

The Curriculum for Master of Science in Engineering (Engineering, Innovation and Business)

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Academic Study Board of the Faculty of Engineering

Programme titles:

- Civilingeniør i Engineering, Innovation and Business
- Master of Science in Engineering (Engineering, Innovation and Business)

ECTS value: 120

Cities: Sønderborg

Semesters: Autumn

Effective date: 01-09-2021

Applicable for students enrolled: 01-09-2020

Version: Archive

▼ § 1 - Description of the Programme

▼ § 1.1 - Applicable for students enrolled

01-09-2020

▼ § 1.2 - Aim of Programme, including any professional profile and specialisations

The purpose of the master's programme is to

- extend students' professional knowledge and competences and increase their theoretical and methodical qualifications and level of independent work beyond the level attained at the bachelor level.
- provide students with the opportunity for in-depth academic study via the use of advanced elements of the disciplines and methods of the academic area, including training in scientific work and methodology to develop the student's competences to perform more specialised vocational functions and participate in scientific development work, and
- to qualify the student for further education, including PhD programmes, cf. the Danish Ministerial Order on the PhD Programme at Universities.

The master's programme is an independent, complete educational programme, which extends the competence and insights acquired by the student during the bachelor programme.

The master's programme aims to qualify the student to solve complex technical problems, design and implement complex technological products and systems in a social context. The contents of the master's programme aim to provide the student with advanced professional competences within the chosen discipline of engineering and options for further specialisation.

The master's programme is a full-time programme which is rated at 120 ECTS points, corresponding to the work of a full-time student for 22 months; for programmes starting in the spring semester, however, the duration is 24 months. The programme consists of constituent course elements related to the programme's specific professional competences and identity, elective courses and a Master's thesis.

Graduates with a bachelor degree that includes knowledge and competences similar to those acquired via a bachelor programme in technical science or engineering are entitled to use the Danish title of civilingeniør, cand.polyt., followed by the title of the specific programme. The English version of the title is Master of Science (MSc) in Engineering - followed by the title of the specific programme.

▼ § 1.3 - Didactic and pedagogical basis

The Engineering Education Model of the University of Southern Denmark (DSMI)

The bachelor and master's programmes within the scientific area of engineering are research-based full-degree programmes which qualify the students to independently perform vocational functions on the basis of knowledge and methodical skills within their professional area.

All programmes at the University of Southern Denmark are structured in accordance with the university's leading principles for programmes. For engineering programmes, the principles are put into practice in the educational concept 'The Engineering Education Model of the University of Southern Denmark' or, in Danish, 'Den Syddanske Model for Ingeniøruddannelser', in the following referred to by its official abbreviation, DSMI.

By offering and implementing engineering programmes based on DSMI, the university ensures that engineers who have recently graduated from the university have a high professional standard, based on their mastery of a range of core skills which are in high demand on the labour market as well as in the research community.

A summary of the main points of the education concept is shown below - the complete description of DSMI is available in electronic form at the Faculty's website.

Content and Competences

- Professional skills are at the centre of the educational activities, and all engineering programmes at the University of Southern Denmark are therefore rooted in research and development environments of a high international standard. Research and development-based tuition is provided at all programme levels to accommodate both the needs of fundamental research and the requirements of practical applied science in close collaboration with business and industry.
- The programmes aim to foster modern, dyed-in-the-wool engineers. The learning and evaluation environment is therefore based on activating tuition and active learning that stimulates students to think and work in a problem-focused, project-oriented and cross-disciplinary manner. Assignments are accomplished both in teams and independently, and the focus is on innovation and reflection.
- The programmes are designed to mature students to perform assignments in an international context. During the course of their studies, students experience an environment characterised by international teachers and researchers and fellow students from many countries. The programme framework is organised in such a way as to provide good opportunities to study abroad and students enrolled on study programmes offered in Danish, will be required to attend courses conducted in English.
- Bachelors from the University of Southern Denmark will have worked in project groups across language and cultural differences.
- To enhance the graduates' labour market value immediately after graduation, the study programmes incorporate a high level of business relevance. Collaboration with private organisations guarantees that the students' professional competences are put to regular use in a concrete, contemporary context.
- In the course of their studies, Bachelors from the University of Southern Denmark will have performed project work in collaboration with external organisations.
- All students are encouraged to think and practise entrepreneurship via a learning and evaluation environment designed to stimulate student enterprise, creativity and responsibility.
- Corporate and business understanding are integral elements of the teaching of the Bachelor programmes at the University of Southern Denmark.
- Bachelors from the University of Southern Denmark have participated in interdisciplinary collaboration projects organised on the basis of a principle of 'Experts in Team Innovation'. This means that the student collaborates with students from other engineering disciplines or other study programmes on the solution of a complex, interdisciplinary problem in close collaboration with an external organisation.

Structure and Learning Environment

In overall terms, the interplay between programme structure, skills acquisition and the learning and evaluation environment of the engineering programmes at the University of Southern Denmark may be described as follows:

- In the practical planning of the programme content, significant emphasis has been placed on ensuring that the forms of tuition and examination are both relevant and contemporary and support students' acquisition of core skills. In doing so, efforts are made to provide a highly dynamic study environment, where each individual student is expected to play an active role and assume responsibility for his or her own learning. The student will 'learn to learn' so that he or she will later be able to quickly embrace new and complex problems, just as the student will be encouraged throughout the programme to practise both independent and co-operative thinking.
- In order to strengthen both the professional contemplation and application of acquired skills as well as the individual's continued motivation for developing professionally and personally on a labour market characterised by rapid change, the educational concept deliberately seeks to integrate both specific technical and broader general engineering skills.
- With DSMI, the University of Southern Denmark offers an attractive and relevant study programme with good immediate work prospects. The keywords are activating tuition and active learning put into practice through project-oriented collaboration and problem-based learning. The purpose is to foster dyed-in-the-wool engineers with a high level of professional skills and the optimum basis for continued personal and professional development.

▼ § 2 - Enrollment

▼ § 2.1 - Legal claim for admission

Following degree has automatic claim for admission:

- BSc in Engineering Innovation and Business - University of Southern Denmark

▼ § 2.2 - Qualifying degrees

The university has assessed that the below degrees qualify for admission:

- BSc in Engineering in Mechatronics – University of Southern Denmark
- BEng in Engineering Mechatronics – University of Southern Denmark
- BEng in Engineering Interaction Design – University of Southern Denmark
- BSc in Engineering in Product Development & Innovation – University of Southern Denmark
- BSc i Design og Innovation - Technical University of Denmark

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

- BEng in Mechanical Engineering (Maskinteknik) - University of Aalborg
- BSc i Globale forretningsystemer – University of Aalborg
- BEng in Mechanical Engineering (Maskinteknik) - University of Aalborg (Esbjerg)
- BEng in Mechanical Engineering (Maskinteknik) - Technical University of Denmark

If your degree is not on the list, please refer to the specific entry requirements in the below paragraph.

▼ § 2.3 - Entry requirements

2.3.1 To be considered for admission applicants must have a relevant bachelor of science degree, bachelor of science in engineering degree, or bachelor of engineering degree.

For a degree to be relevant it must be in the subject area of Innovation & Business and cover the below criteria:

- Mechanical design, statics, dynamics and 3D CAD (15 ECTS)
- Electronics (5 ECTS)
- Programming (10 ECTS), *as of admission 2021: 5 ECTS*
- Entrepreneurship, Marketing, Business administration or Innovation management (5 ECTS)

Note that for specific courses to be included in the assessment, they must have been passed as part of or during the bachelor's degree. Should the constituent courses of the bachelor's degree not meet all the entry requirements, it is possible to acquire the necessary skills during the bachelor's degree through elective courses (either as part of your degree or simultaneously with your bachelor's degree). It is also possible to meet the requirements through supplementary courses after completing the bachelor's degree. You can supplement your bachelor's degree with up to 5 ECTS during the first semester of the master's programme and up to 10 ECTS before study start. For details, please refer to the below paragraph.

Admission with a foreign degree

Applicants with a bachelor's degree from a foreign university who meet the above requirements 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.

Language requirements

English B from a Danish High School with a minimum grade of 3.0 (Danish 7 point grading scale) or an IELTS or TOEFL test with a minimum result of 6.5 in the IELTS test or a minimum result of 88 in the TOEFL test.

Applicants from a country within the European Union or the EEA may not be required to pass an IELTS or a TOEFL test, if they can document that their level of English corresponds with English at B level. The course must be passed with a grade equivalent to a minimum of 3.0 on the Danish grading scale.

For further details, please refer to the University website.

2.3.2 As a rule, the applicant must apply for admission to a Master's programme at the University of Southern Denmark within five years after completing the Bachelor programme.

▼ § 2.4 - Supplementary courses

Supplementary courses passed before completing the bachelor's degree

2.4.1 If the applicant has passed supplementary courses before completing the bachelor's degree and provided the bachelor's degree and supplementary courses meet the entry requirements, the applicant qualifies for admission. The extent of supplementary courses not included in the bachelor's degree cannot exceed 30 ECTS points.

Other supplementary courses

2.4.2.1 If the applicant has a relevant bachelor's degree but does not meet all the entry requirements as defined in §2.3 it is possible to be admitted under the condition that the applicant passes supplementary courses.

Supplementary courses as part of conditional admission must be taken within a period of six months before study start and six months after study start, i.e., the supplementary courses can be completed before semester start, during the master's programme or a combination of the two. The total extent of supplementary courses cannot exceed 15 ECTS points. The University does not guarantee that it is always possible to follow supplementary activities within the required subjects.

Supplementary courses are offered in accordance with the rules on part-time education and course fees are covered by the applicant.

2.4.2.2 Supplementary courses completed during the first semester of the master's programme cannot exceed 5 ECTS points and must be passed within the examination period of the ordinary examination. Students will have only two examination attempts in the supplementary course.

2.4.2.3 Other supplementary courses must be followed before study start and completed within a deadline stated in the letter of conditional admission. Supplementary course before study start must be passed within the examination period of the ordinary examination and students will have only two examination attempts. Supplementary courses before study start cannot exceed 10 ECTS points.

▼ § 3 - Detailed programme specific information

▼ § 3 - Programme title and profiles

▼ Master of Sciences (MSc) in Engineering (Engineering, Innovation and Business) 2020

Name

Master of Sciences (MSc) in Engineering (Engineering, Innovation and Business) 2020

Competence profile

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

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

KNOWLEDGE

A: Possesses knowledge about the complexity and diversity of developing products and production in a quickly changing environment which is based on the highest international research within the areas of product development, Industry 4.0, operations management, technology entrepreneurship and innovation management.

B: Is able to conduct data science and analytics projects for product and production development

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 technology entrepreneurship, open innovation and innovation management.

E: Is able to reflect on the discipline specific 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 including funding opportunities.

B: Is able to define and explain key concepts in machine learning and data science that are used for innovation and production purposes

C: Is able to apply skills regarding product and production development techniques, project management and related working methods.

D: Is able use state of the art software tool and simulation methods for forecasting future production set ups.

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 innovative 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 and public institutions.

C: Is able to act as a professional and responsibility taking person in relation to the development of the academic and personal proficiency

The relationship between the overall competency goals of the programme and the learning objectives of the individual courses appears in the qualification matrix (annex 1).

Professional competence

Engineering, Innovation and Business is a Master of Science in engineering that combines technology, Innovation and Entrepreneurship courses (EIB engineer). The students become technology entrepreneurs who can implement state of the art technical solutions aiming at improving and optimizing the business. The EIB engineer can develop and assess new business opportunities and manage innovation projects in companies operating in different technical fields (Intrapreneurship). The EIB engineer is also able to discover and create new opportunities and turn them into new businesses (technical entrepreneurship). The EIB engineer is internationally oriented and can think globally. Thus, he/she can respond 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 3 areas:

Technology:

- The competence to analyse, evaluate and implement new technologies for product development and production to improve performance in high-tech businesses.

- The competence to use and apply tools to support companies in developing smarter products and a more digitalized production set-up
- The competence to use and apply data science and machine learning techniques for product development and production purposes
- The competence to apply knowledge and suggest solutions in real life cases due to involvement and participation in company-initiated technology projects.

Entrepreneurship:

- The competence to apply creativity skills for stimulating innovation in already existing companies or in new start-up firms
- The competence to manage both product and production-driven intra- and entrepreneurship
- The competence to apply knowledge about business administration and marketing for evaluating market and business opportunities
- The competence to evaluate the financial aspects of new ventures

Innovation:

- The competence to manage innovation projects from the early phase to the implementation
- The competence to handle various stakeholders in innovation projects
- The competence to understand and apply theory from the field of innovation and open innovation management

The combination of technology, entrepreneurship and Innovation competences enable the graduate to work in various jobs in modern companies, where interdisciplinary and cross-functionality is critical 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 product and production development in companies. The candidate is able to understand, analyse and turn complex technology into applications and new solutions. The oral and written communication skills allow the graduate to exchange and realize ideas creatively and dynamically within organizations. The profound economic and technological knowledge allows the graduate 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 solid knowledge both on the strategic level as well as on the tool. The communicative, economic and technological skills make the graduate able 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 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 sustainable strategies that are both economically and technologically sound. The specific communication skills together with knowledge of business and technology allow the graduate to coordinate and mediate between the institutional level and the corporate level.

• Entrepreneur

Graduates have the possibilities of becoming self-employed via their own start-up e.g. business venture. Via the competencies gained in creating and spotting opportunities, assessing technology, carrying out market research etc, the graduate acquires the skills to build their own business.

• 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 optimizing production systems to advice companies to become more productive.

• 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.

Project-oriented course

In-company Project

3.0.1.1 On the third semester of the master's programme, students may choose to follow the Curriculum with the prescribed number of elective courses or to perform the 'In-company Project' period rated at 15 ECTS points. However, there may be deviations in some programmes.

3.0.1.2 The contract for the 'In-company Project' must be approved by the Academic Study Board before the period begins.

3.0.1.3 Students undertaking the 'In-company Project' cannot write a thesis of 40 ECTS points.

3.0.1.4 Participation in the 'In-company Project' may not lead to an extension of the student's study period.

3.0.1.5 Detailed provisions regarding the 'In-Company Project' can be found in the course description.

Internationalisation

Student Exchange Abroad

3.0.2.1 The 3rd Semester has been adapted to give the programme an international aspect in the form of a student exchange abroad.

3.0.2.2 The 3rd semester can be taken as a pre-approved student exchange at one of the partner universities that SDU has agreements with or as an individually arranged student exchange. It is a requirement that the academic content of the courses taken and passed whilst studying abroad corresponds to the academic content of the 3rd semester of the applicable study programme. Alternatively, the 3rd semester can be completed by participation in the educational activities of the 3rd semester of the applicable master's programme.

Programme structure

Semester 4	<u>Master's Thesis - 30 ECTS</u> T350027401 (30 ects)			
30 ECTS				
Semester 3	<u>Engineering in Practice</u> T310013401 (10 ects)	<u>Finance for Entrepreneurial Engineers</u> T310012401 (5 ects)	Select one of four specialisation tracks (see comments for details) (15 ects)	
30 ECTS				
Semester 2	<u>Smart product development</u> T310015401 (10 ects)	<u>High-Tech Business Venturing</u> T310005401 (10 ects)	<u>Open Innovation</u> T310014401 (5 ects)	Elective (5 ects)
30 ECTS				
Semester 1	<u>Automation and Digitalization</u> T310011401 (10 ects)	<u>Innovation in Practice</u> T310010401 (10 ects)	<u>Student Research Project</u> T310009401 (5 ects)	<u>Data science and machine learning for innovation and production</u> T310016401 (5 ects)
30 ECTS				

Study Start
(MSc in Engineering)
T700051401

 = Elective

Explanatory comments to programme structure

Students must pass a study start test within the first two weeks of studies in order to continue on their programme. The purpose of the test is to verify that the students have started their studies.

Students are encouraged to complete the 3rd semester at a foreign partner university. Please note that the courses must be approved by the Academic Study Board of the Faculty of Engineering.

Students who do not go abroad on their 3rd semester must choose one of four specialisation tracks:

1. 40 ECTS thesis (10 ECTS) + 5 ECTS elective. It is a prerequisite for a 40 ECTS master's thesis that the project is experimental.

Students on a 4+4 PhD programme must use 15 ECTS on their 3rd semester together with the 30 ECTS on a 45 ECTS master's thesis.

2. In-company Project (15 ECTS)
3. Entrepreneurship Training (15 ECTS)
4. Electives (15 ECTS)

Cities

Soenderborg

Language

English

▼ § 3.1 - The structure of the programme

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

- Technology – automation, digitalization, product development
- Entrepreneurship and business development
- Innovation management and open innovation

Technology – automation, digitalization and product development

The modules that belong to this subject column are IBAUDI, IBSPD, IBEPR, THS30 and THS40

The progression in this subject column is implemented in the following steps: 1) Introduction to state-of-the art theory and literature, 2) application of theory in a controlled environment and finally 3) application and solving cases in real-life. The first semester focuses on giving the students a theoretical understand-ing of how integrated product development works as well as how to set up competitive production and manufacturing facilities. The students will get to understand the concept of glocalized production with global competition plus local design and implementation of adaptive production technologies. Second semester focuses on the application of new technologies that can enhance company competitiveness and optimize development and production cycles. The students learn how to design, simulate and test state-of-the art technologies for product development and for smarter production set-ups. The students will get to understand the design process and be able to model mechatronics solutions. In the third se-mester students work on real-life projects with companies analyzing problems related to automatization and digitization and produce solution based on their competencies gained in the previous semesters. Finally, students can specialize within this subject column by writing their master thesis in this domain.

Entrepreneurship and business development

The modules that belong to this subject column are IBINPR, IBHTBV, IBEST, IBFEE, THS30 and THS40

The progression in this subject column is implemented in the following steps; 1) Intrapreneurship – Creat-ing and evaluating business opportunities and solving an innovation challenge in an existing company 2) Entrepreneurship – Creating and evaluating a business opportunity for new venture creation 3) Evaluat-ing business case potential and funding opportunities for further implementation. The students learn in the first semester how business opportunities are created and how product development is structured and work in theory. In parallel with the theoretical lectures an innovation challenge is solved. In the sec-ond semester students apply the knowledge, skills and competencies and experience from the first se-mester in realizing their own idea in the pursuit of a new venture creation. In the third semester students learn how to create a business case and evaluate financing aspects for the implementation of their own venture or for business development inside existing organization. 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 Open Innovation

The modules that belong to this subject column are IBDSML IBSRP, IBOI, MC-VF, THS30 and THS40.

The progression in this subject column is implemented in the following steps: 1) Knowledge and skills about methodologies for designing and executing research and innovation projects, 2) Competencies for managing research and innovation projects with many different stakeholders 3) Competencies to solve a specific research task in a company and navigate in the complexity of different interests between stake-holders. The students get in the first semester acquainted with fundamental knowledge on how to struc-ture and design research and innovation/data science projects. In the second semester students learn how to manage complex innovation processes with many different stakeholders. In the third semester, students experience innovation practice during their in-company project which make them able to ad-dress and investigate theoretical and managerial problems within this domain in their thesis in the fourth semester.

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

- 1st semester: Technology, Intrapreneurship and innovation
- 2nd semester: Technology, entrepreneurship and innovation
- 3rd semester: Specialisation or exchange
- 4th semester: Thesis

Description of the 1st semester

Semester theme: Technology, Intrapreneurship and innovation

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 back-grounds. 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 necessary domains. This is to make sure that the students have the same knowledge foundation when they enter the second semester.

VALUE ARGUMENT

Today, innovation solutions are often complex and interdisciplinary where many parties and stake-holders are involved. In this semester, we want to present the journey that takes place within technology intrapreneurship where business opportunities are spotted, analyzed and managed. The focus, this semester, is on the business development inside existing organizations using state-of-the-art technologies to enhance companies' competitiveness.

The first semester introduces the students to different theoretical perspectives on innovation, product and production development as well as technologies that support innovative solutions, 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 stu-dents work with industrial companies to investigate how professional organisations manage inno-vation and the students are challenged with real life innovation challenges. The students work with understand ing technology development and use (eg. AR, VR,) through research publications as well as through practical hands-on courses. The students will learn about business development and how to develop business cases. The students transform researched technology into a physical product/prototype/proof of concept and argue for the business potential. In the process, the busi-ness development regarding sustainable manufacturing solutions has to be illustrated and argued. The students will in a practical way discover the entire value chain in business development. Sup-orting decision making and the analytical process students are trained in research methods and conducting data science projects. This semester prepares them for the coming semesters, where the gained understanding should be used in the other technology, entrepreneurship and inno-va-tion related courses.

LEARNING OBJECTIVES for the 1st semester are the following

KNOWLEDGE

- Is able to understand the complexity of an innovation process with its different stages
- Is able to understand core theoretical concepts and methods in product and production development
- Is able to understand different scientific methods and reflect on the choice of methods

SKILLS

- Is able to apply relevant methods and tools in the various step of the innovation process and interpret the results
- Is able to read and interpret technical research publications as well as innovation and entrepreneurship literature and to apply that on an innovation challenge proposed by a company
- Is able to create a comprehensive business case highlighting pro's and con's and thus assess the business potential of the idea
- Is able to apply academic reading and writing skills in relation to different deliverables

COMPETENCES

- Possess a coherent and holistic view of technology solutions and as a system analyst build, suggest and implement smarter solutions and systems in product and production development
- Create and evaluate business opportunities and suggest solutions to practitioners as well as communicate results to academia.
- Apply scientific methods in performing research, and be able to present findings in a structured way to academia and other stakeholders
- Be able to meaningfully combine the different theoretical fields and practices for facili-tating and communication of the innovation process

MODULES

The 1st semester contains the following modules:

IBAUDI – Automation and Digitalization (10 ECTS)

IBNPR – Innovation in Practice (10 ECTS)

IBDSML – Data Sciences and Machine Learning (5 ECTS)

IBSRP – Student Research Project (5 ECTS)

The modules IBAUDI, IBNPR, IBDSML and IBSRP are constituent, obligatory modules.

CONTEXT

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

IBAUDI: The student will learn about global challenges for industrial production business and understand how highly automated production facilities and digitalization may influence manufacturing businesses. The students will get insights in state-of-the-art production technology (industry 4.0 enabling technologies) and be able to specify solutions based on the technologies and demonstrate this in a virtually simulated VR/AR environment.

IBNPR: The course provides the students with an overview of the topic innovation management and technology innovation. Moreover, students will get introduced to theories on new product development discussing state-of-the-art theories such as agile and hybrid development. Students will apply the theories on a real-life example proposed by an industrial company. The students and the company will work together during the semester which finally results in a presentation of the final outcome. The course is structured around several milestones resulting in a prototype as well as a business case representing the front end of the innovation process/the product development process.

IBDSML: In today's digitalized world machines and humans produce large volumes of data everyday. This holds both threats and opportunities for firms. This course is focused at understanding how firms can analyze and make business decisions based on large volumes of data. The course resides at the intersection of statistics, computer science, and management (of innovation and production). This course introduces students to how they can learn from data and take decisions based on these learnings. It is a broad introduction into the topic and takes a full cycle approach from problem formulation over data preparation and visualization to model selection and assessment.

IBSRP: The student research project deals with a selected topic in the field of Technology Entrepreneurship and Innovation. Under the guidance of the instructor, the students pass through a re-search process: The project starts with developing a research design, further conducts an empirical data collection and its analysis and ends with presentation, documentation and discussion of the results.

Description of the 2nd Semester

Semester theme: Technology, entrepreneurship and innovation

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 with new emerging technologies challenging the ways companies operate and create a demand people who can apply these technologies and use uncertainty to create and manage new opportunities.

In this semester, students will learn how to use emerging technologies in a simulated environment which can optimize existing operations in companies or can be used as a process tool for product development. Students will work on creating ideas for new ventures which can be developed and implemented in the following semester. Therefore, students get some hands-on experience in starting up a technology-based venture.

The students learn about the process of starting up a new business and experiment with practice through interaction with industry, users and other stakeholders. The technical courses allow the students to experience how industry develop 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 technologies that can be used for smart product development
- Understand entrepreneurship theory that can support the creation of new business opportunities
- Understand the role of technology in entrepreneurship, both for internal venturing and for launching a startup company.
- Understand innovation management theory that creates insights on the management of innovations in complex environments
- Relate project experiences to literature within the field

SKILLS

- Apply VR/AR tools to simulate production or product development processes for visualization and optimization purposes
- 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.
- Apply high-tech business venturing concepts, theories and tools in practice from idea generation, to feasibility analysis, to a complete business plan.
- Develop and communicate the relevant and integral aspects of the high-tech business venturing process.

COMPETENCES

- Communicate benefits of the simulated environment to academia and practitioners
- Organize innovation projects with user participation and establish action research activities in an organization.
- Implement the newly acquired knowledge and skills in a relevant business plan for a technology-based internal venture or new company.
- Propose, defend and critically reflect on choices with regard to the high-tech business venture.
- Collaborate in an entrepreneurial team, while also taking responsibility for one's own actions and learning.
- Develop the awareness of entrepreneurship as a career option, including an understanding of what type of entrepreneurial role would fit oneself.

MODULES

The 2nd semester contains the following modules:

- IBSPD – Smart Product Development (10 ECTS)

- IBHTBV – High Tech Business Venturing (10 ECTS)

- IBOI – Open Innovation (5 ECTS)

- Elective – (5 ECTS)

The modules IBSPD, IBHTBV and IBOI are constituent, obligatory modules.

CONTEXT

IBSPD: In this course, students will be introduced to new technologies as well as theory and methods used within product development. Technologies such as Virtual reality, Augmented reality, 3D printing, machine learning algorithms, topology optimization, simulation, virtual prototyping, block-chain technology. Theoretically, the course will draw on the foundation of Innovation Management and New Product Development coupled with insight into fields of Human Computer Interaction, Smart Prototyping, Design Thinking and more. The course will be a combination of presentations and discussions on the history and advancement of product development and case studies on how new technologies and methods are being used in the field. The course will have a series of projects integrated where students will be able to demonstrate how smart tools and technologies can improve a product development process

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.

IBOI: Because knowledge is dispersed across different organizations and individuals in the economy, the sources of innovation are also distributed across different parts of an organization's value network. This course deals with these distributed sources of innovation by exploring different aspects of the innovation process that go beyond the boundaries of the firm. The course will particularly focus on the fact that innovation is the result of the combination of knowledge and often requires firms to look outside for sources of knowledge and innovation.

Elective: The students will have the possibility to select one elective (5 ECTS).

Description of the 3rd Semester

Semester theme: Specialisation or Exchange

VALUE ARGUMENT

The purpose of the third semester is to give the students the opportunity to choose a specialization within entrepreneurship (entrepreneurship training), Innovation (In-company project), Technology, Entrepreneurship or innovation specialization (thesis) or take a number of electives. This specialization has a weight of 15 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 initiates the master thesis corresponding to 10 ECTS in the third semester. In this track one elective with a work-load of 5 ECTS is chosen.
- II. In-company project. Students work on a specific, well defined project in an local, industrial company that is related to the competence profile of the education. The project can lead up to the master project and will involve one assigned professor from the Mads Clausen Institute (MCI).
- III. Entrepreneurship training. Students choosing this track can continue working on their own business idea which they may have initiated during the second semester.

Besides this, the students will get a deeper understanding of an engineering project in practice where a real-life project is conducted. Further, entrepreneurial finance e.g. financing challenges that innovative projects and technology start-ups face is part of this semester, including topics such as valuation, funding rounds, investors, venture capital, exit strategies.

Exchange possibilities

The Faculty recommends and supports, that students go for a one semester exchange at another university abroad. Engineering, Innovation and Business students can use the third semester for this purpose. The In-Company Project/Start of 40 ECTS thesis/Entrepreneurship training + elective part (15 ECTS) can be exchanged to elective courses at our partner universities and the remaining 15 ECTS can be exchanged with relevant courses that to a large extent have the equivalent content. The exchange program must be pre-approved by the Academic Study Board before the exchange semester starts.

LEARNING OBJECTIVES for the 3rd semester are the following:

KNOWLEDGE

- Be able to understand how financing for technology start-ups works
- Be able to create an overview of an engineering problem in a company, outline how to investigate it, analyse the problem and present a solution to the problem
- Be able to understand how to navigate in complex organizations with many stakeholders
- Create and develop a justified research problem that can be carried out as a master thesis.

SKILLS

- Be able to build the capacity for deciding on financing strategies
- Be able to define relevant issues related to own entrepreneurship ideas according to technology, product, production, marketing, financing etc.
- Be able to challenge the company on innovation principles and how to apply innovative technologies seen from an innovation architect's point of view.
- Be able to apply research methods to solve defined research problems

COMPETENCES

- Be able to understand and analyse problems/gaps/dilemmas and perform advanced analysis regarding research and/or practice-based problems related to the chosen specialization

MODULES

The 3rd semester contains the following modules:

IBEPR: Engineering in Practice (10 ECTS)

IBFEE - Finance for Entrepreneurial Engineers (5 ECTS)

Specialisation tracks:

- a) THS40 - Thesis (10 ECTS) + 5 ECTS elective
- b) MC-VF - In company project (15 ECTS)
- c) IBEST - Entrepreneurship Training (15 ECTS)
- d) Electives (15 ECTS)

The modules IBEPR and IBFEE are constituent, obligatory modules. The modules THS40, MC-VF, IBEST and the electives are part of the elective block.

CONTEXT

IBEPR: Technological change such as digitalization and Industry 4.0 trends have a major impact on practice in technology-based ventures. Emerging (digital) technologies often result not only in new products or services, but also in new processes and changes to organizational procedures. Although students encounter many emerging technological trends in theory throughout their education, the implications of practical application are widely unknown. Engineering in Practice sheds light on the actual impact that technology and technological change has in local/regional technology-based companies. The students learn to contextualize technology and to assess, challenge and reflect on engineering in practice. To create a strong connection to contexts external to the classroom, case studies, guest lectures and site visits will be used throughout the course.

IBFEE: The course provides an overview on the financing challenges that innovative projects and technology start-ups face. Including topics such as valuation, funding rounds, investors, venture capital, exit strategies. The course is aimed at engineering students interested in gaining a general standing on how the financing for technology projects works. The course goal is to provide students with the capacity to establish financing strategies that are linked to the technology product-market strategy and overall needs of their organization.

The course has a focus on high technology projects in the context of an existing organization or as part of a new venture, thus it aims to prepare students for financing decisions either as entrepreneurs or as innovation projects managers. The students learn with a combination of insights from finance theory and application of the course concepts and models in real cases.

THS40: 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 Engineering, Innovation and Business education. During the course, the content of the master thesis will be discussed including: Formulating a re-search problem/question, writing a critical literature review and propose an appropriate research design/methodology.

MC-VF: 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 in-company project, students have to analyse and document the 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 in relation to the specified project.

IBEST: The purpose is that students work on their own entrepreneurial ideas focusing on advancing the steps towards 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 (15 ECTS) as part of their specialization.

Description of the 4th Semester

VALUE ARGUMENT

The student shall through the selected research problem document his/her engineering-specific competencies obtained 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.

COMPETENCES

- 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 re-quire new solution models.
- Take responsibility for own professional development and specialization.

MODULES

4th semester contains:

THS30 – Master Thesis (30 ECTS)

The module THS30 is a constituent, obligatory module.

▼ § 3.1.1 - Connection between entry requirements and the first year

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

▼ § 4 - Course Descriptions

▼ § 4 - Compulsory courses

Profile divided course descriptions

Master of Sciences (MSc) in Engineering (Engineering, Innovation and Business) 2020

Course descriptions in the curriculum

▼ Data science and machine learning for innovation and production

▼ Course ID

T310016401

▼ Course Title

Data science and machine learning for innovation and production

▼ ECTS value

5

▼ Internal Course Code

EIB-DSML

▼ Responsible study board

Academic Study Board of the Faculty of Engineering

▼ Automation and Digitalization

▼ Course ID

T310011401

▼ Course Title

Automation and Digitalization

▼ ECTS value

10

▼ Internal Course Code

IBAUDI

▼ Responsible study board

Academic Study Board of the Faculty of Engineering

▼ Innovation in Practice

▼ Course ID

T310010401

▼ Course Title

Innovation in Practice

▼ ECTS value

10

▼ Internal Course Code

IBINPR

▼ Responsible study board

Academic Study Board of the Faculty of Engineering

▼ Student Research Project

▼ Course ID

T310009401

▼ Course Title

Student Research Project

▼ ECTS value

5

▼ **Internal Course Code**

IBSRP

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Smart product development**

▼ **Course ID**

T310015401

▼ **Course Title**

Smart product development

▼ **ECTS value**

10

▼ **Internal Course Code**

IBSPD

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **High-Tech Business Venturing**

▼ **Course ID**

T310005401

▼ **Course Title**

High-Tech Business Venturing

▼ **ECTS value**

10

▼ **Internal Course Code**

IBHTBV

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Open Innovation**

▼ **Course ID**

T310014401

▼ **Course Title**

Open Innovation

▼ **ECTS value**

5

▼ **Internal Course Code**

IBOI

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Finance for Entrepreneurial Engineers**

▼ **Course ID**

T310012401

▼ **Course Title**

Finance for Entrepreneurial Engineers

▼ **ECTS value**

5

▼ **Internal Course Code**

IBFEE

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Engineering in Practice**

▼ **Course ID**

T310013401

▼ **Course Title**

Engineering in Practice

▼ **ECTS value**

10

▼ **Internal Course Code**

IBEPR

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **In-Company Project**

▼ **Course ID**

T350025401

▼ **Course Title**

▼ **ECTS value**

15

▼ **Internal Course Code**

MC-VF

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Master's Thesis - 40 ECTS**

▼ **Course ID**

T350029401

▼ **Course Title**

Master's Thesis - 40 ECTS

▼ **ECTS value**

40

▼ **Internal Course Code**

THS40

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Entrepreneurship Training**

▼ **Course ID**

T310008401

▼ **Course Title**

Entrepreneurship Training

▼ **ECTS value**

15

▼ **Internal Course Code**

IBEST

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Master's Thesis - 30 ECTS**

▼ **Course ID**

T350027401

▼ **Course Title**

Master's Thesis - 30 ECTS

▼ **ECTS value**

30

▼ **Internal Course Code**

THS

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Study Start (MSc in Engineering)**

▼ **Course ID**

T700051401

▼ **Course Title**

Study Start (MSc in Engineering)

▼ **ECTS value**

0

▼ **Internal Course Code**

TEK-SB-KAST

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **§ 5 - Examination provisions**

▼ **§ 5.1 - Programme passing requirements**

5.1.1 An examination is graded in accordance with the 7-point grading scale. It can also be graded as 'passed/failed' (bestået/ikke-bestået) or 'approved/non-approved' (godkendt/ikke-godkendt). The master's thesis is always graded in accordance with the 7-point grading scale.

5.1.2 An examination or a course is considered to be passed when the student has attained the assessment 'passed', 'approved' or the grade of 2 or higher.

5.1.3 The 'passed/failed' and 'approved/non-approved' forms of assessment can account for no more than one-third of the programme's total number of ECTS points. This does not apply to credit transfers from previous examinations.

5.1.4 When the basis for assessing a study activity is 'tuition attendance' - this assessment is made by the teacher based on criteria of which students are informed at the beginning of the course. The condition for awarding the assessment 'approved' is that the student at an examination must have achieved the learning objectives established for the course to such an extent that it would result in the assessment 'approved' or a grade of 02 at minimum.

5.1.5 The basis for assessment in connection with tuition attendance may be one or more of the following:

- attendance at lectures and exercises
- completed laboratory work, portfolios and reports and completed assignments or other practical or theoretical work
- participation in guiding internal examinations
- participation in seminars.

5.1.6 The student must be notified whether or not his/her participation in the course activities has been approved before the end of the semester.

5.1.7 The study programme has successfully completed with the student has attained:

- the grade of 2 or higher in all examinations graded in accordance with the 7-point grading scale
- the assessment 'passed' in all examinations assessed as either 'passed' or 'failed'
- the assessment 'Approved' in all examinations assessed as either 'approved' or 'non-approved'.

▼ § 5.2 - Special exams

Examinations Abroad

5.2.0.1 The Academic Study Board can grant dispensation to take examinations at a Danish representation or other site abroad, when there are exceptional circumstances that prevent the student from taking the examination(s) in Denmark. The examination can be set up as a video conference or by using other technical aids.

5.2.0.2 The student is responsible for all practical arrangements related to the examination.

5.2.0.3 All costs linked to holding the examination, cancellation of the examination due to illness (if applicable) and problems with connecting to the system, etc., for which SDU cannot be held liable, shall be paid by the student.

▼ § 5.2.1 - Start of study exam

5.2.1.1 Students enrolled on a master's programme must take and pass a study start examination in order to continue on their programme. The purpose of the study start examination is to verify that students have commenced their studies.

5.2.1.2 Students have two examinations attempts to pass the study start examination.

5.2.1.3 The content and evaluation form of the study start test are described in the course description.

5.2.1.4 If warranted by special circumstances, the Academic Study Board may grant dispensation from the rules on the study start examination.

▼ § 5.3 - Spelling and writing skills

5.3.1 The assessment of the Master's thesis and other major written assignments must also, in addition to the technical content, address the student's spelling and language proficiency, regardless of the language in which the project is written.

5.3.2 The projects must be written in a concise and easily understandable language. The wording of the written presentations or the Master's thesis may have a positive or negative impact on the overall grade. Additional information on the language requirements is provided in the course descriptions.

5.3.3 The Academic Study Board may grant dispensation from the above spelling and wording requirements for students who can document that they suffer from a relevant, specific impairment (such as dyslexia).

▼ § 5.4 - Internal or external exams

5.4.1 Examinations are either external or internal. External examinations are assessed by the teacher(s) and one or more external examiners appointed by the Danish Agency for Science and Higher Education. Internal examinations are assessed by one or more teachers appointed by the university.

5.4.2 At least one-third of the programme's total number of ECTS points must be documented by external assessment. This includes the most important components of the programme, including the Master's thesis, but does not apply to credits transferred from other examinations.

▼ § 5.5 - Exam language

5.5.1 For study programmes offered in Danish, examinations will be conducted in Danish, unless part of the purpose of an examination is to document the student's foreign language proficiency. Examinations may be taken in Swedish or Norwegian instead of Danish, unless the purpose of the examination is to document the student's proficiency in Danish.

5.5.2 For study programmes or individual courses offered in English or other foreign language, examinations will be conducted in that language, unless part of the purpose of an examination is to document the student's proficiency in a different language. The same applies if a course has been taught in a foreign language. The Academic Study Board may grant dispensation from this rule.

5.5.3 In addition, circumstances permitting, the Academic Study Board may allow students wishing to take an examination in a foreign language, to do so. This, however, does not apply to examinations which require presentations to be given in Danish. The Academic Study Board may grant dispensation from this rule.

▼ § 5.6 - Forms of assessment

Purpose

5.6.1 The purpose of the examination is to assess whether and to which extent the student's qualifications match the learning objectives laid down in the Danish Ministerial Order on Bachelor and Master's (Candidatus) Programmes at Universities (the University Programme Order, Uddannelsesbekendtgørelsen), the Curriculum and the respective semester planning. The final examination provides the basis for issuing a diploma.

Examination forms

5.6.2 The programme includes a variety of examination forms to reflect the content and working methods of the tuition provided. The examination forms must accommodate the purpose of the individual course/course element, and may include:

- oral, written and practical examinations, project-oriented courses and combinations of the different forms of examination.

5.6.3 Any requirements on mandatory attendance or completion of written assignments, etc., during the study period which must be met in order for the student to be allowed to take an examination at the end of the course or course element are specified in the relevant course description.

5.6.4 All written campus-based examinations must be completed using a computer in accordance with the University of Southern Denmark's rule set for written examinations.

Assessment of Group Assignments

5.6.5 Projects are normally completed by groups of students. As a rule, these groups consist of six students. The Head of Programme may allow a group to consist of fewer or more students, based on an individual professional assessment. However, these provisions do not apply to the Master's thesis.

Sound and/or Image Recordings

5.6.6 The use of sound and image recordings during an examination is not allowed, unless such recordings are part of the examination procedure. If so, such recordings will be made by the university.

Examination Aids

5.6.7 The use of examination aids is specified in the individual semester plans.

▼ § 5.7 - Irregularities at exams

Disciplinary Action

5.7.1 Disciplinary action will be taken against a student who:

- unlawfully seeks or offers help with the completion of an examination paper, or
- brings non-allowed examination aids to an examination, or
- passes the work of another off as his/her own, or
- cites his/her own previously evaluated work without adding proper references, or
- is otherwise found guilty of cheating at the examination

cf. Rules regarding Disciplinary Measures for Students at the University of Southern Denmark.

5.7.2 Disciplinary action may also be taken against a student who acts in an interruptive manner during an examination.

Errors and Defects in an Examination

5.7.3 If a student discovers errors or defects in an examination, the student must contact the evaluators (for oral examinations) or the invigilators (for written examinations).

5.7.4 In case of aggravated errors or defects, or where this must be considered the most appropriate way to remedy the error or defect, the university may cancel the examination and make arrangements to conduct an extraordinary examination. Re-examination due to cancellation of the original examination may result in a lower mark.

5.7.5 The university may offer an extraordinary examination in connection with other errors or defects. The offer must apply to all students whose examinations are affected by the error or defect in question. A student who has taken the extraordinary examination may choose to retain the original assessment given.

▼ § 5.8 - Special examination conditions

5.8.1 Students with physical or mental impairments, a native language other than Danish or similar difficulties may apply to the Academic Study Board to be granted special examination conditions. The Academic Study Board will accommodate the request if this is found necessary in order to place such students on an equal footing with others during the examination. It is a condition that the alteration does not imply a change of the level of examination.

5.8.2 The application deadline for special examination conditions is 1 October for the winter examination term and 1 Mrch for the summer examination term. In case of chronic impairments, the Academic Study Board may approve special examination conditions for the rest of the Master's programme.

5.8.3 The diploma will not include any information on special examination conditions.

▼ § 5.9 - Ordinary exams

5.9.1 Ordinary examinations will be held immediately at the end of the course leading up to the examination.

5.9.2 The student must be prepared to sit examinations throughout the examination period, but not in July. This also applies in situations when a planned examination is moved due to *force majeure*.

▼ § 5.10 - Reexams

5.10.1 Students who did not pass the ordinary examination and students who have registered for classes the semester of the ordinary examination but have failed to attend the ordinary examination can register for re-examination.

5.10.2 Re-examinations will be held during the examination period for the autumn semester is 2 January - 28/29 February and for the spring semester 1 June - 31 August. In some cases, examinations can also be held in December and May. Examinations are not held in July, unless warranted by special circumstances.

5.10.3 The student must register for re-examination via Student Self-service, <https://sso.sdu.dk> in the following period:

- 01-20 January for re-examination in the winter examination period (=February)
- 01-20 June for re-examination in the summer examination period (=August)

5.10.4 Students cannot withdraw from registration for re-examination, and it will count as a failed examination attempt if the student does not take the examination unless the Academic Study Board has granted dispensation from this rule.

5.10.5 Re-examination may take a different form of examination or assessment than the ordinary examination. Students will be notified of any change in the form of examination or assessment before the examination. The form of examination for the master's thesis, however, cannot be changed.

Consequences for not having passed an exam by 2nd attempt

5.10.6 If the student does not attend or pass the ordinary examination and the relevant re-examination, the student can register to take the examination the next time the ordinary examination is held. The student must comply with the registration period.

5.10.7 If the student failed an examination on the second attempt on a course offered by the Faculty of Engineering, the student must participate in the course and re-submit all assignments prior to the next ordinary examination (third examination attempt), unless the course is no longer offered. The Academic Study Board can grant dispensation from this rule.

▼ § 5.11 - Exam attempts

5.11.1 A passed examination cannot be retaken.

5.11.2 A student has three attempts to pass an examination. If warranted by extraordinary circumstances, the Academic Study Board may grant additional examination attempts. The question of academic ability cannot be considered in assessing whether or not such extraordinary circumstances exist. Supplementary courses in connection with Master's programmes constitute an exception to this rule as the student has only two (2) examination attempts where supplementary activities are concerned.

5.11.3 A student whose tuition attendance is to be assessed for the second time may demand an examination instead. Tuition attendance associated with practical exercises, however, cannot be replaced by an examination.

▼ § 5.12 - Requirements for exams

Failure to Meet Examination Requirements

5.12.1 If students do not meet examination requirements, this will be regarded as one examination attempt unless the Academic Study Board grants dispensation from this rule due to extraordinary circumstances.

Absence from Examination Activities

5.12.2 If the student is absent from an examination, this leads to the student losing an examination attempt. If the evaluation a course is based on an overall evaluation of two or more examination activities, absence from one or more activities leads to the student being registered as absent from the entire examination. The Academic Study Board can grant dispensation from this rule, if there are extraordinary circumstances.

Participation in Group Assignments

5.12.3 The student is required to participate actively in group assignments. For this reason, the work will be supervised by the academic supervisor. If a student fails to meet the requirement on active participation, the relevant programme co-ordinator, following the academic supervisor's or the Head of Programme's recommendation, may decide that the student be excluded from the group. The applicable criteria for assessing whether the group assignment work has been performed satisfactorily will be laid down for the assignment at the start of the supervision

▼ § 5.13 - Group exams

5.13.1 Examinations are arranged as individual or group examinations.

5.13.2 The basis for assessment is always individual, and individual grades are given.

5.13.3 The course description specifies the maximum number of students who can participate in a group examination. It will not be possible to choose an individual examination instead of a group examination, the examination in Master's Thesis being an exception from this rule.

▼ § 6 - Credit transfer

▼ § 6.1 - Transfer of credit

6.1 The student must apply for credit transfer for course elements passed from all previous study programmes at master level immediately after enrolling in the programme in question at the Faculty of Engineering.

▼ § 6.2 - Transfer of credit

6.2.1 Students who wish to take course elements from a different course or at another institute of higher education in Denmark or abroad as part of their study programme can apply to the Academic Study Board for pre-approved credit transfers for planned course elements.

6.2.2. Students who wish to take on student exchange abroad for at least a semester, must have passed courses corresponding to at least 30 ECTS points on the respective master's programme. Furthermore, the student exchange may not lead to an extension of the student's study period.

6.2.3 The Academic Study Board must have pre-approved credits for courses offered in the autumn semester and which form part of the student's pool of electives no later than at the Study Board's meeting in August. Likewise, the Academic Study Board must have pre-approved credits for courses offered in the spring semester and which form part of the student's pool of electives no later than at the Study Board's meeting in January.

6.2.4 The Academic Study Board must have pre-approved credits for courses offered in the autumn semester and which are to replace constituent courses in the curriculum no later than at the Study Board's meeting in April. Likewise, The Academic Study Board must have preapproved credit transfer for courses offered in the spring semester and which are to replace constituent subjects in the curriculum no later than at the Study Board's meeting in November.

6.2.5 A decision of pre-approval of credit transfer puts the student under the obligation of sending documentation for passed study activities to the Academic Study Board.

6.2.6 Students must re-apply for pre-approved credit transfers if they cannot attend one or more of the course elements for which they have obtained pre-approved credit transfers.

▼ § 6.3 - Credit

6.3.1 Based on an academic assessment, the Academic Study Board may allow credit transfers for courses passed in a previous higher education programme in Denmark or abroad.

6.3.2 In order for a student to be entitled to a Danish diploma and a Danish title, no more than two-thirds of the master's programme can be completed abroad.

6.3.3 It will not be possible to transfer credits from a Master's thesis forming the basis of a title under one master's programme to a different title under a different master's programme.

6.3.4 The possibilities of credit transfers will always depend on the Academic Study Board's assessment of the level of equivalence between the relevant programme components.

6.3.5 Previously passed programme components can only entitle credit transfers if they are at master level.

6.3.6 Course elements whose contents coincide in part or in full with the contents of constituent course elements of the study programme in question or with any already passed course elements cannot be approved as elective courses or entitle to credit transfers to the study programme. Elective courses include all course elements which have been approved by the Academic Study Board and which are not mandatory for the programme in which the student is enrolled.

6.3.7 Credit transfers are only given upon production of an original, official transcript of records showing the study activities passed by the student.

6.3.8 Credit transfer with grades is possible only when the previously passed study activity was graded in accordance with the 7-point grading scale, and when there is equivalence between the previously passed study activity and the study activity being substituted. Such equivalence must exist both in terms of the technical contents and in terms of the scope of the activity, as measured in ECTS points.

▼ § 7 - Provisions on the organisation of the programme

▼ § 7.1 - Enrollment and Unenrollment from teaching and exams

Course and exam registration

7.1.1 Registration for tuition and examinations shall be conducted in compliance with SDU's rules on registering for courses and examinations.

7.1.2 The prerequisite for participating in tuition and examinations during each semester is that the student registers for the semester's activities within the deadlines.

7.1.2.1 Registration for tuition and examination takes place electronically on Student Services Online at <https://sso.sdu.dk>.

7.1.2.2 The registration periods are May for tuition during the autumn semester and December for tuition during the spring semester. The registration period is published on the website and is sent by e-mail to students' SDU e-mail addresses. It is the student's responsibility to keep abreast of the time limits for registration.

7.1.3 Registration for a course (obligatory or elective) involves automatic registration for tuition and the associated ordinary examination and a second examination attempt (re-examination), if applicable. Registration for both compulsory and elective courses is binding. However, electives can be changed. See 7.1.4

7.1.3.1 If the student registers for courses additional to the 30 new ECTS points per semester, this registration will also be binding and cannot be cancelled.

7.1.4 Students may swap electives within the first two weeks of the start of each semester, provided they have not used examination attempts in the electives in question.

7.1.5 The student must register for tuition and examination for the subject is offered for the final time.

7.1.6 It is the responsibility of students to check their registrations at the start of the semester.

7.1.7 The university is not obliged to let a student attend courses beyond the level required to complete the study programme.

Course and Exam Withdrawal

7.1.8 Withdrawal is not permitted and absence from an examination will be considered a failed examination attempt, unless the Academic Study Board grants dispensation for withdrawal from one or more courses. The student must apply for withdrawal before the exam in the course in question is held.

▼ § 7.2 - Deadline for programme completion

Maximum Study Period

7.2.1 A student must have completed the Master's programme within two-and-a-half years of commencing the programme in compliance with SDU's Rules on Completion Times for Bachelor, Profession Bachelor or Master's Programmes. These periods do not include any periods of granted leave.

7.2.2 If warranted by special circumstances or the student is elite athlete, entrepreneur or a chairman for an organisation under the Danish Youth Council (DUF), the Academic Study Board may grant dispensation from the rules on the maximum study period.

▼ § 7.3 - Study activity

Minimum Pass Grade Requirement

7.3.1 A student must pass at least one ECTS qualifying examination during a coherent period of at least one year. Should this requirement not be fulfilled, the student's enrolment will be cancelled.

7.3.2 If warranted by special circumstances, the Academic Study Board can grant dispensation from the minimum pass grade requirement.

▼ § 7.4 - Master's thesis

7.4.1 The Master's thesis accounts for 30 or 40 ECTS points and is a major independent written assignment which is included in the final year of a Master's programme. For students admitted on the 4+4 Ph.D programme, the thesis constitutes 45 ECTS points.

7.4.2 The thesis may be written individually or jointly by two students. The relevant Head of Programme may permit joint completion of a Master's Thesis project by up to three students.

7.4.3 The thesis must document the student's competences in using scientific theory and methodology in the work with a clearly defined academic subject. The subject of the thesis must be agreed with an academic supervisor.

7.4.4 A 30 ECTS thesis must be completed in the course of four months, whereas a 40 ECTS thesis must be completed in the course of two full semesters. As a rule, the starting date and deadline for submission of the thesis are the first workday in September, and the month of January, respectively, for theses to be completed in the autumn semester, and the first workday in February, and the month of June, respectively for theses to be completed in the spring semester. In extraordinary circumstances, the Academic Study Board may grant dispensation from the above dates/deadlines.

7.4.5 The Contract for the Master's thesis must be approved by the academic supervisor, the Head of Programme and the director of studies. A Contract for the Master's Thesis project approved by all the instances mentioned above, may be amended only if dispensation to do so has been granted by the Academic Study Board. Title changes, which do not lead to a delay in the submission date, are approved by the academic supervisor.

7.4.6 The deadline for submission of the thesis is binding. If the student fails to submit the thesis report within the set deadline, the student loses one examination attempt and the student must enter into a supplementary contract within two weeks of the original submission date. The deadline will be extended by three months from this date, and the formulation of the assignment will be extended by additional deliverables corresponding to three months' work within the original subject area. The deadline can be extended by a further three months, subject to the same conditions. Every time a deadline for submission is exceeded, this will be registered as a used examination attempt.

7.4.7 If a student does not pass his or her thesis examination, the student is under obligation to enter into a supplementary contract within two weeks of the original examination date. The supplementary contract means that the student shall extend the formulation of the assignment by additional deliverables corresponding to three months' work within the original subject area. The student is given three months to prepare the thesis after which a new examination will be held.

7.4.8 In situations when it has not been possible to carry out lab experiments or when collaboration with a company fails, a company goes bankrupt or there are serious problems with empirical data or method selections, etc., the Academic Study Board can decide that the student shall write a new thesis with a new topic and deadline corresponding to the scope of the thesis. See 7.6.4.

7.4.9 The Master's thesis must include an abstract in a foreign language. The course description specifies which language the abstract must be written in. If the thesis is written in a foreign language, the abstract may be written in Danish. The abstract forms part of the assessment of the thesis.

7.4.10 The specific provisions on the Master's thesis are laid down in the course description.

▼ § 7.5 - Change of profile

7.5.1 The Academic Study Board may grant dispensation to change of profile/specialisation. Students are not permitted to extend their total standard study period if they change profile/specialisation course.

▼ § 7.6 - The Master's Degree part of the 4+4 PhD programme

7.6.1 Prior to the enrolment on the PhD programme, the student must be enrolled under a Master of Science in Engineering programme at the University of Southern Denmark and have passed 60 ECTS (=the first two semesters) of the master's programme. The remaining 60 ECTS consist of:

- Constituent courses on the 3rd semester of the relevant master programme corresponding to 15 ECTS
- Master's Thesis on 45 ECTS points (see 7.6 for further information about the thesis).

7.6.2 The student must have completed the master's programme within three years of commencing the 4+4 PhD Programme.

▼ § 7.7 - Individual activities

Individual Study Activities

7.7.1 Students may in agreement with a supervisor apply to the Academic Study Board for an individual study activity.

7.7.2 Individual study activities shall include a description of the learning outcomes in terms of knowledge, skills, competencies and assessment method.

7.7.3 An individual study activity may not be used to reduce the scope of the study programme and it may not overlap with the contents of the Master's Thesis.

7.7.4 As a general rule, students cannot combine an individual study activity with a 40 ECTS Master's Thesis.

7.7.5 As a general rule, the extent of an individual study activity may not exceed 5 ECTS points. The Academic Study Board can, under special circumstances, make an exception to this rule.

7.7.6 Individual study activities completed in the autumn semester and which do not form part of the curriculum and which are to be included in the student's pool of electives, must have been approved by the Academic Study Board no later than at the Study Board's meeting in August. Likewise, individual study activities completed in the spring semester and which do not form part of the curriculum and which are to be included in the student's pool of electives, must have been approved by the Academic Study Board no later than at the Study Board's meeting in January.

7.7.7 Individual study activities completed in the autumn semester and which do not form part of the curriculum and which are to be included in the student's constituent courses must have been approved by the Academic Study Board no later than at the Study Board's meeting in April. Likewise, individual study activities completed in the spring semester and which do not form part of the curriculum and which are to be included in the student's constituent courses must have been approved by the Academic Study Board no later than at the Study Board's meeting in November. As a general rule, individual study activities can only substitute obligatory courses in situations, where the obligatory course in question no longer is offered, the student has not used examination attempts in the course in question, and it is not possible to take an equivalent course (pre-approval of credit transfer).

▼ § 7.8 - Limitation on the number of entries

7.8.1 The university may introduce restrictions on the choice of modules and on the choice of subjects for the project assignments. The university applies academic criteria as selection criteria if there is a limited number of places on a subject. If setting academic criteria is not possible, the university may use a draw as a selection criterion.

▼ § 8 - Exemptions and complaints procedures

▼ § 8.1 - Dispensation from University regulations

8.1.1 When warranted by extraordinary circumstances, the Academic Study Board may grant dispensations from those rules of the Curriculum which have been laid down exclusively by the institution. In certain situations, where the student is elite athlete, entrepreneur or a chairman for an organisation under the Danish Youth Council (DUF), the Academic Study Board may grant a dispensation from the curriculum or the rules of SDU. The Academic Study Board may, apart from when deciding upon extra examination attempts, consider the academic ability of the student in question.

8.1.2 Any application for dispensation from the rules of the Curriculum must be made in writing, must be reasoned, and must be accompanied by relevant documentation. Costs related to acquiring such documentation shall be borne by the student. Find information on application deadlines here.

▼ § 8.2 - Complaints over exams

8.2.1 The student is entitled to complain about an examination or other evaluation that is a constituent part of the examination. Complaints may

- be procedural (i.e. concerning whether the matter has been handled in accordance with applicable law and general principles of administrative law), or
- relate to the basis of examination,
- relate to the examination procedure and/or
- relate to the assessment of the examination

and must be submitted by the student to the university no later than 14 days after publication of the examination result. The complaint must be in writing. The complaint must be addressed to the Faculty of Engineering's Secretariat and sent to studienaevn@tek.sdu.dk.

8.2.2 The university will decide on the complaint based on the assessors' professional opinion and the complainant's comments on the result. The decision may offer a reassessment or a re-examination, or may find against the complainant. A re-assessment or re-examination could result in a lower grade. Complaints cannot be made about examination basis, examination procedures or assessment related to the study start examination.

▼ § 8.3 - Complaints over University decisions

Appeals regarding procedural matters

8.3.1 The student is entitled to file a procedural appeal (i.e. concerning whether the matter has been handled in accordance with applicable law and general principles of administrative law) against the university's decisions, including decisions made by the Academic Study Board. Procedural appeals may be submitted to the Danish Agency for Science and Higher Education.

8.3.2 The appeal must be submitted to the University no later than 14 days after the student has been notified of the contested decision. The complaint must be in writing. The appeal must be addressed to the secretariat of the Academic Study Board at the Faculty of Engineering and sent to studienaevn@tek.sdu.dk.

Complaints about credit transfers and pre-approved credit transfers

8.3.3 Complaints about academic issues (ie. whether the qualifications the student has/would acquire can substitute parts of the study programme in question) in connection with the refusal or partial refusal of

Academic issues

- pre-approved credit transfers for Danish or foreign course elements, and
- credit transfers for Danish and foreign course elements that have been passed

can be submitted to a credit transfer Appeals board in accordance with the rules on Appeals boards for decisions regarding credit transfers for university programmes (the ministerial order on credit transfer appeals boards). The complaint must be submitted to the University no later than 14 days after the student has been notified of the contested decision. The complaint must be in writing and include an explanation of the reasons for the appeal. The complaint must be addressed to the secretariat of the Academic Study Board at the Faculty of Engineering and sent to studienaevn@tek.sdu.dk.

8.3.4 Complaints about judicial issues (ie. whether the case has been processed in agreement with existing laws and general principles of administrative law) in connection with the refusal or partial refusal of

Judicial issues

- pre-approved credit transfers for Danish or foreign course elements, and
- credit transfers for Danish and foreign course elements that have been passed

can be submitted to the Vice-Chancellor's Secretariat in accordance with the rules on Appeals boards for decisions regarding credit transfers for university programmes (the ministerial order on credit transfer appeals boards). The complaint must be submitted to the University no later than 14 days after the student has been notified of the contested decision. The complaint must be in writing and include an explanation of the reasons for the appeal. The complaint must be addressed to the secretariat of the Academic Study Board at the Faculty of Engineering and sent to studienaevn@tek.sdu.dk.

▼ § 9 - The affiliation of the programme

▼ § 9 - Transitions

9.1 The rules concerning maximum period of study, which were valid at the time of admission and enrolment, apply on students admitted and enrolled on a Master's study programme before 1 September 2015. I.e. these students must have completed the study programme within 3 years from the commencement of studies.

9.2 Transitional Curriculum Arrangements (programme specific)

Upon effective date of the curriculum, earlier curricula will be phased out and the affected courses will be taught and examined for the last time concurrently with the phasing out of the curriculum. For details please refer to the individual course descriptions.

Students enrolled on earlier curricula will continue on their current curriculum and will not be affected by these changes unless they are behind in their studies and have yet to pass courses that are no longer offered or for some other reason apply for change of curriculum.

Students enrolled on earlier curricula who do not follow the prescribed course of study will not be offered special teaching. Thus, students who have yet to pass courses that are no longer offered must replace those courses with courses from the new curriculum. Alternatively, students can apply to the study board for change of curriculum.

Leave of absence and re-enrolment

In cases of re-enrolment the faculty will decide whether the student is enrolled on this curriculum or will continue on his/her original curriculum. At the end of a leave of absence the student will be enrolled on his/her original curriculum unless the student applies for a change of curriculum.

Credit transfer

When students change curriculum, courses passed will be credit transferred to compulsory courses in the new curriculum according to the below. There will be no transfer of or changes in the number of ECTS credits. This also applies when the credits on an earlier curriculum differs from the credits on the courses to which it is credit transferred. Only courses completed and passed in their entirety can be transferred.

Following courses from the 2018 curricula can be credit transferred to the 2019 and 2020 curricula:

- T310000401 (IBITB-U1) covers T310010401 (IBINPR)
- T310007401 (IBENF-U1) covers T310012401 (IBFEE)

▼ § 9.1 - Legal basis

This Curriculum was prepared on the basis of the authority granted by the provisions of:

- Danish Constitutional Act no. 778 of 7 August 2019 concerning the Danish Act on Universities (Universitetsloven)
- Danish Ministerial Order no. 104 of 24 January 2021 on Admission and Enrolment on Bachelor and Master's Programmes (candidatus) at Universities (Adgangsbekendtgørelsen)
- Danish Ministerial Order no. 20 of 9 January 2020 on bachelor and master's programmes (candidatus) at universities (Uddannelsesbekendtgørelsen)
- Danish Ministerial Order no. 22 of 9 January 2020 on University Examinations and Grading (Eksamensbekendtgørelsen)
- Danish Ministerial Order no. 114 of 3 February 2015 on the Grading Scale and Other Forms of Assessment under the Danish Ministry of Higher Education and Science (Karakterbekendtgørelsen)
- Danish Ministerial Order no 1517 of 16 December 2013 on Credit Transfer Appeals Boards (Meritankenævnsbekendtgørelsen)
- Danish Ministerial Order no 597 of 8 March 2015 on Talent Initiatives on Higher Education within the area of Ministry of Higher Education and Science (Talentbekendtgørelsen)

▼ § 9.2 - Academic Study Board

Academic Study Board of the Faculty of Engineering

▼ § 9.4 - Effective date

01-09-2021

▼ § 9.5 - Date of Study Board Approval

06-09-2021

▼ § 9.6 - Date of Deans Approval

06-09-2021