams

IBOIM: The course presents the students with different perspectives on and challenges related to managing open innovation, which relies on the distributed nature of innovative knowledge, technology and commercialization opportunities. During the course, the students will increase their understanding about the theory and practice of open innovation, they will develop their ability to identify, grasp and analyse scientific and practical material, synthesize this material, and present their (critical) view on relevant concepts, theories and practices. Finally they will improve their analytic and decision-making competences in the context of open innovation.

IBGPR: The aim of the course is to present new manufacturing paradigms to students and challenge their understanding of how manufacturing set-ups could be. The students learn in this course about global challenges for industrial production businesses and how to work with highly automated production facilities and global local supply chains.

MC-SES: The students will learn about the following content:

- Object-oriented programming in C++
- Classes
- Inheritance
- Polymorphism
- Templates
- Exceptions
- Linux for embedded systems
- Threads
- Synchronization of threads
- Basic hardware interfaces in embedded Linux

or

MC-DFPGA: The students will learn about the following content:

- Implementation of digital circuits in Field Programmable Gate Arrays (FPGA's)
- Design tools and environments for developing FPGA based digital circuits
- Using a Hardware Description Language (VHDL)
- Synthesis, Test and simulation of complex digital circuits.

§7 Description of the 2nd Semester

Semester theme: Innovation, technology and business in practice

VALUE ARGUMENT

Innovation can be performed on an individual basis, but in reality innovation is mostly performed in participation among various people and stakeholders. Innovation challenges are complex where new methods and social interactions are required. In this semester, students will learn how to manage innovation in practice and get some hands on experience in starting up a technology based new business venture.

The students learn about the process of starting up a new business and experiment with practice through interaction with industry, user and other stakeholder. The technical courses allow the students to experience how industry develops products and production technologies and they experiment with technologies, which they turn into physical products or prototypes.

LEARNING OBJECTIVES for the 2nd semester are the following

KNOWLEDGE

- Understand the concepts of technology and use in practice
  Be able to use and apply theories of user-driven innovation, initiate and facilitate conversations about innovation between stakeholders.
- Relate project experiences to literature within the field
- Have knowledge of the role of technology in entrepreneurship, both for internal venturing and for launching a startup company.
- Understand key elements regarding material, processes and surface treatments
- Understand the Mechatronic Design Process.
- Understand actuators and the devices needed to power Mechatronic systems.
  Have knowledge about modelling and mechatronic design concepts to provide intelligent sensing and adaptive control.

SKILLS

- Initiate and facilitate conversations about innovation between employees, users and other stakeholders. Choose and apply appropriate methods for user studies, sense-making, user co-creation, participatory business modelling etc.
- The ability to apply high-tech business venturing concepts, theories and tools in practice from idea generation, to feasibility analysis, to a complete business plan.
- The ability to develop and communicate the relevant and integral aspects of the high tech business venturing process.
- Designing 3D CAD models using advanced surface modeling techniques

- Creating manufacture friendly design. Taking into consideration the possibilities and the limitations as to industrial design in manufacturing processes; in particular according to designing and manufacturing plastic and aluminum part
- Understand simulation, control and signal processing methods, to improve the precision of Mechatronic devices.

COMPETENCES

- Organise innovation projects with user participation and establish action research activities in an organisation.
- The ability to implement the newly acquired knowledge and skills in a relevant business plan for a technology-based internal venture or new company.
- The ability to propose, defend and critically reflect on choices with regard to the high tech business venture.
- The ability to work together in an entrepreneurial team, while also taking responsibility for one's own actions and learning.
- The awareness of entrepreneurship as a career option, including an understanding of what type of entrepreneurial role would fit oneself.
- Understand how parts that are made of aluminum and / or of plastic are manufactured in today's industry

MODULES

The 2nd semester contains the following modules:

- IBPIN– Participatory Innovation (10 ECTS)
- IBHTBV – High Tech Business Venturing (10 ECTS)
- IBPTECH – Production Technology (5 ECTS)
- MC-MDB1 – Mechatronics Design and Build 1 (5 ECTS)

The modules IBPIN, IBHTBV, IBPTECH and MC-MDB1 are constituent, obligatory modules.

CONTEXT

IBPIN: This module introduces history and approaches of user-driven innovation (usability engineering, participatory design, design anthropology, lead-user approach and others). It discusses how these approaches play out in an industrial organisation: The uptake of provocative user knowledge, collaborative sense-making, user empathy and identity forming, social shaping of innovation, participatory business modelling. The course is project based and will embrace the topics from The high tech business venturing course and the mechatronics design and build course.

IBHTBV:

This course provides the students with a profound understanding on the role, analytics, and process of business planning that lead to the successful creation of a new business venture. The students will learn how to rigorously prepare for the actual starting-up of either an internal venture or a new company. They will have to engage in all the important stages that precede the formal starting up: from idea generation, to feasibility analysis, to a fully conceived plan that maps out how the venture will operate and how it will create value.IBPTECH: In the course students experience how industry develop products and production technologies. The students get insight in the design for manufacturing methodologies and in practice experience the possibilities and limitations in different production technologies through direct contact and visits to industrial companies. The students will experience the interaction between design, quality, manufacturing and economy. They will get insight in the processes from CAD, CAM to the shop floor control including CNC and automation. Upcoming technologies like e.g. rapid manufacturing are introduced.

MC-MDB1: The course will provide students with the confidence and knowledge to undertake mechatronic design and build projects. This is done by exposing students to research topics associated with Mechatronics, Embedded Systems and Control Engineering. The students will be introduced to the design rules and principles when designing and building mechatronics elements and systems.

§8 Description of the 3rd Semester

Semester theme: Specialisation or Exchange

VALUE ARGUMENT

The purpose of the 3rd semester is to give the students the opportunity to choose a specialization within entrepreneurship (entrepreneurship training), Innovation practice (In-company period), innovation and mechatronics research (thesis) or take a number of electives. This specialization has a weight of 20 ECTS. The students can also go for an exchange abroad.

The specialization tracks are the following:

I. 40 ECTS master thesis. Building upon the previous semesters this track starts up the master project corresponding to 10 ECTS in the 3rd semester. On this track, two elective courses are offered.
II. In-company period. Students can take an internship in an industrial company to work with innovation projects in the company. The innovation project is typically leading up to the master project and will involve one assigned professor from MCI. These students have the option to choose one elective course.
III. Entrepreneurship training. Students choosing this track can continue working on their own business idea which they may have initiated during the first two semesters. The students have to choose one elective course.

Besides this, the students will get a deeper understanding of innovation as a social process where interactive learning between different actors (e.g. suppliers/producers, customers/users, universities, public procurers) is a central element.

The students will also get advanced knowledge within the field of mechatronics development (design and build) which is building on top of the knowledge gained in the previous semester.

Exchange possibilities

The Faculty recommends and supports, that students go for a one semester exchange at another university abroad. On the Master of Science in Engineering in Innovation and Business the third semester can be used for this purpose. The In-Company Period/Start of Thesis/Entrepreneurship training + elective part (20 ECTS) can be exchanged to elective courses at our partner universities and the remaining 10 ECTS can be exchanged with relevant courses – that contains a majority of the same topics. The exchange programme must be approved by the Study Board

LEARNING OBJECTIVES for the 3rd semester are the following:

KNOWLEDGE

- Basic understanding of how to navigate in complex organizations with many stakeholders and political relationships
- Coherent/holistic view on innovation or mechatronic research to such an extent that a research profile/topic can be selected.

SKILLS

- Be able to define relevant issues related to own entrepreneurship ideas according to technology, product, production, marketing, financing etc. or
- Through an internship in a company, students can challenge the company on innovation principles and how to apply innovative technologies seen from an innovation architect's point of view.

COMPETENCES

- Be able to understand, analyse and perform advanced issues concerning mechatronics design and build seen from a system integrator's point of view

MODULES

The 3rd semester contains the following modules:

IBDIN – Dynamics of Innovation (5 ECTS)
MC-MDB2 – Mechatronics Design and Build 2 (5 ECTS)

Specialisation tracks:

a) THS-U1 – Thesis (10 ECTS) + 10 ECTS elective
b) MC-VF – In company period (15 ECTS) + 1 elective (5 ECTS)
c) IBEST - Entrepreneurship Training (15 ECTS) + 1 elective (5 ECTS)
d) Electives (20 ECTS)

The modules IBDIN and MC-MDB2 are constituent, obligatory modules. The modules THS-U1, MC-VF, IBEST and the electives are part of the elective block.

CONTEXT

IBDIN: The course IBDIN (5 ECTS) views innovation as a social process, where interactive learning between different actors (e.g. suppliers/producers, customers/users, universities, public procurers) is a central element.

MC-MDB2: The aim of the module is to provide students with the opportunity to carry out research-oriented design and build projects in the general area of Mechatronics. On this semester, the final prototype has to be developed. The available projects will reflect the research interests of the Mads Clausen Institute which are at the same time relevant and of interests of the students. Projects will, for example, encompass smart actuators (modelling and control), embedded systems and control engineering for a variety of different applications.

THS-U1 The students should work on a thesis proposal during this course. The selection of the topic should be within one of the key areas of the Innovation and Business education. During the course, the content of the master thesis will be discussed including: Formulating a research problem/question, writing a critical literature review and propose an appropriate research design/methodology.

IBIBT: The purpose is that students work closely with an industrial company. Students are responsible for making the agreement with the company and to get a company supervisor. During the internship, students have to analyse and document the innovation process, evaluate their contribution to the process and reflect critically upon these activities. By means of critical thinking, students have to challenge the company with new theories and methodology for performing Innovation.

IBEST: The purpose is that students work on their own entrepreneurial ideas focusing on becoming an entrepreneur and setting up a new business. The student or group of students

are able to define, a market need, select a market segment, develop their product idea, assess new technology or something that may lead to a new business. A supervisor in a company or even a sponsor may be found that can challenge and assist the business idea and assist the students in taking the next steps.

Electives: The students will have the possibility to select a number of electives (20 ECTS) as part of their specialization.

§9 Description of the 4th Semester

VALUE ARGUMENT

The student shall through the selected research problem document his/her engineering-specific competencies attained during his/her work with a limited, relevant and engineering-specific subject.

LEARNING OBJECTIVES for the 4th semester are the following

KNOWLEDGE

- Be acquainted with relevant engineering skills based on the highest level of international research.
- Attain good understanding of - and be able to reflect on - relevant knowledge.
- Apply scientific methods and tools.

SKILLS

- Identify scientific problems and formulate research questions.
- Be able to identify and review the relevant scientific literature and develop a conceptual framework to empirical work.
- Assess, select and apply scientific methods, tools and competencies within the subject area of the course
- Explain and discuss relevant professional and scientific problems.
- Present novel analysis and problem-solving models.
- Disseminate research-based knowledge.
- Set up a clear framework for the thesis including a proper scientific structure.
- Be able to communicate in a clear and understandable manner.

COMPETENCE

- Be able to independently initiate and carry out discipline-specific and cross-disciplinary cooperation and to assume professional responsibility.
- Manage work and development situations that are complex and unforeseen and require new solution models.
- Take responsibility for own professional development and specialization.

MODULES

4th semester contains:

THS-U2 – Master Thesis (30 ECTS)

The module THS-U2 is a constituent, obligatory module.

§10 Qualifying Degrees for Admission

10.1 Qualifying degrees

Based on §10.2 – §10.4 the university has assessed that the below degrees qualify for admission to Master of Science in Engineering (Innovation & Business). The list is not exhaustive

- BSc in Engineering Innovation & Business – University of Southern Denmark (automatic claim for admission)
- BSc in Engineering Product Development & Innovation – University of Southern Denmark

Following degrees qualify for admission, *provided that the degree covers 5 ECTS of Entrepreneurship, Marketing, Business administration or Innovation management:*

- BSc in Engineering Mechatronic – University of Southern Denmark
- BEng in Engineering Mechatronic – University of Southern Denmark
- BEng in Engineering Interaction Design – University of Southern Denmark
- BEng in Engineering Electronic Design – University of Aarhus (Herning)
- BEng in Mechanical Engineering (Maskinteknik) – University of Aalborg
- BEng in Mechanical Engineering (Maskinteknik) – University of Aalborg (Esbjerg)
- BEng in Mechanical Engineering (Maskinteknik) – Technical University of Denmark

10.2 Level and content of qualifying degrees

Qualifying bachelor and professional bachelor degrees in the scientific and technical area where the level and the content of the scientific and technical courses correspond to a bachelor of science degree or a bachelor of engineering degree in the subject area of the MSc in Engineering (Innovation & Business) programme.

10.3 Academic content of qualifying degree

MSc in Engineering (Innovation & Business) admits applicants with a bachelor degree or a professional bachelor degree in Mechatronics cf. §10.2 provided that the degree covers:

Subject knowledge	Extent
Mechanical design, statics, dynamics and 3D CAD	15 ECTS
Electronics	10 ECTS
Programming	10 ECTS
Entrepreneurship, Marketing, Business administration or Innovation management	5 ECTS

10.4 Additional courses

Should the applicant's degree fail to meet the requirements mentioned in §10.1 - §10.3, it is possible to acquire the necessary skills through additional courses offered at the University of Southern Denmark. The extent of additional courses cannot exceed 15 ECTS.

Additional courses have to be taken after admission to the programme. The courses can be taken during the first two semesters of the programme and must be passed by the end of the first year of study. Additional courses are restricted to courses offered by the University of Southern Denmark as summer courses or parallel to the first year of the master programme.

10.5 Admission with a foreign degree

Applicants with a bachelor degree or professional bachelor degree from a foreign university who meet the requirements of §10.2 and §10.3 are eligible for admission subject to an academic assessment and comparison of whether the applicant's academic qualifications correspond to those of qualifying Danish degree.

10.6 Possible exemptions

Applicants whose bachelor degree or professional bachelor degree fails to meet the terms stated in § 10.1 – §10.5 are not eligible for admission.

Applicants who do not hold a bachelor degree or a professional bachelor degree but who have the academic qualifications equivalent thereto are eligible for admission should their qualifications, based on an academic assessment and comparison, correspond to those of a qualifying Danish degree.

Two-year transitional arrangement regarding additional courses:
Completed and passed additional courses, i.e. single courses from existing bachelor programmes, may be included in the application for admission until 31 August 2016.

§ 11 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. Modules offered by the Faculty of Social Sciences belong under corps of the external examiners for social sciences.

§ 12 Entry into Force

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 20th August 2010.

2. Curriculum 2013 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 on 18th April 2013.

3. 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 on 13 November 2013 (Version 1.0).

4. Curriculum 2014 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 on 23 June 2014.

5. Curriculum 2015 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 on 27 January 2015.