AALBORG UNIVERSITET

CURRICULUM FOR THE MASTER'S PROGRAMME IN ELECTRONIC SYSTEMS, 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 Electronic Systems, 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 Technical Faculty of IT and Design, Aalborg University.

§ 5: STUDY BOARD AFFILIATION

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

§ 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

Assessment of qualifications obtained from other technical or natural science bachelor educations will emphasize qualifications in mathematics, physics, electronic circuit analysis and design, and embedded programming corresponding to a total of 60 ECTS credits. The assessment will also evaluate basic qualifications in relation to communication systems, digital signal processing and automation and control. Equivalent qualifications can be accepted, although for the emphasized topics certain specific minimum requirements apply:

- Mathematics at bachelor level equivalent to at least 20 ECTS, covering several of the topics calculus, vector calculus, linear algebra, dynamical systems theory, optimization, and probability and statistics
- Physics at bachelor level equivalent to at least 5 ECTS, covering topics such as classical physics and electrostatics/electrodynamics
- Qualifications at bachelor level equivalent to minimum 15 ECTS covering topics such as analogue and digital electronics and embedded programming
- Qualifications at bachelor level equivalent to minimum 5 ECTS covering one or more of the topics communication systems, automation and control, and digital signal processing

Applicants with a legal right of admission (retskrav):

- Bachelor of Science (BSc) in Engineering (Electronic Systems Engineering), AAU
- Bachelor of Science (BSc) In Engineering (Electronic Engineering) with specialisation in Control Engineering, AAU
- Bachelor of Science (BSc) in Engineering (Electronic Engineering) with specialisation in Signal Processing), AAU
- Bachelor of Science (BSc) in Engineering (Electronic Engineering) with specialisation in Informatics), AAU
- Bachelor of Science (BSc) in Enigneering (Electronic Engineering) with specialisation in Communication Systems), AAU

Applicants without legal right of admission:

- 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 (BSc) in Engineering (Robotics) (AAU)
- Bachelor of Science (BSc) in Engineering (Energy Engineering) (AAU)
- Bachelor of Science (BSc) in Engineering (Mathematical Engineering) (AAU)
- Bachelor of Science (BSc) in Engineering (Electronics) (SDU)
- Bachelor of Science (BSc) in Engineering in Electrical Engineering (DTU)
- Bachelor of Engineering (BScEE) in Electronics (AAU)
- Bachelor of Engineering (BScEE) in Electronics (AU)
- Bachelor of Engineering (BScEE) in Electronics (SDU)
- Bachelor of Engineering (BScEE) in IT-Electronics (DTU)
- Bachelor of Engineering (BScEE) in Electrical engineering (DTU)

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.

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

§ 8: THE PROGRAMME TITLE IN DANISH AND ENGLISH

The Master's programme entitles the graduate to the Danish designation Civilingeniør, cand.polyt. i elektroniske systemer. The English designation is: Master of Science (MSc) in Engineering (Electronic Systems)

§ 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

The graduate of the Master's programme

Knowledge

- Has in-depth knowledge and understanding within one of the following core areas: machine learning and signal processing, wireless communication and automation and control
- Has knowledge of methods for data acquisition and measurement, including physical sensor construction and applications
- Has knowledge of stochastic systems and signals and their mathematical modelling, and how models can be applied in the analysis and design of complex interconnected/distributed systems
- Has knowledge of theories and methods for design and implementation of resource optimal real-time systems on embedded platforms
- Has scientifically based knowledge about modelling and optimization of complex systems, e.g., relating to complex control, reliable communication or advanced ML/signal processing

Skills

- Can analyze the specialization area's knowledge, theory, methodologies and practice
- Must be able to critically assess and select among scientific theories and methods - including the application of analytical, numerical and experimental methods - for analysis, design and implementation of non-real-time and real-time hardware/software platforms
- Must be able to select and apply advanced methods of control, signal processing and communication when applied to complex systems to ensure specified performance, safety and/or robustness aspects
- Can communicate orally and in writing on topics within the field of knowledge, and in particular on the application of relevant techniques, procedures and algorithms used in the solution of a given problem

Competencies

- Must be able to formulate and explain scientific hypotheses and results achieved through scientific work within at least one of the three core areas
- Must be able to choose between and apply relevant methods and theories for evaluation and design of complex interconnected/distributed systems, specific subsystems and/or components

- Can manage work and development situations that are complex, unpredictable and require new solutions
- Can independently take responsibility for own professional development and specialization
- Can initiate and implement discipline-specific as well as interdisciplinary cooperation and assume professional responsibility
- Can communicate research-based knowledge and discuss professional and scientific problems with both peers and non-specialists using the correct terminology

§ 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. 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 instructio
- project work
- workshops
- exercises (individually and in groups)
- self-study
- 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).

Elective: The remaining 25 ECTS can be obtained by choosing elective courses and projects on the 3rd Semester as described below. Note that elective courses might not be offered if less than 10 students sign up.

Offered as: 1-professional						
Module name	Course type	ECTS	Applied grading scale	Evaluation method	Assessment method	Language
1 SEMESTER						
Machine Intelligence (ESNESK1P1)	Project	10	7-point grading scale	Internal examination	Oral exam based on a project	English
Machine Learning (ESNESK1K6)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Stochastic Systems (ESNESK1K2)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
1st Semester Elective Course Choose 2 course modules	Course	10				
2 SEMESTER						

Systems of Systems (ESNESK2P1)	Project	15	7-point grading scale	External examination	Oral exam based on a project	English
Sensors and Systems (ESNESK2K1)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Networks and Systems (ESNESK2K2)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
2nd Semester Elective Course Choose 1 course module	Course	5				
3 SEMESTER Option A						
Engineering Systems (Scientific Communication) (ESNESK3P1)	Project	20	7-point grading scale	Internal examination	Oral exam based on a project	English
Advances in Electronic Systems (ESNESK3K1)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
3rd Semester Elective Course Choose 1 course module	Course	5				
3 SEMESTER Option B						
Project-Oriented Study in an External Organisation (ESNESK3P2)	Project	20	Passed/Not Passed	Internal examination	Oral exam based on a project	English
Advances in Electronic Systems (ESNESK3K1)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
3rd Semester Elective Course Choose 1 course module	Course	5				
3 SEMESTER Option C						
Project-Oriented Study in an External Organisation (ESNESK3P3)	Project	25	Passed/Not Passed	Internal examination	Oral exam based on a project	English
3rd Semester Elective Course Choose 1 course module	Course	5				
3 SEMESTER Option D						
Project-Oriented Study in an External Organisation (ESNESK3P4)	Project	30	Passed/Not Passed	Internal examination	Oral exam based on a project	English
3-4 SEMESTER Option E						
Master's Thesis (ESNESK4P2)	Project	50	7-point grading scale	External examination	Master's thesis/final project	English
Advances in Electronic Systems (ESNESK3K1)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
3rd Semester Elective Course Choose 1 course module	Course	5				
4 SEMESTER						
Master's Thesis (ESNESK4P1)	Project	30	7-point grading scale	External examination	Master's thesis/final project	English

1st Semester Elective Course Choose 2 course modules						
Module name	Course type	ECTS	Applied grading scale	Evaluation Method	Assessment method	Language
Advanced Signal Processing (ESNESK1K3)	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
Communication Systems (ESNESK1K5)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Performance and Reliability Analysis of Communication Networks (ESNNDSK1K3)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Perception and Acquisition of Data (MSNAVSK1231)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English

2nd Semester Elective Course Choose 1 course module						
Module name	Course type	ECTS	Applied grading scale	Evaluation Method	Assessment method	Language
Fundamentals of Acoustics and Sound (ESNAVSK2K2)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Deep Learning (ESNNDSK2K3)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Advanced Control (ESNESK2K3)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Numerical Scientific Computing (ESNAVSK2K3)	Course	5	Passed/Not Passed	Internal examination	Active participation/continuous evaluation	English

3rd Semester Elective Course Choose 1 course module						
Module name	Course type	ECTS	Applied grading scale	Evaluation Method	Assessment method	Language
Advanced Signal Processing (ESNESK1K3)	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
Communication Systems (ESNESK1K5)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English
Performance and Reliability Analysis of Communication Networks (ESNNDSK1K3)	Course	5	7-point grading scale	Internal examination	Written or oral exam	English

Perception and Acquisition of Data (MSNAVSK1231)	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

§ 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 under the previous curriculum from 2022 after the summer examination period 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 of Examination Order.

§ 21: AMENDMENTS TO THE CURRICULUM AND REGULATIONS

On 20 September 2023 the Vice-Dean of Education has approved, that the prerequisite for enrollment for the exam in the module *"Machine Learning"* on the 1st Semester is deleted. The amendment is valid from Autumn 2023.

On November 12th, 2023, the Pro-Dean of Education has approved that the form of assessment in the module "Fundamentals of Acoustics and Sound" is changed from written to written and oral as of spring 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 *Systems of Systems*, valid from Spring 2025.