AALBORG UNIVERSITET

CURRICULUM FOR THE MASTER'S PROGRAMME IN INDOOR ENVIRONMENTAL AND ENERGY ENGINEERING, 2022

MASTER OF SCIENCE (MSC) IN ENGINEERING
AALBORG

Link to this studyline

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

Curriculum for the Master's Programme in Indoor Environmental and Energy Engineering, 2020

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§ 1: PREFACE

Pursuant to consolidation Act 778 of August 7, 2019 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) and Ministerial Order no. 2271 of December 1, 2021 on University Examinations (the Examination Order). Further reference is made to Ministerial Order no. 104 of January 24, 2021 (the Admission Order) and Ministerial Order no. 114 of February 3, 2015 (the Grading Scale Order).

§ 3: CAMPUS

The Master's 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 Built Environment.

§ 6: AFFILIATION TO CORPS OF EXTERNAL EXAMINERS

The Master's programme falls under the external examiners corps on Nationwide engineering examiners/Building.

§ 7: ADMISSION REQUIREMENTS

Applicants with a legal right of admission (retskrav)
Applicants with one of the following degrees are entitled to admission:

- Bachelor of Science in Engineering (Civil Engineering with specialisation in Indoor Environmental Engineering), Aalborg University

Applicants without legal right of admission
Bachelor's programmes qualifying students for admission:

- Bachelor of Science in Architectural Engineering, Technical University of Denmark
- Bachelor of Engineering in Architectural Engineering, Technical University of Denmark
- Bachelor of Science in Civil Engineering, Technical University of Denmark
- Bachelor of Engineering in Civil Engineering with specialization in Building Energy, Technical University of Denmark
- Bachelor of Engineering in Architectural Engineering with specialisation in Energy and Indoor Climate, Aarhus University
- Bachelor of Engineering in Civil and Structural Engineering with specialisation in Energy and Indoor Climate, Aarhus University
- Bachelor of Engineering in Civil Engineering with specialisation in Energy Design. VIA University College, Horsens

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).

§ 8: THE PROGRAMME TITLE IN DANISH AND ENGLISH

The Master's program entitles the graduate to the designation Civilingeniør, cand.polyt. i indeklima og energi. The English designation is: Master of Science (MSc) in Engineering (Indoor Environmental and Energy Engineering).

§ 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

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

Knowledge

- Must be able to describe the mathematical models for the dynamic conditions of buildings and HVAC systems
- Must have knowledge about basic architectural design methodology, the integrated design process and integrated building concepts
- Must understand the relationship between the thermal comfort, indoor air quality and health issues and the heat, mass and momentum transfer in the micro-environment of a human being
- Must have knowledge about the design philosophy and calculation methods which can be used to minimize the environmental impact of a building throughout its life cycle
- Must be able to describe the energy system of a building and its interaction with the Building Energy Management Systems (BEMS)
- Must be able to understand the background and theory of sensitivity analysis and uncertainty analysis in indoor environmental and energy engineering
- Be able to critically evaluate knowledge and identify new scientific problems within the field of Indoor Environmental and Energy Engineering

Skills

- Must be able to evaluate buildings by using assessment and certification methods for high performance buildings
- Must be able to apply both simple and advanced calculation methods for analysis and simulation of temperature conditions and heat flows in buildings and elements in HVAC systems under dynamic load conditions
- Must be able to apply, combine and evaluate advanced methods for analysis of the interplay between energy systems, architectural concepts, building design, building use, outdoor climate and HVAC systems both in the design and operation of buildings
- Must be able to investigate, explain and develop indoor environmental and energy engineering models using sensitivity analysis and uncertainty analysis
- Must be able to perform CFD simulations in ventilation settings including the establishment of proper boundary conditions
- Be able to apply a wide range of engineering methods in research and development in the field of Indoor Environmental and Energy Engineering
- Be able to utilize and create digital solutions for data collection and storage, statistical data analysis, data visualization, modeling and simulation, for presentation of theories, hypotheses and results in writing as well as orally, as well as for organizing and implementing the collaboration internally in project groups as well as with external partners.

Competencies

- Must be able to combine, optimise and evaluate models for energy transport in buildings and HVAC systems
- Must be able to handle complex and research-oriented cases related to development of low-energy, energy-neutral and energy-producing buildings
- Must be able to identify and discuss the optimal solution for an air distribution system based on theory and/or experiments
- Be competent to solve new and complicated technical problems by the use of advanced mathematics, scientific and technological knowledge
- Must be able to assess and relate the content of the project to those of the UN World Goals that are relevant
- Has competencies within and can participate in the development of digitization of the built environment and can digitally and effectively collaborate, communicate and exchange information, data and results with adjacent disciplines

§ 17: STRUCTURE AND CONTENTS OF THE PROGRAMME

The programme is structured in modules and organized as a problem-based study. A module is a programme element or a group of programme 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 programme 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
- study groups
- exercises (individually and in groups)
- laboratory tests
- measurements and testing in the field
- teacher feedback
- reflection
- portfolio work
- independent study

The modules are evaluated either through written or oral exams as started in the description of the modules in the Appendix.

For individual written exams the study board selects among the following possibilities:

- written exam based on handed out exercises
- multiple choice
- ongoing evaluation of written assignments

For individual oral exams the study board selects among the following possibilities:

- oral exam with or without preparation
- oral exam based on project report
- oral exam based on presentation seminar
- portfolio based oral exam

§ 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).

Of a total of 120 ECTS, 80-110 ECTS are assessed by the 7-point scale and 45-65 ECTS are assessed by external examination.

The students are given options in the project modules as they can select among different projects within the same general theme. Moreover, the Master's Thesis on the 4th semester can be selected freely within the field of Indoor Environmental and Energy Engineering. The students have the choice of making a long master's thesis comprising both 3rd and 4th semester.

Offered as: 1-professional Study programme: Indoor Environmental and Energy Engineering						
Module name	Course type	ECTS	Applied grading scale	Evaluation method	Assessment method	Language
1 SEMESTER						
Ventilation, Airflow and Contaminant Transport in Buildings (B-IE-K1-5)	Project	15	7-point grading scale	External examination	Oral exam based on a project	English

Numerical Methods (M-MP-B5-3B)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Fluid Mechanics and Computational Fluid Dynamics (B-IE-K1-8)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Building Related Fluid Mechanics (B-IE-K1-6A)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
2 SEMESTER						
Integrated Design of Sustainable Buildings and Building Services (B-IE-K2-9A)	Project	20	7-point grading scale	Internal examination	Oral exam based on a project	English
Modelling and Design Optimisation by Sensitivity Analysis and Uncertainty Analysis (B-IE-K2-10A)	Course	5	Passed/Not Passed	Internal examination	Written or oral exam	English
Environmental Assessment Methods and Life Cycle Cost Analysis (B-IE-K2-12)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
3 SEMESTER Version A						
3. semester Electives: Projects		20				
IT System Development (B-BIC-K2-3)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Fault Detection and Diagnosis in Buildings (B-IE-K3-15)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
3 SEMESTER Version B						
Project-oriented Study in an External Organisation (B-IE-K3-14)	Project	30	7-point grading scale	Internal examination	Oral exam based on a project	English
3-4 SEMESTER Version C						
Master's Thesis (B-IE-K3-16)	Project	50	7-point grading scale	External examination	Master's thesis/final project	English
IT System Development (B-BIC-K2-3)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Fault Detection and Diagnosis in Buildings (B-IE-K3-15)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
4 SEMESTER						
Master's Thesis (B-IE-K4-15)	Project	30	7-point grading scale	External examination	Master's thesis/final project	English

The study board must approve on the content of **the project-oriented study** before it is commenced.

3. semester Electives: Projects

Module name	Course type	ECTS	Applied grading scale	Evaluation Method	Assessment method	Language
Advanced Modelling of Energy Transport in Buildings and HVAC Systems	Project	20	7-point grading scale	Internal examination	Oral exam based on a project	English

(B-IE-K3-10)						
Building Commissioning and Operation (B-IE-K3-9)	Project	20	7-point grading scale	Internal examination	Oral exam based on a project	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. For further information, please visit this website.

§ 20: COMMENCEMENT AND TRANSITIONAL RULES

The curriculum is approved by the dean and enters into force as of September 1, 2022.

The Study Board does not offer teaching after the previous curriculum from 2020 after the summer examination 2024.

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

On January 19 2023 the Vice-Dean of Education has approved, that the module "Fluid Mechanics and Compressible Flow" on the 1st semester is replaced by the module "Fluid Mechanics and Computational Fluid Dynamics". The amendment is valid from Autumn 2022.