AALBORG UNIVERSITET

CURRICULUM FOR THE MASTER'S PROGRAMME IN INDOOR ENVIRONMENTAL AND ENERGY ENGINEERING, 2017, VERSION 2

MASTER OF SCIENCE (MSC) IN ENGINEERING
AALBORG

Curriculum for The Master’s Programme in Indoor Environmental and Energy Engineering, 2017, version 2

Link to this studyline

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

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§ 1: PREFACE

Pursuant to Act 261 of March 15, 2015 on Universities (the University Act) with subsequent changes, the following curriculum for the Master's program in Indoor Environmental and Energy Engineering is stipulated. The program also follows the Joint Programme Regulations and the Examination Policies and Procedures for The Faculty of Engineering and Science.

§ 2: BASIS IN MINISTERIAL ORDERS

The Master's programme is organised in accordance with the Ministry of Higher Education and Science's Order no. 1061 of June 30, 2016 on Bachelor's and Master's Programmes at Universities (the Ministerial Order of the Study Programmes) and Ministerial Order no. 1062 of June 30, 2016 on University Examinations (the Examination Order). Further reference is made to Ministerial Order no. 258 of March 18, 2015 (the Admission Order) and Ministerial Order no. 114 of February 3, 2015 (the Grading Scale Order) with subsequent changes.

§ 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 Energy), Aalborg University
- Bachelor of Science in Engineering (Civil Engineering; Indoor Environmental and Energy Engineering)

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

- Bachelor of Engineering in Civil Engineering with specialization in Indoor Environmental Engineering, Aalborg University
- 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

At programmes that are 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

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

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

§ 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

If the number of students following a module is small and/or if the number of students having to attend a re-exam is small the study board can decide that an exam is conducted either as an oral or written individual exam for economic reasons. In the first case decision must be notified before the start of the teaching activity in the latter case the students must be notified when the examination date is decided.

1st to 4th semesters of the programme are taught in English and projects are to be written in English. However, the programme can be taught in Danish if no international students are enrolled.

§ 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, 90-120 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.

The study board of civil engineering can decide, that the contents of a course module on a semester is taught in the project module in the same semester, by increasing the ECTS extend of the project module by the same number of ECTS. The decision is taken regarding to capacity and/or economy.

Offered as:

Study programme: Indoor Environment 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-K1-1)	Project	15	7-point grading scale	External examination	Oral exam based on a project	Danish and English
Numerical Methods (B-IE-K1-2)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Fluid Mechanics and Computational Fluid Dynamics (B-IE-K1-3)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Building Related Fluid Mechanics (B-IE-K1-4)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
2 SEMESTER						
Integrated Design of Buildings and Building Services (B-IE-K2-5)	Project	15	7-point grading scale	Internal examination	Oral exam based on a project	Danish and English
Stochastic Modelling and Design Optimisation (B-IE-K2-6)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Integrated Building Energy Design (B-IE-K2-7)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Environmental Assessment Methods and Life Cycle Cost Analysis (B-IE-K2-8)	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-BLD-K9)	Course	5	7-point grading scale	Internal examination	Written or oral exam	Danish and English
Fault Detection and Diagnosis in Buildings (B-IE-K3-12)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
3 SEMESTER Version B						
Academic Internship (B-IE-K3-13)	Project	30	7-point grading scale	Internal examination	Oral exam based on a project	Danish and English
3 SEMESTER Version C						
Study at Other University		30				
4 SEMESTER						
Master's Thesis (B-IE-K4-15)	Project	30	7-point grading scale	External examination	Master's thesis/final project	English
3-4 SEMESTER Version A						
Master's Thesis (B-IE-K13-16)	Project	50	7-point grading scale	External examination	Master's thesis/final project	English

IT System Development (B-BLD-K9)	Course	5	7-point grading scale	Internal examination	Written or oral exam	Danish and English
Fault Detection and Diagnosis in Buildings (B-IE-K3-12)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
3-4 SEMESTER Version B						
Master's Thesis (B-IE-K13-16)	Project	50	7-point grading scale	External examination	Master's thesis/final project	English
Study at Other University		10				
3-4 SEMESTER Version C						
Master's Thesis (B-IE-K13-17)	Project	45	7-point grading scale	External examination	Master's thesis/final project	English
Study at Other University		15				

Students not familiar with Problem-based Learning at Aalborg University must attend the course "Problem-based Learning (PBL) and Student Responsibility" as an integrated part of the project module on 1st, 2nd or 3rd semester, at the first semester studying at Aalborg University.

The study board must approve on the content of the Academic Internship, before it is commenced.

Assessment and exam according to the curriculum at the other university. The study board must approve on the contents before the study 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 (B-IE-K3-10)	Project	20	7-point grading scale	Internal examination	Oral exam based on a project	English
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

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 spelling and formulation 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 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.* If the project is written in English, the summary must be in Danish.** The summary must be at least 1 page and not more than 2 pages. The summary is included in the evaluation of the project as a whole.

* Or another foreign language (upon approval from the Board of Studies).
** The Board of Studies can grant exemption from this.

Rules concerning credit transfer (*merit*), including the possibility for choice of modules that are part of another program at a university in Denmark or abroad

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

Rules concerning the completion of the Master's Programme
The Master's Programme must be completed no later than four years after it was begun.

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 School of Engineering and Science's website.

Rules for examinations
The rules for examinations are stated in the Examination Policies and Procedures published by The Technical Faculty of IT and Design, The Faculty of Engineering and Science, and the Faculty of Medicine on their website.

Exemption
In exceptional circumstances, the Board of Studies study 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.

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

§ 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 1. September 2017.

Students who wish to complete their studies under the previous curriculum from 2015 must conclude their education by the summer examination period 2018 at the latest, since examinations under the previous curriculum are not offered after this time.

§ 21: AMENDMENTS TO THE CURRICULUM AND REGULATIONS

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

The Vice Dean of Education has on June 17, 2019, approved that the module "*Control and Analysis of Building Energy Systems*" on 3rd semester is replaced with the module "*IT System Development*". The replacement enters into force as of fall 2019.