AALBORG UNIVERSITET

CURRICULUM FOR THE MASTER'S PROGRAMME IN ROBOTICS, 2023

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 Robotics, 2020

Curriculum for the master's programme in Robotics, 2022

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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. 35 of January 13, 2023 (the Admission Order) and Ministerial Order no. 1125 of July 4, 2022 (the Grading Scale Order).

§ 3: CAMPUS

The programme is offered in Aalborg.

§ 4: FACULTY AFFILIATION

The Master's programme falls under the The Technical Faculty of IT and Design.

§ 5: STUDY BOARD AFFILIATION

The Master's programme falls under the Study Board of Electronics and IT.

§ 6: AFFILIATION TO CORPS OF EXTERNAL EXAMINERS

The programme is affiliated with the Civil engineering corps of external examiners.

§ 7: ADMISSION REQUIREMENTS

Applicants with a legal right of admission (retskrav):

Applicants with the following degree are entitled to admission:

- Bachelor of Science (BSc) in Engineering (Robotics), Aalborg University

Applicants without legal right of admission

Bachelor's programmes qualifying students for admission:

- Bachelor of Science (BSc) in Engineering (Electronic Engineering and IT with specialisation in Communication Systems) (AAU)
- Bachelor of Science (BSc) in Engineering (Electronic Engineering and IT with specialisation in Signal Processing) (AAU)
- Bachelor of Science (BSc) in Engineering (Electronic Engineering and IT with specialisation in Informatics) (AAU)
- Bachelor of Science (BSc) in Engineering (Electronic Engineering and IT with specialisation in Control Engineering) (AAU)
- Bachelor of Scinece (BSc) in Enigneering (Electronics Systems Engineering) (AAU)
- Bachelor of Science (BSc) in Engineering (Internet Technologies and Computer Engineering with specialization in Communication Systems) (AAU)
- Bachelor of Science (BSc) in Engineering (Internet Technologies and Computer Engineering with specialization in Signal Processing) (AAU)
- Bachelor of Science (BSc) in Engineering (Internet Technologies and Computer Engineering with specialization in Informatics) (AAU)
- Bachelor of Science (BSc) in Engineering (Internet Technologies and Computer Engineering with specialization in Control Engineering) (AAU)
- Bachelor of Science (BSc) in Engineering (Computer Engineering) (AAU)
- Bachelor of Science (BSc) in Engineering (General Engineering with specialisation in Electrotechnics and Control Theory) (AAU)

- Bachelor of Science (BSc) in Engineering (General Engineering with specialisation in Informatics and Signal Processing) (AAU)
- Bachelor of Science in Engineering (Robot Systems) (SDU)

Assessment of qualifications obtained from other technical or natural science bachelor educations emphasize qualifications in Mathematics, Mechanical physics, Control engineering, and embedded and high-level programming. The assessment will also evaluate basic qualifications in relation to robot mobility, communication systems, and automation. Equivalent qualifications can be accepted, although for the emphasized topics certain specific minimum requirements apply:

- Mathematics at bachelor level equivalent to minimum 15 ECTS, covering several of the subjects calculus, vector calculus, linear algebra, dynamical systems, optimization, probability and statistics.
- Mechanical physics at bachelor level equivalent to minimum 5 ECTS, covering the subjects of kinematics and dynamics
- Qualifications at bachelor level equivalent to minimum 10 ECTS covering high- and low-level programming
- Qualifications at bachelor level equivalent to minimum 10 ECTS covering robotic systems, such as sensing, feedback control, decision making in artificial intelligence etc.

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

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 designation Civilingeniør, cand.polyt. i robotteknologi. The English designation is: Master of Science (MSc) in Engineering (Robotics).

§ 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

It is assumed that the student can read academic texts 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:

- Has a comprehensive base of knowledge of scientific foundations and technological principles within robotics
- Has knowledge about mobile robots and human robot collaboration
- Has knowledge of and can reflect upon the interaction between the various components of a robotic system and a broader systems-oriented context
- Has an understanding of the interaction between various engineering domains and other competencies in connection with solving specific engineering problems

Skills:

- Can utilize up-to-date scientific methodologies, theories and tools to analyse and solve complex problems in robotics
- Can evaluate theoretical and practical problems, as well as describe and select relevant solution strategies
- Is able to implement solution strategies and evaluate their success in a systematic manner
- Is able to communicate and discuss research-based knowledge, both orally and in writing, to specialists as well as non-specialists
- Is familiar with and can seek out leading international research within his/her specialist area

Competencies:

- Is able to handle technical problem solving at a high level and has the capacity to work with and manage all phases of a project
- Is able to develop and test robotics hardware and software and integrate them into a broader systems-oriented context
- Can work independently as well as in collaboration with others, both within and across technical fields, in an efficient and professional manner
- Is able to work independently and to identify his/her own learning needs and structure his/her own learning, academic development and specialization

§ 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 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. The examinations are defined in the curriculum.

The programme is based on a combination of academic, problem-oriented and interdisciplinary approaches and organised 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
- self-study
- 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).

Offered as: 1-professional						
Module name	Course type	ECTS	Applied grading scale	Evaluation method	Assessment method	Language
1 SEMESTER						
Advanced Mobile Robotics (ESNROBK1P3)	Project	15	7-point grading scale	Internal examination	Oral exam based on a project	English
Robot Navigation (ESNROBK1K1)	Course	5	Passed/Not Passed	Internal examination	Written or oral exam	English
Robot Mobility (ESNROBK1K2)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Advanced Robotic Perception (MSNROBK1231)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
2 SEMESTER						
Collaborative Robotics (ESNROBK2P4)	Project	15	7-point grading scale	External examination	Oral exam based on a project	English
Object Manipulation and Task Planning (M-ESNROBK2K1)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Human Robot Interaction (SOTROBK2K2)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Human Bionics (SOTROBK2K3)	Course	5	Passed/Not Passed	Internal examination	Written or oral exam	English
3 SEMESTER Option A						

Contextual Robotics (ESNROBK3P5)	Project	20	7-point grading scale	Internal examination	Oral exam based on a project	English
Electives Choose 1 or 2 courses	Course	10				
3 SEMESTER Option B						
Entrepreneurial Practice (ESNROBK3P6)	Project	20	Passed/Not Passed	Internal examination	Oral exam based on a project	English
Electives Choose 1 or 2 courses	Course	10				
3 SEMESTER Option C						
Project-Oriented Study in an External Organisation (ESNROBK3P3)	Project	30	Passed/Not Passed	Internal examination	Oral exam based on a project	English
3 SEMESTER Option D						
Project-Oriented Study in an External Organisation (ESNROBK3P7)	Project	25	Passed/Not Passed	Internal examination	Oral exam based on a project	English
Electives Choose 1 or 2 courses	Course	5				
3-4 SEMESTER Option E: Long Master's Thesis						
Master's Thesis (ESNROBK4P4)	Project	50	7-point grading scale	External examination	Master's thesis/final project	English
Electives Choose 1 or 2 courses	Course	10				
4 SEMESTER						
Master's Thesis (ESNROBK4P3)	Project	30	7-point grading scale	External examination	Master's thesis/final project	English

Electives Choose 1 or 2 courses						
Module name	Course type	ECTS	Applied grading scale	Evaluation Method	Assessment method	Language
Readings in Robotics (M-ESNROBK3K1)	Course	5	Passed/Not Passed	Internal examination	Active participation/continuous evaluation	English
Innovation and Entrepreneurship (M-ESNROBK3K2)	Course	5	Passed/Not Passed	Internal examination	Written or oral exam	English
Machine Learning (ESNESK1K6)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Quantum Information and Computing (ESNESNK1K1)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English

Modelling of Physical Systems (ESNESK1K4)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Non-linear Control and Multi-body Systems (N-EE-K1-11)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English

Note that elective courses might not be offered if less than 10 students sign up.

§ 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 see Department of Electronics Systems's webiste.

§ 20: COMMENCEMENT AND TRANSITIONAL RULES

The curriculum is approved by the dean and enters into force as of 1 September 2023.

The Study Board does not offer teaching after the previous curriculum from 2022 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 30 September 2024, the Vice Dean for Education has approved a revision of the 3rd Semester. The amendment is valid from autumn 2024.

The Vice dean of Education has on February 12, 2025, approved that the prerequisite for enrollment for the exam is erased in the module *Collaborative Robotics*, valid from Spring 2025.