AALBORG UNIVERSITET

MASTER OF SCIENCE (MSC) IN ENGINEERING (MATERIALS AND NANOTECHNOLOGY), 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 (Materials and Nanotechnology), 2020

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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 Materials and Nanotechnology 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 Materials and Nanotechnology is a two-year education which contains in total two specialisations within the areas of materials and nanophysics:

- Materials Technology
- Nanomaterials and Nanophysics

§ 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/Building.

Furthermore, external examiners from the Nationwide engineering examiners/Machine will be used for the specialization in Materials Technology.

§ 7: ADMISSION REQUIREMENTS

Applicants with a legal claim to admission (retskrav):

- Bachelor of Science in Nanotechnology with specialization in Physics, Aalborg University

Applicants with one of the following degrees are entitled to admission:

- Bachelor of Science in Nanotechnology with specialization in Biotechnology, Aalborg University
- Bachelor of Science in Physics, Aalborg University
- Bachelor of Science in Nanotechnology, Aalborg Univeristy
- Bachelor of Science in Nanoscience, Aarhus University
- Bachelor of Science in Nanoscience, University of Copenhagen
- Bachelor of Science in Physics and Nanotechnology, 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 materiale- og nanoteknologi med specialisering i materialeteknologi. The English designation is: Master of Science (MSc) in Engineering (Materials and Nanotechnology) with specialization in materials technology.
- Civilingeniør, cand.polyt. i materiale- og nanoteknologi med specialisering i nanomaterialer og nanofysik. The English designation is: Master of Science (MSc) in Engineering (Materials and Nanotechnology) with specialization in nanomaterials and nanophysics.

§ 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.studieservice.aau.dk/regler-vejledninger

§ 12: RULES FOR EXAMINATIONS

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

§ 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

Competence profile of the programme

Students graduating with a Master's degree in Material's Technology and Nanotechnology have acquired the following knowledge, skills and competencies:

Knowledge:

- Has attained thorough understanding and can reflect on a scientific level over theory, methods and experiments within the area of materials technology and nanotechnology.
- Demonstrate an understanding of research work and be able to become a part of the research environment.
- Demonstrate insight into the implications of research work, including research ethics.
- Has knowledge on the highest international research level in several subject areas within the fields of materials characterization and processing, synthesis and modeling of materials on different scale, and materials engineering.

Students with specialization in Materials technology have:

- Has attained thorough understanding of a broad range of theoretical and experimental techniques within the area of materials technology.
- Has knowledge on the highest international research level in several subject areas within, within the field of materials technology.

Students with specialization in Nanomaterials and Nanophysics have:

- Has attained thorough understanding of a broad range of theoretical and experimental techniques within the area of nanotechnology.
- Has knowledge on the highest international research level in several subject areas within, within the field of nanotechnology.

Skills:

- Be able to apply a wide range of engineering and scientific methods within relevant topics of materials and nanotechnology.
- Be able to perform scientific work in relevant topics of the field of specialization.
- Can select and apply appropriate theories, methods and tools to solve a wide range of problems within the field of specialization.
- Can communicate research-based knowledge and discuss professional and scientific problems with both peers and nonspecialists.
- Can evaluate and select among scientific theories, methods, tools and general skills and, on a scientific basis, advance new analyses and solutions within materials and nanotechnology.
- Can use advanced laboratory equipment, test setups and data collection methods.

Students with specialization in materials technology have additional skills in:

- Are able to choose an appropriate material for a given application.
- Are able to implement standardized methods for quality control in an industrial environment.
- Can communicate research-based knowledge and discuss professional and scientific problems with both peers and non- specialists.

Students with specialization in nanomaterials and nanophysics have additional skills in:

- Be able to apply specific methods of materials fabrication and characterization on the nanoscale.
- Be able to choose appropriate theoretical approaches for the description and modeling of nanomaterials and nanostructures.

- Can discuss the nanoscale phenomena with peers and non-experts.

Competencies:

- Be able to work independently with a project on a specific problem within their field of interest on the highest possible level within their specialization.
- Be able to take part in technical development and research.
- Can manage work and development situations that are complex, unpredictable and require new solutions.
- Can independently initiate and implement discipline-specific and interdisciplinary cooperation and assume professional responsibility.
- Be competent to solve new and complicated technical problems by the use of advanced mathematic, scientific and technological knowledge.
- Can independently take responsibility for own professional development and specialization

Students with specialization in Materials technology have additional competences in:

- Be able to participate in or lead projects in materials technology, materials selection, product development, and production technology.

Students with specialization in Nanomaterials and Nanophysics have additional competences in:

- Are able to participate in or lead projects involving nanotechnology, semiconductors and / or optical nanostructures.

§ 17: STRUCTURE AND CONTENTS OF THE PROGRAMME

The M.Sc. program in Materials and Nanotechnology 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

§ 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: Materials Technology						
Module name	Course type	ECTS	Applied grading scale	Evaluation method	Assessment method	Language
1 SEMESTER						
Processing and characterization	Project	15	7-point grading scale	Internal examination	Oral exam based on a project	English
Materials Characterization	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Advanced Materials Science and Physical Metallurgy	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Solid Mechanics with Microstructure	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
2 SEMESTER						
Modelling and Characterization within Materials Technology	Project	15	7-point grading scale	External examination	Oral exam based on a project	English
Computational Modeling	Course	5	Passed/Not Passed	Internal examination	Active participation/continuous evaluation	English
Physics and Chemistry of Surfaces	Course	5	7-point grading scale	Internal examination	Oral exam	English
Polymers and Polymer Composites	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
3 SEMESTER Option A						
Materials engineering	Project	30	7-point grading scale	Internal examination	Oral exam based on a project	English
3 SEMESTER Option B						
Materials engineering	Project	25	7-point grading scale	Internal examination	Oral exam based on a project	English
Elective courses - Materials and Nanotechnology	Course	5				
3 SEMESTER Option C						
Project Oriented Study in an External Organisation	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	Project	25	7-point grading scale	Internal examination	Oral exam based on a project	English
Elective courses - Materials and Nanotechnology	Course	5				
4 SEMESTER						

Master's Thesis	Project	30	7-point grading scale	External examination	Master's thesis/final project	English

Offered as: 1-professional Specialisation: Nanomaterilas and Nanophysics						
Module name	Course type	ECTS	Applied grading scale	Evaluation method	Assessment method	Language
1 SEMESTER						
Processing and characterization	Project	15	7-point grading scale	Internal examination	Oral exam based on a project	English
Materials Characterization	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Advanced Materials Science and Physical Metallurgy	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Semiconductors: Physics, Devices and Engineering	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
2 SEMESTER						
Synthesis and Modelling within Nanomaterials and Nanophysics	Project	15	7-point grading scale	External examination	Oral exam based on a project	English
Computational Modeling	Course	5	Passed/Not Passed	Internal examination	Active participation/continuous evaluation	English
Physics and Chemistry of Surfaces	Course	5	7-point grading scale	Internal examination	Oral exam	English
Quantum materials and optical nanostructures	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
3 SEMESTER Option A						
Materials engineering	Project	30	7-point grading scale	Internal examination	Oral exam based on a project	English
3 SEMESTER Option B						
Materials engineering	Project	25	7-point grading scale	Internal examination	Oral exam based on a project	English
Elective courses - Materials and Nanotechnology	Course	5				
3 SEMESTER Option C						
Project Oriented Study in an External Organisation	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	Project	25	7-point grading scale	Internal examination	Oral exam based on a project	English
Elective courses - Materials and Nanotechnology						

4 SEMESTER						
Master's Thesis	Project	30	7-point grading scale	External examination	Master's thesis/final project	English

Elective courses

Elective courses - Materials and Nanotechnology						
Module name	Course type	ECTS	Applied grading scale	Evaluation Method	Assessment method	Language
Fracture Mechanics and Fatigue	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Finite Element Methods	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Solid State Physics II: Electronic Structure	Course	5	7-point grading scale	Internal examination	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 https://www.mp.aau.dk/study-board

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.