AALBORG UNIVERSITET

CURRICULUM FOR THE MASTER OF SCIENCE PROGRAMME IN SUSTAINABLE ENERGY ENGINEERING, 2025

MASTER OF SCIENCE (MSC) IN ENGINEERING
ESBJERG

Link to this studyline

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

Curriculum for the Master of Science (MSc) Programme in Sustainable Energy Engineering 2020
Curriculum for the Master's Programme in Sustainable Energy Engineering, 2022
Curriculum for the Master of Science Programme in Sustainable Energy Engineering, 2023
Curriculum for the Master of Science Programme in Sustainable Energy Engineering, 2024

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§ 1: PREFACE

Pursuant to consolidation Act 391 of April 10, 2024 on Universities (the University Act), the following is established.

The programme also follows the Examination Policies and Procedures incl. the Joint Programme Regulations for Aalborg University.

§ 2: BASIS IN MINISTERIAL ORDERS

The Master's programme is organised in accordance with the Ministry of Higher Education and Science's Order no. 2285 of December 1, 2021 on Full-time University Programmes (the University Programme Order) with subsequent change and Ministerial Order no. 2271 of December 1, 2021 on University Examinations (the Examination Order) with subsequent change. Further reference is made to Ministerial Order no. 69 of January 26, 2023 (the Admission Order) and Ministerial Order no. 1125 of July 4, 2022 (the Grading Scale Order).

§ 3: CAMPUS

The programme is offered in Esbjerg.

§ 4: FACULTY AFFILIATION

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

§ 5: STUDY BOARD AFFILIATION

The Master's programme falls under Study Board of Build, Energy, Electronics and Mechanics in Esbjerg.

§ 6: AFFILIATION TO CORPS OF EXTERNAL EXAMINERS

The Master's programme is associated with the external examiners corps on Civil engineering corps of external examiners.

§ 7: ADMISSION REQUIREMENTS

Applicants with a legal claim to admission (retskrav)

- Bachelor of Science (BSc) in Energy Engineering, Aalborg University, campus Esbjerg

Applicants without a legal claim to admission

- Bachelor of Science (BSc) in Energy Engineering, Aalborg University, campus Aalborg
- Bachelor of Engineering (BE) in Sustainable Energy Engineering, Aalborg University
- Bachelor of Science (BSc) in Applied Industrial Electronics, Aalborg University, campus Esbjerg
- Bachelor of Engineering (BE) in Mechanical Engineering, Aalborg University, campus Esbjerg
- Bachelor of Engineering (BE) in Mechatronics, University of Southern Denmark (SDU), campus Sønderborg
- Bachelor of Science (BSc) in General Engineering, Aalborg University, campus Aalborg

All applicants without a legal claim must prove that their English language qualifications is equivalent to level B (Danish level) in English.

Applicants without a qualifying bachelor's degree

Admission to the master's programme in Sustainable Energy Engineering requires that the applicant has passed a relevant qualifying Bachelor of Science or Bachelor of Engineering degree programme. A Bachelor of Science or Bachelor of Engineering is defined as relevant if the degree programme provides competencies to a minimum of ECTS within the following subject areas:

- Mathematics skills at bachelor's level with a scope of at least 20 ECTS, covering the subjects: calculus, linear algebra, probability, statistics and numerical methods.

- Physics skills at bachelor's level with a scope of at least 10 ECTS, covering the subjects: classical physics and basic electrical subjects, as well as basic knowledge of energy systems
- Competences at bachelor's level with a scope of at least 5 ECTS, covering one or more of the subjects: basic control theory

As a prerequisite for admission to the master's programme, students must have completed a bachelor programme in technical sciences, a bachelor of engineering programme or a bachelor in natural science.

§ 8: THE PROGRAMME TITLE IN DANISH AND ENGLISH

The Master's programme entitles the graduate to the Danish designation Civilingeniør, cand.polyt. i bæredygtig energiteknik med specialisering i offshore energisystemer. The English designation is Master of Science (MSc) in Engineering (Sustainable Energy Engineering with specialisation in Offshore Energy Systems).

Or

The Master's programme entitles the graduate to the Danish designation Civilingeniør, cand.polyt. i bæredygtig energiteknik med specialisering i strømnings- og procesteknik. The English designation is Master of Science (MSc) in Engineering (Sustainable Energy Engineering with specialisation in Fluids and Process Systems).

§ 9: PROGRAMME SPECIFICATIONS IN ECTS CREDITS

The Master of Science programme is a 2-year, research-based, full-time study programme taught in English. 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

It is assumed that the student can read academic texts in English and use reference works, etc., in other European languages.

§ 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 of Science programme has the following qualifications:

Knowledge

- Knowledge about the state of the art of research within their field of specialisation
- Knowledge on a scientific basis to reflect over subject areas related to sustainable energy engineering and identify scientific problems of different types within that area
- Knowledge about and insight into publication ethics in research
- Knowledge about the ethics related to the social, economic and environmental impact of research
- Knowledge and comprehension within innovation and entrepreneurship in relation to project work and courses
- Advanced skills in probability theory and statistics, control theory and simulation technique

In addition, students have the following knowledge:

- The specialisation in Fluids and Process Systems:
  - Advanced knowledge and comprehension within fluids and process systems including conversion, consumption and transport of energy and advanced thermal and fluid systems
  - Understanding of the design, modelling, simulation and optimisation of fluids and process systems used in various energy conversion applications
  - Understanding of the detailed operation, functionality and interactions between the various components of key thermal energy conversion technologies
  - Detailed insight in system integration with respect to both system efficiency and control aspects of energy systems
- The specialisation in Offshore Energy Systems:
  - Advanced knowledge and comprehension within offshore systems
  - Understanding of the design, analyses, modelling, simulation and diagnosis of offshore energy systems used in various energy production applications
  - Comprehension of the detailed operation, functionality and interaction between the various components used in offshore systems, including knowledge about fluid mechanics and flow systems, water wave dynamics, electrical machines and mechanics
  - Detailed insight in system integration with respect to both system efficiency and control engineering aspects of offshore energy systems

Skills

- Be proficient in the scientific methods, tools and general skills related to employment within the subjects of sustainable energy engineering
- Be able to obtain advanced skills in simulation techniques and mathematical methods

- Be able to evaluate and select among the scientific theories, methods, tools and general skills of the subject area(s) and, on a scientific basis, develop new analyses and solutions
- Be able to communicate research-based knowledge and discuss professional and scientific problems with both peers and non-specialists
- Be able to obtain skills which are related to his/her field within sustainable energy engineering
- Be able to use advanced laboratory test set-ups and data collection, storing and processing methods
- Have experience with the application of e-learning methods

In addition, the different specialisations have the following skills:

- The specialisation in Fluids and Process Systems:
  - The ability to develop, construct and understand the operation of thermal energy conversion systems in the laboratory and in real applications
- The specialisation in Offshore Energy Systems:
  - The ability to construct and understand the operation of offshore systems in the laboratory and in real applications

Competences

- Be able to demonstrate an understanding of research work and be able to become a part of the research environment and perform oral and written scientific communication
- Be able to manage work and development in situations that are complex, unpredictable and require new solutions within the area of energy engineering
- Have project manager and project management experience
- Be able to independently initiate and implement discipline-specific and interdisciplinary cooperation and assume professional responsibility, also with external partners
- Be able to work with different kinds of projects like discipline oriented, cross-disciplinary projects, multi-disciplinary projects (where several groups within the department are working together on a larger project, solving different parts of the project; where groups from several departments are involved in a large project contributing each within their specific area for a total solution).
- Be able to independently take responsibility for own professional development and specialisation and be able to collaborate in groups according to the PBL Model

Upon completion of the MSc programme, the student has achieved advanced professional competences in production, distribution and the usage of electrical, thermal and/or mechanical energy together with design and control, modelling and simulation of energy or mechatronic systems. The competences should advance the student's ability to perform in functions within planning, development, consulting and research in Danish as well as international industries or public institutions. Examples could be research and development departments or managing positions in energy supply companies, wind, machine, or process industry together with electro-technical and consultancy companies, etc.

§ 17: STRUCTURE AND CONTENTS OF THE PROGRAMME

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(s) to give students a set of professional skills within a fixed time frame specified in ECTS credits, and concluded with one or more examinations within the specific exam periods. Examination formats are defined in the modules of the present curriculum.

The programme is based on a combination of academic, problem oriented and interdisciplinary approaches and organised on the following types of instruction that combine skills and reflection:

- lectures
- project work
- workshop
- exercises (individually and in groups)
- e-learning in different ways such as flipped class-room, blended learning, game or quiz, etc.
- teacher feedback
- reflection

- portfolio work study circle
- self-study

1st to 4th semesters of the programmes are taught in English and projects are to be written in English.

For students with a bachelor's degree from another university, a basic course is taught to familiarize the students with Problem Based Learning, besides the engineering courses belonging to the specialisation.

On the first semester, the students are required to acquire knowledge about scientific English; the project work will be documented by a scientific paper, a summary report, a poster and a presentation at a conference, all in English.

AAU micro modules

During the study programme, a number of AAU micro modules are offered.

AAU micro modules are small voluntary learning modules within a defined subject. AAU micro modules can be used as supporting learning modules in connection with projects as well as other modules of the study programme.

§ 18: OVERVIEW OF THE PROGRAMME

All modules are assessed through individual grading according to the 7-point grading scale *or* Passed/Not passed. All modules are assessed by the supervisor/lecturer together with an external examiner (external assessment) or with an additional examiner (internal assessment).

Instead of doing the project work and the elective courses on the 3rd semester, the student can do a project-oriented study in an external organisation as an individual or as a part of a group. **However, the student's special preferences for the semester must be approved by the Study Board in advance.**

Offered as: 1-professional Specialisation: Offshore Energy Systems						
Module name	Course type	ECTS	Applied grading scale	Evaluation method	Assessment method	Language
1 SEMESTER						
Modelling and Identification of Offshore Systems (25E-SEE1-1)	Project	15	7-point grading scale	Internal examination	Oral exam based on a project	English
Fluid and Water Wave Dynamics (25E-SEE1-2)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Probability Theory, Stochastic Processes and Applied Statistics (22KMATSPASTA)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
System Identification and Diagnosis (25E-SEE1-3)	Course	5	7-point grading scale	Internal examination	Oral exam	English
2 SEMESTER						
Dynamic Control Of Offshore Energy Systems (25E-SEE2-1)	Project	15	7-point grading scale	External examination	Oral exam based on a project	English
Control and Surveillance of Processes and Systems (25E-SEE2-2)	Course	5	7-point grading scale	Internal examination	Oral exam	English
Multi-body Dynamics (25E-SEE2-3)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Sensing and Automation in Offshore Energy Systems (25E-SEE2-4)	Course	5	7-point grading scale	Internal examination	Oral exam	English

3 SEMESTER Option A						
Advanced Topics Within Sustainable Energy Engineering (25E-SEE3-1)	Project	20	7-point grading scale	Internal examination	Oral exam based on a project	English
Elective courses 3rd Semester MSc Two courses must be chosen	Course	10				
3 SEMESTER Option B						
Project-Oriented Study in an External Organisation (25E-SEE3-2)	Project	30	7-point grading scale	Internal examination	Oral exam based on a project	English
3-4 SEMESTER Option C						
Master’s Thesis (25E-SEE3-3)	Project	50	7-point grading scale	External examination	Master's thesis/final project	English
Elective courses 3rd Semester MSc Two courses must be chosen	Course	10				
4 SEMESTER Master's Thesis						
Master’s Thesis (25E-SEE4-1)	Project	30	7-point grading scale	External examination	Master's thesis/final project	English

Offered as: 1-professional Specialisation: Fluids and Process Systems						
Module name	Course type	ECTS	Applied grading scale	Evaluation method	Assessment method	Language
1 SEMESTER						
Fluid Mechanical Analysis Methods (25E-SEE1-4)	Project	15	7-point grading scale	Internal examination	Oral exam based on a project	English
Fluid Mechanics and Compressible Flow (N-EE-K1-8B)	Course	5	7-point grading scale	Internal examination	Oral exam	English
Computational Fluid Dynamics (CFD) and Multiphase Flow (N-EE-K1-7C)	Course	5	7-point grading scale	Internal examination	Oral exam	English
Probability Theory, Stochastic Processes and Applied Statistics (22KMATSPASTA)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
2 SEMESTER						
Process Systems (25E-SEE2-5)	Project	15	7-point grading scale	External examination	Oral exam based on a project	English
Fuel Conversion and Production (N-EE-K2-7D)	Course	5	7-point grading scale	Internal examination	Oral exam	English
Modelling and Simulation of Biological Processes (K-KT-K2-35)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Optimisation Theory and Reliability (N-EE-K2-13B)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English

3 SEMESTER Option A						
Advanced Topics Within Sustainable Energy Engineering (25E-SEE3-1)	Project	20	7-point grading scale	Internal examination	Oral exam based on a project	English
Elective courses 3rd Semester MSc Two courses must be chosen	Course	10				
3 SEMESTER Option B						
Project-Oriented Study in an External Organisation (25E-SEE3-2)	Project	30	7-point grading scale	Internal examination	Oral exam based on a project	English
3-4 SEMESTER Option C						
Master's Thesis (25E-SEE3-3)	Project	50	7-point grading scale	External examination	Master's thesis/final project	English
Elective courses 3rd Semester MSc Two courses must be chosen	Course	10				
4 SEMESTER Master's Thesis						
Master's Thesis (25E-SEE4-1)	Project	30	7-point grading scale	External examination	Master's thesis/final project	English

Elective courses on 3rd semester MSc

In addition to the project work, the students should choose 10 ECTS courses on the 3rd semester MSc. The Study Board offers a portfolio of various, elective courses covering the technical aspects for the thermal and offshore specialisations with reference to well-defined research programmes which reflect the current research focus of the Department of Energy. Each year the Study Board selects a number of the courses below to be announced as the year's elective courses (6 to 10). Based on the number of students assigned to each of these courses, 2 to 6 courses will be taught covering broadly all specialisations under the Department of Energy.

The elective courses approved by the Study Board are given in the following overview.

Courses from other specialisations at Aalborg University or from other universities might be relevant too. **Nevertheless, the courses must be approved by the Study Board in advance.**

Elective courses 3rd Semester MSc Two courses must be chosen						
Module name	Course type	ECTS	Applied grading scale	Evaluation Method	Assessment method	Language
Adaptive and Predictive Control (25E-APEL3-3)	Course	5	7-point grading scale	Internal examination	Oral exam	English
Advanced Analysis of Thermal Machines (N-EE-K3-8C)	Course	5	7-point grading scale	Internal examination	Oral exam based on a project	English
Artificial Intelligence (25E-APEL3-4)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Analysis of Advanced Thermal Process Systems (N-EE-K3-10C)	Course	5	7-point grading scale	Internal examination	Oral exam	English
Applied Optimisation for Energy Systems Engineering: Theory and Practice	Course	5	7-point grading scale	Internal examination	Oral exam	English

(N-EE-K3-23B)						
Artificial Intelligence in Energy Systems (N-EE-K3-27A)	Course	5	7-point grading scale	Internal examination	Oral exam based on a project	English
Battery Energy Storage Systems (N-EE-K3-11C)	Course	5	7-point grading scale	Internal examination	Oral exam based on a project	English
Biofuels and CCU-based E-fuels (N-EE-K3-26)	Course	5	7-point grading scale	Internal examination	Oral exam	English
Biomass Gasification, Combustion and their Advanced Modelling (N-EE-K3-13B)	Course	5	7-point grading scale	Internal examination	Oral exam	English
Control of Grid Connected Photovoltaic and Wind Turbine Systems (N-EE-K3-14B)	Course	5	7-point grading scale	Internal examination	Oral exam based on a project	English
Fuel Cells, Hydrogen Technology and Power-to-X (N-EE-K3-15C)	Course	5	7-point grading scale	Internal examination	Oral exam	English
Fault Tolerant Control (N-EE-K3-17B)	Course	5	7-point grading scale	Internal examination	Written exam	English
Future Power System in Denmark (N-EE-K3-18B)	Course	5	7-point grading scale	Internal examination	Oral exam based on a project	English
Hybrid Power Plants (N-EE-K3-28)	Course	5	7-point grading scale	Internal examination	Oral exam based on a project	English
Modern Electrical Drives (N-EE-K3-19B)	Course	5	7-point grading scale	Internal examination	Oral exam based on a project	English
Modern Power Electronic Devices and their Models (N-EE-K3-20A)	Course	5	7-point grading scale	Internal examination	Oral exam based on a project	English
Performance Assessment and Modelling of Batteries (N-EE-K3-24C)	Course	5	7-point grading scale	Internal examination	Oral exam based on a project	English
Reliability of Power Electronics Based Power Systems (N-EE-K3-25B)	Course	5	7-point grading scale	Internal examination	Written exam	English
System Identification and Diagnosis (25E-SEE1-3)	Course	5	7-point grading scale	Internal examination	Oral exam	English
Wind Power System and Renewable Energy Grid Integration (N-EE-K3-22C)	Course	5	7-point grading scale	Internal examination	Oral exam based on a project	English

"System Identification and Diagnosis" is taught to the 1st semester MSc students at the Offshore Energy Systems specialisation and therefore 3rd semester MSc students of the Offshore Energy Systems specialisation cannot elect the module as an elective module.

§ 19: ADDITIONAL INFORMATION

When writing a project report the following extent and format must be adhered to:

Maximum number of pages

The allowed maximum number of pages for a report is determined by semester and number of students in the project group, and is calculated using the following formula:

Max number of pages = fixed value + factor x ECTS x number of students

'ECTS' refers to the number of ECTS for the project module.

'Fixed value' is:

- 5 pages for mini projects
- 20 pages for 1st – 5th semester Bachelor studies
- 30 pages for Bachelor of Engineering internship report, Bachelor of Engineering project, and Bachelor of Science and case-based project report (traineeship)
- 30 pages for 1st – 4th semester Master of Science studies

'Factor' is:

- 0.8 for mini projects
- 1.0 for semester projects
- 1.2 for long Master of Science theses
- 1.5 for Bachelor of Science, Bachelor of Engineering, and Master of Science theses
- 1.5 for Bachelor of Engineering internship report and case-based project report (traineeship)

An example of calculating the maximum number of pages for a Bachelor of Science thesis by 4 students: 30 + 1.5 x 15 x 4 = 120 pages.

The number of pages is counted from the first content page, incl. appendix. Appendices are a compilation of material which is relevant for the project, but not part of the main focus and therefore does not belong inside the report; e.g. detailed description of test setups, additional experimental or model results, theoretical derivations, etc. Front page, title page, summary, table of contents, list of table and figures, nomenclature, and references, are not included in the page count. Enclosures are not included in the page count either. An enclosure is technical documentation which does not include significant portions of text composed by the students. It can be data sheets from instruments, print out of program code, diagrams, additional tables or figures compiling data without accompanying text, copy of communication with external contact etc. Additionally, blank pages prior to the beginning of a new chapter are not counted.

The character size should be minimum 11 pt.

Participation in PBL introductory course

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. For further information, please see the module description.

The current version of the study curriculum is published on the Aalborg University website for study curricula and the Study Board's website.

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 and enters into force as of September 1, 2025.

The Study Board does not offer teaching after the previous curriculum from 2024 after the summer examination 2026.

The Study Board will offer examinations after the previous curriculum, if there are students who have used examination attempts in a module without passing. The number of examination attempts follows the rules in the Examination Order.

§ 21: AMENDMENTS TO THE CURRICULUM AND REGULATIONS