AALBORG UNIVERSITET

MASTER OF SCIENCE (MSC) IN ENGINEERING (MECHANICAL ENGINEERING) 2019

MASTER OF SCIENCE (MSC) IN ENGINEERING
AALBORG

Link to this studyline

Link(s) to other versions of the same line:

Master of Science (MSc) in Engineering (Mechanical Engineering), 2020
Curriculum for the Master's Programme in Mechanical Engineering, 2022
Curriculum for the Master's Programme in Mechanical Engineering, 2024

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§ 1: PREFACE

Pursuant to consolidation Act 172 of February 27, 2018 on Universities (the University Act) with subsequent changes, the following curriculum for the Master's program in Mechanical Engineering is stipulated. The programme also follows the Joint Programme Regulations and the Examination Policies and Procedures for the The Faculty of Engineering and Science.

The Master of Science programme in Mechanical Engineering is a two-year education which contains in total 3 specialisations within the areas of mechanical, electro-mechanical and manufacturing engineering:

- Design of Mechanical Systems
- Electro-Mechanical System Design
- Manufactuing Technology

§ 2: BASIS IN MINISTERIAL ORDERS

The Master's programme is organised in accordance with the Ministry of Higher Education and Science's Order no. 1328 of November 15, 2016 on Bachelor's and Master's Programmes at Universities (the Ministerial Order of the Study Programmes) with subsequent changes and Ministerial Order no. 1062 of June 30, 2016 on University Examinations (the Examination Order) with subsequent changes. Further reference is made to Ministerial Order no. 106 of February 12, 2018 (the Admission Order) and Ministerial Order no. 114 of February 3, 2015 (the Grading Scale Order).

§ 3: CAMPUS

The programme is offered in Aalborg.

§ 4: FACULTY AFFILIATION

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

§ 5: STUDY BOARD AFFILIATION

The Master's programme falls under the Study Board of Mechanical Engineering and Physics.

§ 6: AFFILIATION TO CORPS OF EXTERNAL EXAMINERS

The Master's programme is associated with the external examiners corps on Nationwide engineering examiners/Machine.

§ 7: ADMISSION REQUIREMENTS

Applicants with a legal claim to admission (retskrav):

- Bachelor of Science in Mechanical Engineering and Manufacturing, Aalborg University (Aalborg)

Applicants without legal claim to admission:
Applicants with one of the following degrees are entitled to admission:

- Bachelor of Science in Mechanical Engineering, Aalborg University (Aalborg)
- Bachelor of Science in Mechanical Engineering, Aalborg University (Esbjerg)
- Bachelor of Science in Engineering (Mechanical Engineering), Technical University of Denmark

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

§ 8: THE PROGRAMME TITLE IN DANISH AND ENGLISH

The Master's programme entitles the graduate to one of the following titles:

- Civilingeniør, cand.polyt.i mekanik og produktion med specialisering i design af mekaniske systemer. The English designation is: Master of Science (MSc) in Engineering (Mechanical Engineering) with specialization in design of mechanical systems.
- Civilingeniør, cand.polyt.i mekanik og produktion med specialisering i elektro-mekanisk system design. The English designation is: Master of Science (MSc) in Engineering (Mechanical Engineering) with specialization in electro-mechanical system design.
- Civilingeniør, cand.polyt.i mekanik og produktion med specialisering i virksomhedsteknologi. The English designation is: Master of Science (MSc) in Engineering (Mechanical Engineering) with specialization in manufacturing technology.

§ 9: PROGRAMME SPECIFICATIONS IN ECTS CREDITS

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

§ 10: 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

The Study Board can approve that passed programme elements from other educational programmes at the same level replaces programme elements within this programme (credit transfer).

Furthermore, the Study Board can, upon application, approve that parts of this programme is completed at another university or a further education institution in Denmark or abroad (pre-approval of credit transfer).

The Study Board's decisions regarding credit transfer are based on an academic assessment.

§ 11: EXEMPTIONS

The Study Board's possibilities to grant exemption, including exemption to further examination attempts and special examination conditions, are stated in the Examination Policies and Procedures published at this website: https://www.studyservice.aau.dk/rules

§ 12: RULES FOR EXAMINATIONS

The rules for examinations are stated in the Examination Policies and Procedures published at this website: https://www.studyservice.aau.dk/rules

§ 13: RULES CONCERNING WRITTEN WORK, INCLUDING THE MASTER'S THESIS

In the assessment of all written work, regardless of the language it is written in, weight is also given to the student's formulation and spelling ability, in addition to the academic content. Orthographic and grammatical correctness as well as stylistic proficiency are taken as a 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 good language performance alone; similarly, an examination normally cannot be assessed as 'Fail' on the basis of poor language performance alone.

The Study Board 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. If the project is written in English, the summary can be in Danish. The summary is included in the evaluation of the project as a whole.

§ 14: REQUIREMENTS REGARDING THE READING OF TEXTS IN A FOREIGN LANGUAGE

At programmes taught in Danish, it is assumed that the student can read academic texts in modern Danish, Norwegian, Swedish and English and use reference works, etc., in other European languages At programmes taught in English, it is assumed that the student can read academic text and use reference works, etc., in English.

§ 15: COMPETENCE PROFILE ON THE DIPLOMA

The following competence profile will appear on the diploma:

A Candidatus graduate has the following competency profile:

A Candidatus graduate has competencies that have been acquired via a course of study that has taken place in a research environment.

A Candidatus graduate is qualified for employment on the labour market based on his or her academic discipline as well as for further research (PhD programmes). A Candidatus graduate has, compared to a Bachelor, developed his or her academic knowledge and independence so as to be able to apply scientific theory and method on an independent basis within both an academic and a professional context.

§ 16: COMPETENCE PROFILE OF THE PROGRAMME

The graduate of the Master's programme:

Knowledge

- Has attained thorough understanding of a broad range of theoretical, numerical and experimental techniques within the area of mechanical engineering.
- Have knowledge on a scientific basis to reflect over subject areas related to mechanical engineering and identify scientific problems within the area of mechanical engineering.
- Demonstrate insight into the implications of research work, including research ethics.

Students with specialization in Electro Mechanical System Design have:

- Additional knowledge in one or more selected areas within electro mechanical system design, based on the highest level of international research.
- Understanding and, on a scientific basis, are able to reflect over the subject areas related to electro mechanical system design and identify scientific problems within that area.
- Understanding of the basic elements and concepts involved in designing electro mechanical systems and components, and how they interact in a synergistic way.

Students with specialization in Design of Mechanical Systems have:

- Additional knowledge in one or more subject areas within mechanical system design, based on the highest level of international research.
- Understanding and, on a scientific basis, are able to reflect over the subject area related to mechanical system design and identify scientific problems within that area.
- Understanding of the basic elements and concepts involved in designing mechanical systems and components, and how they interact in a synergistic way.

Students with specialization in Manufacturing Technology have:

- Additional knowledge in one or more subject areas within manufacturing technology, based on the highest level of international research.
- Understanding and, on a scientific basis, are able to reflect over the subject areas related to manufacturing technology and identify scientific problems within that area.
- Understanding of the relationship between product design and manufacturing.
- The ability to use innovation models which speed up the innovation process, reduce the risk of failure and/or improve the business or societal value.

Skills

- Are able to apply scientific methodology for solving a wide variety of problems within the field of mechanical engineering.
- Are able to perform scientific work in relevant topics in the field of mechanical engineering.
- Are able to apply a wide range of engineering methods in research and development projects in the field of mechanical engineering.
- Can evaluate and select among scientific theories, methods, tools and general skills and, on a scientific basis, advance new analyses and solutions within mechanical engineering.
- Can communicate research-based knowledge and discuss professional and scientific problems with peers as well as non-specialists, using the correct terminology in mechanical engineering.
- Can use advanced laboratory test set ups and data collection methods.
- Can apply experimental tests for obtaining input for calibrating computational models and assess uncertainties within mechanical engineering.
- Demonstrate an understanding of research work and be able to become a part of a research environment.

Students with specialization in Electro Mechanical System Design have additional skills in:

- Designing, modelling and analyzing electro-mechanical systems and components.
- Designing and applying both classical and advanced control methods for electro-mechanical systems and components.

Students with specialization in Design of Mechanical Systems have additional skills in:

- Designing, modelling and analyzing mechanical systems and components.
- Designing, modelling and analyzing lightweight structures.
- Designing, modelling and analyzing dynamic systems.

Students with specialization in Manufacturing Technology have additional skills in:

- Analyzing any given manufacturing system and prescribe measures to improve the efficiency of the facility.
- Formulating suitable models to improve either a specific manufacturing process or manufacturing system.

Competencies

- Are able to work independently with a project on a specific problem within their field of interest on the highest possible level within their field of specialization.
- Can, on a highly qualified manner, take part in technical development and research.
- Can manage work and development situations that are complex, unpredictable and require new solutions within their field of specialization.
- Can independently initiate and implement discipline-specific and interdisciplinary cooperation and assume professional responsibility.
- Can identify scientific problems within their field of specialization and select and apply appropriate scientific theories, methods and tools for their solution.
- Are able to direct the technical management of development projects within the industry.
- Are competent to solve new and complicated technical problems by the use of advanced mathematics, scientific and technological knowledge.
- Can independently take responsibility for own professional development and specialization.
- Have the ability to design and evaluate a technical solution.

Students with specialization in Electro Mechanical System design have additional competencies in:

- Are able to participate in or lead projects in electro mechanical system design, product development, modelling and analysis of electro mechanical systems.

Students with specialization in Design of Mechanical Systems have additional competencies in:

- Are able to participate in or lead projects in mechanical system design, product development, modelling and analysis of mechanical systems, materials technology, structural mechanics and design of lightweight structures.

Students with specialization in Manufacturing Technology have additional competencies in:

- Are able to participate in or lead projects in manufacturing system design, product development, modeling and analysis of manufacturing processes and systems, or materials technology

§ 17: STRUCTURE AND CONTENTS OF THE PROGRAMME

The M.Sc. program in Mechanical Engineering aims at educating graduates, who are qualified to take part in technical development and research and who are able to direct the technical management of development projects within the industry.

The graduates are expected to have gained a broad knowledge within the areas of mechanical system design, product development, modelling and analysis of mechanical systems, materials technology, production technology, structural mechanics and design of lightweight structures. Also, the graduates are expected to be competent to solve new and complicated technical problems by the use of advanced mathematics, scientific and technological knowledge.

The program is structured in modules and organized as a problem-based study. A module is a program element or a group of program elements, which aims 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 that are defined in the curriculum.

The program is based on a combination of academic, problem-oriented and interdisciplinary approaches and organized 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

AAU Micro
AAU Micro are small e-learning modules of limited, well-defined scope. AAU Micro modules are extra-curricular but may be employed to support learning in curricular course and project modules.

§ 18: 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).

Overview of specializations

Offered as: 1-professional Specialisation: Design of Mechanical Systems						
Module name	Course type	ECTS	Applied grading scale	Evaluation method	Assessment method	Language
1 SEMESTER						
System Analysis and Modelling (M-ME-K1-1)	Project	15	7-point grading scale	Internal examination	Oral exam based on a project	English
Finite Element Methods (M-ME-K1-2)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Solid Mechanics with Microstructure (M-DMS-K1-3)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Fracture Mechanics and Fatigue (M-DMS-K1-4)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
2 SEMESTER						
System Design (M-ME-K2-1)	Project	15	7-point grading scale	External examination	Oral exam based on a project	English
Engineering Optimization – Concepts, Methods and Applications (M-DMS-K2-2)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Mechanics of Composite Materials and Structures	Course	5	7-point grading scale	Internal examination	Written or oral exam	English

(M-DMS-K2-3)						
Energy and Variational Methods with Applications (M-DMS-K2-4)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
3 SEMESTER Option A						
Industrial Development (M-ME-K3-1)	Project	30	7-point grading scale	Internal examination	Oral exam based on a project	English
3 SEMESTER Option B						
Industrial Development (M-ME-K3-2)	Project	25	7-point grading scale	Internal examination	Oral exam based on a project	English
Elective courses - Mechanical Engineering	Course	5				
3 SEMESTER Option C						
Project Oriented Study in an External Organisation (M-ME-K3-4)	Project	30	7-point grading scale	Internal examination	Oral exam based on a project	English
3 SEMESTER Option D						
Project Oriented Study in an External Organisation (M-ME-K3-3)	Project	25	7-point grading scale	Internal examination	Oral exam based on a project	English
Elective courses - Mechanical Engineering	Course	5				
4 SEMESTER						
Master's Thesis (M-ME-K4-1)	Project	30	7-point grading scale	External examination	Master's thesis/final project	English

Offered as: 1-professional

Specialisation: Electro-Mechanical System Design

Module name	Course type	ECTS	Applied grading scale	Evaluation method	Assessment method	Language
1 SEMESTER						
System Analysis and Modelling (M-ME-K1-1)	Project	15	7-point grading scale	Internal examination	Oral exam based on a project	English
Finite Element Methods (M-ME-K1-2)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Control of Fluid Power and Electrical Servomechanisms (N-EMSD-K1-2)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Embedded Micro Processors: Applications and C Programming (N-EMSD-K1-3)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
2 SEMESTER						

System Design (M-ME-K2-1)	Project	15	7-point grading scale	External examination	Oral exam based on a project	English
Engineering Optimization – Concepts, Methods and Applications (M-DMS-K2-2)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Multi Variable Control (N-EE-K2-11B)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
AC Motor Drives: Converters and Control (N-EMSD-K2-4)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
3 SEMESTER Option A						
Industrial Development (M-ME-K3-1)	Project	30	7-point grading scale	Internal examination	Oral exam based on a project	English
3 SEMESTER Option B						
Industrial Development (M-ME-K3-2)	Project	25	7-point grading scale	Internal examination	Oral exam based on a project	English
Elective courses - Mechanical Engineering	Course	5				
3 SEMESTER Option C						
Project Oriented Study in an External Organisation (M-ME-K3-4)	Project	30	7-point grading scale	Internal examination	Oral exam based on a project	English
3 SEMESTER Option D						
Project Oriented Study in an External Organisation (M-ME-K3-3)	Project	25	7-point grading scale	Internal examination	Oral exam based on a project	English
Elective courses - Mechanical Engineering	Course	5				
4 SEMESTER						
Master's Thesis (M-ME-K4-1)	Project	30	7-point grading scale	External examination	Master's thesis/final project	English

Offered as: 1-professional

Specialisation: Manufacturing Technology

Module name	Course type	ECTS	Applied grading scale	Evaluation method	Assessment method	Language
1 SEMESTER						
System Analysis and Modelling (M-ME-K1-1)	Project	15	7-point grading scale	Internal examination	Oral exam based on a project	English
Technology and Operations Management (M-MT-K1-3)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Design for Manufacturing (M-MT-K1-4)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English

Electives VT1 Electives VT1	Course	5				
2 SEMESTER						
System Design (M-ME-K2-1)	Project	15	7-point grading scale	External examination	Oral exam based on a project	English
Engineering Optimization – Concepts, Methods and Applications (M-DMS-K2-2)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Product Development and Modelling (M-MT-K2-4)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Electives VT2 Electives VT2	Course	5				
3 SEMESTER Option A						
Industrial Development (M-ME-K3-1)	Project	30	7-point grading scale	Internal examination	Oral exam based on a project	English
3 SEMESTER Option B						
Industrial Development (M-ME-K3-2)	Project	25	7-point grading scale	Internal examination	Oral exam based on a project	English
Elective courses - Mechanical Engineering	Course	5				
3 SEMESTER Option C						
Project Oriented Study in an External Organisation (M-ME-K3-4)	Project	30	7-point grading scale	Internal examination	Oral exam based on a project	English
3 SEMESTER Option D						
Project Oriented Study in an External Organisation (M-ME-K3-3)	Project	25	7-point grading scale	Internal examination	Oral exam based on a project	English
Elective courses - Mechanical Engineering	Course	5				
4 SEMESTER						
Master's Thesis (M-ME-K4-1)	Project	30	7-point grading scale	External examination	Master's thesis/final project	English

Electives VT1
Electives VT1

Module name	Course type	ECTS	Applied grading scale	Evaluation Method	Assessment method	Language
Finite Element Methods (M-ME-K1-2)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Machine Learning (ESNSPAK3K2F)	Course	5	Passed/Not Passed	Internal examination	Written or oral exam	English

Electives VT2 Electives VT2						
Module name	Course type	ECTS	Applied grading scale	Evaluation Method	Assessment method	Language
Robot Vision (M-MT-K2-2)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Digital Manufacturing (M-MT-K2-5)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English

Elective courses for 3rd semester

Elective courses - Mechanical Engineering						
Module name	Course type	ECTS	Applied grading scale	Evaluation Method	Assessment method	Language
Solid Mechanics with Microstructure (M-DMS-K1-3)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Fracture Mechanics and Fatigue (M-DMS-K1-4)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Computational Fluid Dynamics (CFD) and Multiphase Flow (N-EE-K1-7)	Course	5	7-point grading scale	Internal examination	Oral exam	English
Control of Fluid Power and Electrical Servomechanisms (N-EMSD-K1-2)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Embedded Micro Processors: Applications and C Programming (N-EMSD-K1-3)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Technology and Operations Management (M-MT-K1-3)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Design for Manufacturing (M-MT-K1-4)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English

§ 19: ADDITIONAL INFORMATION

All students, who have not participated in Aalborg University's PBL introductory course during their Bachelor's degree, must attend the introductory course "Problem-based Learning and Project Management". The introductory course must be approved before the student can participate in the project exam. Further information about the introductory course can be found at the homepage of the study board of Materials and Production.

The current version of the study curriculum is published on the Aalborg University website for study curricula.

Additional information about semester descriptions is available in Moodle. Moodle provides study-related information, i.e. course descriptions, course literature, timetables and information about activities and events.

§ 20: COMMENCEMENT AND TRANSITIONAL RULES

The curriculum is approved by the Dean of the Faculty of Engineering and Science and enters into force as of September 2019.

§ 21: AMENDMENTS TO THE CURRICULUM AND REGULATIONS

Minor editorial changes have been made in connection with digitisation of the study curriculum.

The Pro-dean has on March 23, 2020, approved that the module "*Test and Validation*" is no longer offered as an elective from September 2020.

The Vice-dean has on November 24, 2023, approved an addition of Micro Modules in section 17, valid from spring 2024.