The Faculty of Engineering and Science
The Board of Studies for Industry and Global Business Development

AALBORG UNIVERSITET

Curriculum for the Master's Programme in Global Systems Design

(cand.tech.)

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Preface

Pursuant to Act 695 of June 22, 2011 on Universities (the University Act) with subsequent changes, the following curriculum for the Master programme in Global Systems Design is stipulated. The programme also follows the Framework Provisions and the Examination Policies and Procedures for the Faculty of Engineering and Science.

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Chapter 1: Legal Basis of the Curriculum, etc.

1.1 Basis in Ministerial Orders

The Master's programme in Global Systems Design is organised in accordance with the Ministry of Science, Technology and Innovation's Ministerial Order no. 814 of June 29, 2010 on Bachelor and Master Programmes at Universities (the Ministerial Order of the Study Programmes) and Ministerial Order no. 857 of July 1, 2010 on University Examinations (the Examination Order) with subsequent changes. Further reference is made to Ministerial Order no. 213 of February 21 2012 (the Admission Order) and Ministerial Order no. 250 of March 15, 2007 (the Grading Scale Order) with subsequent changes.

1.2 Faculty Affiliation

The Master programme falls under the Faculty of Engineering and Science, Aalborg University.

1.3 Board of Studies Affiliation

The Master programme falls under the Board of Studies for Industry and Global Business Development under the School of Engineering and Science.

Chapter 2: Admission, Degree Designation, Programme Duration and Competence Profile

2.1 Admission

Admission to the Master programme in Global Systems Design requires a Bachelor degree in one of the following:

Bachelor of Science (BSc) in Engineering (Mechanical Engineering and Manufacturing)

Bachelor of Engineering in Mechanical Engineering and Industry

Bachelor of Science (BSc) in Engineering (Global Business Engineering)

Bachelor of Engineering in Export Technology

Bachelor of Engineering in Production Engineering

Bachelor of Science (BSc) in Engineering (Nanotechnology)

Bachelor of Science (BSc) in Mathematics

Bachelor of Engineering in Electronics and Electrical Engineering

Bachelor of Science (BSc) in Engineering (Electronic Engineering and IT)

Bachelor of Engineering in Computer Engineering and IT

Bachelor of Technology Management and Marine Engineering (Maskinmester)

Students with Bachelor degrees in similar areas are also accepted.

All applicants must, as a minimum, document English language qualifications comparable to an "English B level" in the Danish upper secondary school (gymnasium) (the Admission Order).

Students with another Bachelor's degree may upon application to the Board of Studies be admitted following a specific academic assessment if the applicant is considered as having comparable educational prerequisites. The University can stipulate requirements concerning conducting additional exams prior to the start of study.

2.2 Degree Designation in Danish and English

The Master programme entitles the graduate to the Danish designation Cand.tech. (candidatus/candidata technologiae) i globalt systemdesign. The English designation is: Master of Science and Technology (Global Systems Design).

2.3 The Programme's Specification in ECTS Credits

The Master programme is a 2-year, research-based, full-time study programme. The programme is set to 120 ECTS credits.

2.4 Competence Profile in the Diploma

The following competence profile will appear in the diploma:

A graduate of the Master programme has competencies acquired through an educational programme that has taken place in a research environment.

The graduate of the Master programme can perform highly qualified functions on the labour market on the basis of the educational programme. Moreover, the graduate has prerequisites for research (a PhD programme). Compared to the Bachelor degree, the graduate of the Master programme has developed her/his academic knowledge and independence, enabling the graduate to independently apply scientific theory and method in both an academic and occupational/professional context.

2.5 Competence Profile of the Programme

<u>The graduate of the Master programme:</u>

Knowledge

- Has thorough knowledge of the elements and concepts involved in manufacturing and service operations, including how these elements interact - locally as well as globally
- Has an in-depth knowledge of a selected manufacturing and service technologies; including a deep understanding of the interface and structure of a limited manufacturing and service system
- Understands the potential and limitations of modelling, calculation and simulation tools to be applied for analysis and design of products / services as well as manufacturing and service operations systems
- Can understand and, on a scientific basis, reflect over subject areas related to product / service design and business simplification, standardisation and automation
- Can demonstrate insight into how strategic / tactical or conceptual designs can be transformed into practical and profitable solutions of an industrial or public company taking client and other stakeholder requirements into consideration
- Can demonstrate insight into the implications of research work, including research ethics

Skills

- Is able to assist in business process innovation – that is simplification, standardisation and automation of business processes across different industries / sectors to benefit stakeholders of companies / public organisations – also using state of the art technology available in use as well as considering the future design of products / services
- Is able to analyse and solve technical and organizational as well as human issues with relation to business processes of a manufacturing or service facility, including:
    - Formulation of operational objectives for the performance of a manufacturing and service facility
    - Development of solutions for improving a manufacturing and service facility based on the analysis
    - Performance of a cost-benefit or sensitivity analysis of solutions in relation to the defined operational performance criteria
    - Development of a requirements specification for a manufacturing and service system through an analysis of customer and stakeholder needs
    - Development of solution concepts that satisfy the requirements specification
    - Identification of critical elements of proposed solution concepts
- Is able to identify and explain commercial and financial cost-benefits of a proposed solution
- Is able to assess limitations of the concepts, theories and methodologies applied in solution of a problem
- Is able to scout for new products, services or manufacturing and service operations technologies

Competencies

- Is able to analyse any given manufacturing and service system and prescribe measures to improve the efficiency or quality of the facility
- Is able to interact and communicate with the participants involved in the design, development and operation of manufacturing and service systems
- Is able to professionally participate in development of new products and services and their related operations systems, focusing on evaluation, selection and implementation of relevant simplification and standardisation efforts and modern automation technologies
- Is able to participate in technological and organisational innovation activities
- Is able to work independently with a project on a specific problem within his/her field of interest at the highest possible level within his/her specialisation.
- Can independently take responsibility for own professional development and specialisation.

Chapter 3: Content and Organisation of the Programme

The Master's programme in Global Systems Design aims at providing graduates with competences to solve complex manufacturing and service operations related problems and has been developed to build both theoretical understanding and practical experience of students enrolled in the programme. The programme focuses on topics as: System thinking and design, Product and Service Design, Manufacturing and Service Operations Design, Automation, Intelligent and Digital Manufacturing, Advanced Engineering Optimization, Applied Statistics and Stochastics, Lean- Six Sigma and Project management of business improvement projects. Those topics can be applied across industrial sectors in relation to simplify, standardize and automate products and services of everything from classical manufacturing to service production, e.g. health care of patients.

The programme is structured giving the graduate the opportunity to specialise within specific areas; ranging from e.g. Product and service design, Automation and Robotics, Manufacturing and Service Operations Improvement etc. The specialisation is carried out through the project work.

The programme is structured in modules and organised as a problem-based study. A module is a programme element or a group of programme elements which aim to give students a set of professional skills within a fixed time frame specified in ECTS credits, and concluding with one or more examinations within specific exam periods defined in the curriculum.

The programme is based on a combination of academic, problem-oriented and interdisciplinary approaches and organised based on the following work and evaluation methods that combine skills and reflection:

- Lectures
- Classroom instruction
- Project work
- Workshops
- Exercises (individually and in groups)

- Teacher feedback
- Reflection
- Portfolio work.

The 3rd semester offers different ways of organisation – depending on the student's choice of content; traditional project work at Aalborg University, study visit at an educational institution in Denmark or abroad, voluntary internship with project work at a company in Denmark or abroad, or a semester programme that comprises cross-disciplinary programme elements composed by the student. The total work load of the semester must be equivalent to 30 ECTS, of which up to 15 ECTS may be elective courses. The project may be finalised with a project report or in the form of a scientific paper, or, if the project is continued on the 4th semester, with a midterm evaluation. For further information about the organisation of the module, please see the Framework Provisions, chapter 9.4.1., and the programme's study guide.

On the 4th semester, the Master's Thesis is completed. The Master's Thesis may be combined with the 3rd semester in an extended Master's Thesis.

3.1 Overview of the Programme

All modules are assessed through individual grading according to the 7-point scale *or* Pass/Fail. All modules are assessed by external examination (external grading) or internal examination (internal grading or by assessment by the supervisor only).

Semester	Module	ECTS	Grading	Exam
1.	Manufacturing and Service Systems – Analysis and Design	15	7-point scale	Internal
	Product and Service Design	5	Passed/failed	Internal
	Process Automation	5	Passed/failed	Internal
	Manufacturing and Service Systems Design	5	Passed/failed	Internal
2.	Manufacturing and Service Systems of the Future	15	7-point scale	External
	Intelligent and Digital Manufacturing and Service Operations	5	Passed/failed	Internal
	Systems Engineering – Analysis and Optimal Design	5	Passed/failed	Internal
	Strategy, Operations and Business Process Improvement	5	Passed/failed	Internal

3.	A	Business Process Simplification, Standardisation and Automation	30	7-point scale[1]	Internal
	B	Scientific Paper[2]	30	7-point scale[3]	Internal
	C	Internship	30	7-point scale	Internal
4.		Master's Thesis[4]	30	7-point scale	External

3.2 Global Systems Design, 1st semester

3.2.1 Manufacturing and Service Systems - Analysis and Design (15 ECTS)

Title: **Manufacturing and Service Systems – Analysis and Design**

(Analyse og udvikling af produktions- og servicesystemer)

Prerequisites: The student must meet the admission requirements described in chapter 2.1

Goal: Students who complete the module are expected to:

Knowledge

- Have an understanding of the basic elements and concepts involved in manufacturing and service operations / systems
- Have an understanding of how the elements interact locally as well as globally
- Have a deep understanding of the interface and structure of a limited manufacturing and service system
- Have attained an understanding for methods of analysing a manufacturing and service system
- Have attained an understanding of how to identify relevant actions and sketch and verify solutions.

Skills

[1] By agreement with the Study Board of Industry and Global Business Development, the project may be reduced to allow for participation in course activities. However, the project must encompass at least 15 ECTS. Proposed course activity is evaluated and tested in accordance with the curriculum in which the course module is described. At least one of chosen course activities must be graded according to the 7-point grading scale.
[2] Scientific paper writing must be equivalent to at least 15 ECTS. Course modules approved by the Study Board for the specific study must supplement to a total of 30 ECTS.
[3] By agreement with the Study Board of Industry and Global Business Development, scientific paper writing may be reduced to allow for participation in course activities. However, the scientific paper must encompass at least 15 ECTS. Proposed course activity is evaluated and tested in accordance with the curriculum in which the course module is described.
[4] The Master's Thesis may be combined with the 3rd semester in an extended Master's Thesis.

- Be able to identify and map causal relations between items such as the equipment, the flexibility of the production and service facility, organisation, economy, the working environment, sustainability and the likes
- Be able to analyse technical and organizational issues with relation to manufacturing and service processes at a facility
- Be able to formulate operational objectives for the performance of a manufacturing and service facility
- Be able to develop solutions for improving a manufacturing and service facility based on an analysis
- Be able to perform a sensitivity analysis of solutions in relation to the defined operational objectives.

Competencies

- Be able to analyse any given manufacturing and service system and to prescribe measures to improve the efficiency of the facility
- Be able to interact and communicate with the participants involved in the design, development and operation of manufacturing and service systems
- Have the foundation to analyse and improve large scale (also global) manufacturing and service systems.

Teaching Method: The module is carried out as group-based, problem-oriented project work. The group work is carried out as an independent work process in which the students themselves organise and coordinate their workload in collaboration with a supervisor. The project is carried out in groups with normally no more than 6 members. The project will be carried out in close collaboration with an industrial company or public organization and will involve practical observations and analysis on site at the specific production and service facility.

Form of examination: Internal, oral examination.

Evaluation criteria: As stated in the Framework Provisions.

3.2.2 Product and Service Design (5 ECTS)

Title: **Product and Service Design**

(Udvikling af produkter og services)

Prerequisites: The student must meet the admission requirements described in chapter 2.1.

Goal: Students who complete the module are expected to:

Knowledge

- Have an understanding of the fundamental principles of product and service design and business / market analysis and innovation
- Have an understanding of the relationship between product and service design and operations (design for manufacturing and automation)
- Have an understanding of product modelling and product configuration and its implications for manufacturing and service operations as well as the larger business community (also taking environmental aspects into account)
- Have an understanding of how various IT tools can be used to support the design and innovation process.

Skills

- Be able to use basic system theory, methods, models and approaches, including the domain theory for design of manufacturing and service systems
- Be able to use product modelling in support of design and as a means of integration
- Be able to use various design for X methods, inclusive user centric or craddle2craddle design methods
- Be able to use systematic methods for specification and development of product / service modules and platforms
- Be able use of different IT tools to represent product / service and production data
- Be able to use relevant IT tools to simulate the performance of the whole or part of manufacturing and service operations.

Competencies

- Have the ability to systematically develop new products and services to be integrated into modern competitive manufacturing and service systems
- Have improved the ability to interact with product and service designers, enabling design for manufacturing / logistics / user / environment etc.

<u>Lecturing topics (application oriented topics):</u>

- The Product development Process
- Design Engineering, and Modularisation
- Service Design and Customer centric design
- Design of Hi-tech / Nano Products
- Design for sustainability / Craddle2Craddle
- Business / Market innovation and analysis
  IT support for Design Engineering (CAD)

Teaching Method: The form(s) of teaching will be determined and described in connection with planning the semester. The description will account for the form(s) of teaching and may be accompanied by an elaboration of the participants' roles. The course/project

theme is performed in either English or Danish dependent of the participants' language skills.

Form of examination: Internal, oral/written examination (for further information, please see the programme's study guide).

Evaluation criteria: As stated in the Framework Provisions.

3.2.3 Process Automation (5 ECTS)

Title: **Process Automation**

(Proces automatisering)

Prerequisites: The student must meet the admission requirements described in chapter 2.1

Goal: Students who complete the module are expected to:

Knowledge

- Have gained an understanding of the different classes of Automation
- Have gained an understanding of automation technologies and material handling – including robots.
- Have gained an understanding of relevant sensor technologies including vision
- Have gained an understanding of highly flexible and integrated automation technologies
- Have gained an understanding of the concepts, methods and tools of software development and computer programming for automation

Skills

- Be able to use tools and methods to analyse an automation system
- Be able to analyse a company's automation hardware
- Be able to analyse the automation process using statistical methods

Competencies

- Have gained the insight and tools necessary to analyse automation technologies
- Have gained awareness and a holistic understanding of the automation technology and their interactions the entire production process and running a business facility.

<u>Lecturing topics (fundamentals topics):</u>

- Automation Classes (Numerical control, Programmable automation, Flexible automation, Fix/bang-bang automation + PLC)
- Automation Technologies (Sensors, incl. Vision, Actuators + Robots)
- Material Handling + Transport
- Software development and computer programming for automation

Teaching Method: The form(s) of teaching will be determined and described in connection with planning the semester. The description will account for the form(s) of teaching and may be accompanied by an elaboration of the participants' roles. The course/project theme is performed in either English or Danish dependent of the participants' language skills.

Form of examination: Internal, oral/written examination (for further information, please see the programme's study guide).

Evaluation criteria: As stated in the Framework Provisions.

3.2.4 Production and Service Systems Design (5 ECTS)

Title: **Manufacturing and Service Systems Design**

(Udvikling af produktions- og servicesystemer)

Prerequisites: The student must meet the admission requirements described in chapter 2.1

Goal: Students who complete the module are expected to:

Knowledge

- Have gained understanding of the problem based learning method, fundamentals of philosophy of science and quantitative and qualitative research methods typically applied within the education and related research areas
- Have gained an in-depth understanding of concepts, theories and methods for analysis and design of Manufacturing and Service systems – also technologies enabling this work process
- Have gained knowledge about individual elements of a manufacturing and service system – i.e. core processes, technology, layout, organization, production planning and control systems, quality management, IT applications, measurements of performance, reward and salary systems etc
- Have gained knowledge of the importance of a holistic approach to design of manufacturing and service systems – emphasizing integration and coherence of all individual elements

- Have gained an understanding of modelling and simulation of business processes, through discrete event simulation techniques and software (SAS JMP, Promodel etc.)

Skills

- Be able to do problem based project work during the education
- Be able to reflect critically on own work and research done or knowledge provided within disciplines of the education
- Be able to use of the concepts, theories and methods taught to design of specific manufacturing and service systems
- Be able to use relevant technologies and systems in solving specific inventory and capacity planning and control problems in practice as well as substantiate economic optimal solutions
- Be able to communicate such problems and solution models to other participants in development projects.

Competences

- Be able to apply knowledge and skills in relation to complex manufacturing and service systems analysis and design projects
- Be able to contribute constructively and professionally in multidisciplinary projects
- Be able to identify personal needs for additional learning and an appropriate approach.

<u>Lecturing topics (application oriented topics):</u>

- Introduction to Problem Based Learning
- Philosophy of Science and Research methods
- Systems and Process thinking
- Process Modeling and Discrete Event Simulation (Use and understanding of statistical software as SAS JMP included)
- Operations and Service Management
- Planning and control (capacity and inventory man) and ERP systems

Teaching Method: The form(s) of teaching will be determined and described in connection with planning the semester. The description will account for the form(s) of teaching and may be accompanied by an elaboration of the participants' roles. The course/project theme is performed in either English or Danish dependent of the participants' language skills.

Form of examination: Internal, oral/written examination (for further information, please see the programme's study guide).

Evaluation criteria: As stated in the Framework Provisions.

3.3 Global Systems Design, 2nd semester

3.3.1 Manufacturing and Service Systems of the Future (15 ECTS)

Title: **Manufacturing and Service Systems of the Future**

(Fremtidens produktions- og servicesystemer)

Prerequisites: 1st semester of the Master's programme in the Global Systems Design or the like.

Goal: Students who complete the module are expected to:

Knowledge

- Understand the fundamental principles of manufacturing and service operations of the future
- Have an understanding of the relationship between product / service design and manufacturing or service operations design
- Understand strategic design of product / services and operations in a global context
- Understand the use of modern / advanced modelling, calculation and simulation tools with regards to analysis and solution design and evaluation of solutions for manufacturing and service systems
- Understand the use of state-of-art approaches, tools and techniques applied across industries for simplification, standardisation and automation of business processes
- Understanding methods for managing improvement projects and stakeholders as well as enablers / barriers for implementation success
- Understand the assumptions and limitations of the theories, methods and tools used in a project.

Skills

- Be able to develop a requirements specification for a competitive manufacturing and service system of the future through an analysis of customer and stakeholder needs
- Be able to develop (strategic) solution concepts that satisfy the requirement specification developed
- Be able to transform strategic / tactical solutions designed into operational or realizable processes and technologies leading to further simplification, standardisation and automation of business processes
- Be able to identify critical elements of proposed solution concepts.
- Be able to use appropriate approached, theories, modelling, calculation and simulation tools for developing solutions

- Be able to plan and management business improvement project's dealing with design of products / services and / or manufacturing and service systems.

Competencies

- Be able to professionally participate in the development of new products / services and manufacturing / services systems, focusing on the analysis, design, evaluation, selection and implementation of relevant technologies
- Establish the foundation for applying advanced and relevant approaches, tools and techniques, particularly supported by relevant software and applications to challenges related to creating manufacturing and service systems of the future.

Teaching Method: The module is carried out as group-based, problem-oriented project work. The group work is carried out as an independent work process in which the students themselves organise and coordinate their workload in collaboration with a supervisor. The project is carried out in groups with normally no more than 6 members.

Form of examination: Oral examination with participation of an external examiner.

Evaluation criteria: As stated in the Framework Provisions.

3.3.2 Intelligent and Digital Manufacturing and Service Operations (5 ECTS)

Title: **Intelligent and Digital Manufacturing and Service Operations**

(Intelligente og digitale produktions- og servicesystemer)

Prerequisites: 1st semester of the Master's programme in the Global Systems Design or the like.

Goal: Students who complete the module are expected to:

Knowledge

- Have gained an understanding of different approaches and techniques for digital production preparation
- Have gained an understanding of relevant technologies enabling the design of intelligent machines (artificial intelligence)
- Have gained an understanding of advanced sensor technologies including vision
- Have gained an understanding of advanced flexible automation technologies in manufacturing and service
- Have gained an understanding of databases, Business Intelligence and Data Warehouse / mining technologies
- Have gained understanding of options for integrating PLC, MES and ERP applications of companies

- Have gained an understanding of the business potential of intelligent manufacturing and service operations.

Skills

- Be able to use various digital simulation tools to test the automation approach against a model
- Be able to use various technologies to provide manufacturing and service systems with intelligent capabilities (reasoning, knowledge, planning, learning, communication, perception and the ability to move and manipulate objects)
- Be able to integrate and implement intelligent machines as well as performance monitoring systems into a small and limited manufacturing system.

Competencies

- Have the foundation to participate in projects aiming at designing, modelling and simulating (intelligent) automation systems.

Lecturing topics (application oriented topics):

- Digital Modeling and Simulation of automation (Robot + CNC simulation, Virtual commissioning: test code against model, Ergonomic Simulation)
- Integration of PLC, MES and ERP systems
- Data bases, Business Intelligence and Data Warehouse technologies
- Digital solutions and virtual environments
- Outlook on "Advanced Robotics, Advanced vision and design of intelligent systems"

Teaching Method: The form(s) of teaching will be determined and described in connection with planning the semester. The description will account for the form(s) of teaching and may be accompanied by an elaboration of the participants' roles. The course/project theme is performed in either English or Danish dependent of the participants' language skills.

Form of examination: Internal, oral/written examination (for further information, please see the programme's study guide).

Evaluation criteria: As stated in the Framework Provisions.

3.3.3 System Engineering – Analysis and Optimal Design (5 ECTS)

Title: **System Engineering – Analysis and Optimal Design**

(Avanceret analyse og optimering af systemer)

Prerequisites: 1st semester of the Master's programme in the Global Systems Design or the like.

Goal: Students who complete the module are expected to:

Knowledge

- Have gained an in-depth understanding of important concepts and methods of operations research and optimisation for efficient solution of optimisation problems within different areas of engineering, including design and manufacturing and service system optimisation.
- Have gained an in-depth understanding of statistical analysis and methods of quality or process control to be applied in manufacturing and service systems

Skills

- Have developed skills and expertise in the formulation of operations research and optimization problems to be solved applied well developed techniques and software
- Have developed skills and expertise in the modelling as well as optimisation of advanced engineering problems of product / service design as well as manufacturing /and service systems, and selecting or developing appropriate techniques for numerical solutions to such problems.
- Have developed skills for displaying process performance and quality levels of business processes with control charts in manufacturing and service systems, as well as doing validating quality of measurement systems and sampling of process data
- Have developed skills for validating scale and impact of root causes / options for problem solving on business processes of manufacturing and service systems and their performance through use inferential statistics and similar methods
- Have been trained in use of standard statistical software as SAS JMP, R and O or Minitab

Competencies

- Be able to apply the concepts, theories and methods for solution of operations and optimisation problems
- Be able to account for the considerations involved in the process of formulating and modelling an engineering optimisation problem, choosing an advantageous method of solution and implementing it in practice.
- Be able to apply methods for measurement system analysis, sampling of process data quality, statistical quality and process control and inferential statistics on problems related to design of products / services and their industrial / business process performance

Lecturing topics (fundamentals topics):

- Applied Operations Research (Management Science, Forecasting, Optimization and Scheduling, e.g. LP and DP)
- Statistical Quality Control, SPC
- Advanced Statistics (Design for Six Sigma)
- Extended use of statistical software, e.g. SAS JMP, R and / or Minitab

Teaching Method: The form(s) of teaching will be determined and described in connection with planning the semester. The description will account for the form(s) of teaching and may be accompanied by an elaboration of the participants' roles. The course/project theme is performed in either English or Danish dependent of the participants' language skills.

Form of examination: Internal, oral/written examination (for further information, please see the programme's study guide).

Evaluation criteria: As stated in the Framework Provisions.

3.3.4 Manufacturing Systems – Strategy, Operations and System Intelligence (5 ECTS)

Title: **Strategy, Operations and Business Process Improvement**

(Strategi, produktion og procesforbedringer)

Prerequisites: 1st semester of the Master's programme in the Global Systems Design or the like.

Goal: Students who complete the module are expected to:

Knowledge

- A coherent and profound understanding of approaches, tools and techniques of business process Business Process Excellence, Lean, Six Sigma, TPM, TQM to be used for continuous simplification, standardization, automation and improvement of business processes in industry and service organizations
- An understanding of Supply Chain Management fundamentals and Value Chain Logistics, as well as Green Logistics and the relevance of these approaches from a manufacturing / service operations perspective
- An understanding of fundamentals of transportation and Supply / Distribution Logistics, inclusive Revenue / Yield Management
- An understanding of concepts and methods for Operations and Business Strategy formulation and implementation
- An understanding of fundamental Organization Theory, Project and change management

- An understanding of basic principles of Accounting, Investments and Financial cost-benefit analysis

Skills

- Developed skills for strategic design of manufacturing and service systems, taking competitive the global context, and opportunities and threats into account
- Developed skills for design and management of supply chains and their internal, as well as supply or distribution or transportation logistics systems and processes
- Developed relevant skills for applying approaches, tools and techniques for business process excellence, i.e. lean-six sigma on specific projects for business process improvement
- Developed skills to do financial cost-benefit analysis, project management and stakeholder management of business improvement projects

Competencies

- Be able to discuss the complex of problems associated with globalisation of manufacturing and service operations to outline the different paths and strategies a company may choose and evaluate costs-benefits of proposed / recommended solutions
- Develop abilities to craft and implement relevant operations and internal as well as external logistics strategies
- Be able to apply knowledge and skills in relation to business process excellence (Lean-Six Sigma, TPM, TQM) on specific business process improvement projects running in a manufacturing or service organisation.
- Develop abilities to do project and stakeholder management of business improvement projects in own organization

<u>Lecturing topics (application oriented topics):</u>

- Business Process Excellence, Lean, Six Sigma, TPM, TQM
- SCM and Value Chain Logistics, Green Logistics
- Transportation and Supply / Distribution Logistics, including Revenue / Yield Management
- Operations and Business Strategy formulation and implementation
- Organization Theory, Project and change management
- Fundamentals of Accounting, Investments and Financial cost-benefit analysis

Teaching Method: The form(s) of teaching will be determined and described in connection with planning the semester. The description will account for the form(s) of teaching and may be accompanied by an elaboration of the participants' roles. The course/project theme is performed in either English or Danish dependent of the participants' language skills.

Form of examination: Internal, oral/written examination (for further information, please see the programme's study guide).

Evaluation criteria: As stated in the Framework Provisions.

3.4 Global Systems Design, 3rd semester

3.4.1 Business Process Simplification, Standardisation and Automation (30 ECTS)

Title: **Business Process Simplification, Standardisation and Automation**

(Simplificering, standardisering og automatisering af forretningsprocesser)

Prerequisites: 2nd semester of the Master's programme in Global Systems Design or the like.

Goal: Students who complete the module are expected to:

Knowledge

- Be able to understand and do business process innovation, i.e. simplification, standardisation and automation – perhaps through redesign of products / services in a selected company / organization / industry
- Above with the purpose of improvement business profitability, competitiveness and societal value of products / services
- Have an in-depth knowledge of how specific manufacturing and service technologies can enable business product improvements and competitive advantage.

Skills

- Be able to use product / services or business process innovation models in the solution of an industrial problem
- Be able to perform an assessment of different options to solve the problem
- Be able to explain the commercial / financial and societal impact of the proposed solution
- Be able to assess the limitations of the concepts, theories and methodologies applied in the solution of the problem
- Be able to scout for new products / services, materials or technologies of business benefit.

Competencies

- Be able to participate in business innovation and improvement activities.
- The 3rd semester may be utilized to achieve competencies comparable to a Lean-Six Sigma Green Belt / Black Belt level if carried out in collaboration with an external company including.

Organisation: Dependent on student's choice of content and organisation of the semester; the student may choose between project work at Aalborg University or a voluntary internship at a company (projektorienteret forløb) in Denmark or abroad. The total work load of the semester must be equivalent to 30 ECTS. If carried out at

Aalborg University, the project may be finalised with a project report or in the form of a scientific paper (Artikel af videnskabelig karakter). If continued on the 4th semester, the project is evaluated with a midterm evaluation. For further information about the organisation of the module please see the Framework Provisions, chapter 9.4.1., and read further in the study guide).

Teaching Method: Dependent on student's choice of content and organisation of the semester;

- If the semester is carried out as an internship, the student is included in the company's daily work. Concurrent to the work in the company, the student makes a report which is evaluated after ending the internship;
- The project work is carried out as an independent work process in which the students themselves organise and coordinate their workload in collaboration with a supervisor. The project may be carried out individually or in groups.

Form of examination: Internal, oral examination (for further information, please see the programme's study guide).

Evaluation criteria: As stated in the Framework Provisions.

3.5 Global Systems Design, 4th semester

3.5.1 Master's Thesis (30 ECTS)

Title: **Master's Thesis**

(Kandidatspeciale)

Prerequisites: Successful conclusion of the first three semesters of the Master's programme in Global Systems Design. Exemptions to this rule can be given, but only by decision of the Study Board of Industry and Global Business Development.

Goal: Students who complete the module are expected to:

Knowledge

- Be able to acquire new knowledge required to solve an industrial or scientific problem within manufacturing and service operations.

Skills

- Be able to demonstrate engineering and/or scientific skills within the line of specialisation and to display their ability to perform engineering and/or scientific work.

Competences

- Be able to work independently with a project on a specific problem within their field of interest on the highest possible level within their specialisation.

Teaching Method: The project is normally performed in small groups of two or three members or individually.

Form of examination: Oral examination with participation of an external examiner.

Evaluation criteria: As stated in the Framework Provisions.

Chapter 4: Entry into Force, Interim Provisions and Revision

The curriculum is approved by the Dean of the Faculty of Engineering and Science and enters into force as of September 2012.

In accordance with the Framework Provisions and the Handbook on Quality Management for the Faculties of Engineering, Science and Medicine at Aalborg University, the curriculum must be revised no later than 5 years after its entry into force.

Chapter 5: Other Provisions

5.1 Rules concerning Written Work, including the Master's Thesis

In the assessment of all written work, regardless of the language in which it is written weight is also put on the student's spelling and formulation ability, in addition to the academic content. Orthographic and grammatical correctness as well as stylistic proficiency are considered basis for the evaluation of language performance. Language performance must always be included as an independent dimension of the total evaluation. However, no examination can be assessed as 'Pass' on the basis of language performance alone; similarly, an examination cannot normally be assessed as 'Fail' on the basis of poor language performance alone. The Board of Studies can grant exemption from this in special cases (e.g., dyslexia or a native language other than Danish).

The Master's Thesis must include an English summary.[5] If it is written in English, the summary must be in Danish.[6] The summary must be at least one page and maximum two pages. The summary is included in the evaluation of the project as a whole.

5.2 Rules concerning Credit Transfer (*merit*), including the Possibility for Choice of Modules that are Part of Another Programme at a University in Denmark or Abroad

In the individual case, the Board of Studies can approve successfully completed (passed) programme elements from other Master programmes in lieu of programme elements in this programme (credit transfer). The Board of Studies can also approve successfully completed (passed) programme elements from another Danish programme or a programme outside of Denmark at the same level in lieu of programme elements within this curriculum. Decisions on credit transfer are made by the Board of Studies based on an academic assessment. See the Framework Provisions for the rules on credit transfer.

5.3 Rules for Examinations

The rules for examinations are stated in the Examination Policies and Procedures published by the Faculty of Engineering and Science on their website.

[5] Or another foreign language (upon approval from the Board of Studies).
[6] The Board of Studies can grant exemption from this.

5.4 Exemption

In exceptional circumstances, the Board of Studies can grant exemption from those parts of the curriculum that are not stipulated by law or ministerial order. Exemption regarding an examination applies to the immediate examination.

5.5 Additional Information

The current version of the curriculum is published on the Board of Studies' website, including more detailed information about the programme and exams.

5. 6 Completion of the Master Programme

The Master programme must be completed no later than four years after it was begun.

5. 7 Rules and Requirements concerning the Reading of Texts in Foreign Languages and a Statement of the Foreign Language Knowledge this Assumes

It is assumed that the student is able to read academic texts in modern Danish, Norwegian, Swedish and English and use reference works, etc., in other European languages.

5.8 Revision of the curriculum

The curriculum has been revised in November 2014. The Danish designation cand.scient.techn. i globalt systemdesign has changed to cand.tech. i globalt systemdesign.