Curriculum for the Master of Science (MSc) in Engineering (Wireless Communication Systems)

1\textsuperscript{st} – 4\textsuperscript{th} Semester

The Faculty of Engineering and Science
Aalborg University

September 2011
Preface:
Pursuant to Act 695 of June 22, 2011 on Universities (the University Act) with subsequent changes, the following curriculum for the Master's programme is stipulated. The programme also follows the Framework Provisions and the Examination Policies and Procedures for the Faculty of Engineering and Science and The Faculty of Medicine.

Table of Contents

Table of Contents ...................................................................................................................... 1
Chapter 1: Legal Basis of the Curriculum, etc. ................................................................................. 2
  1.1 Basis in ministerial orders ................................................................................................... 2
  1.2 Faculty affiliation ................................................................................................................. 2
  1.3 Board of Studies affiliation .................................................................................................. 2
Chapter 2: Admission, Degree Designation, Programme Duration .................................................. 2
  2.1 Admission ............................................................................................................................ 2
  2.2 Degree designation in Danish and English ......................................................................... 2
  2.3 The programme's specification in ECTS credits ................................................................. 2
  2.4 Competence profile on the diploma .................................................................................... 2
Chapter 3: Content and Organisation of the Programme ................................................................. 4
  Descriptions of modules ............................................................................................................ 6
Chapter 4: Entry into Force, Interim Provisions and Revision ........................................................ 22
  5.1 Rules concerning written work, including the Master's thesis ........................................... 22
  5.2 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 ........................................ 22
  5.3 Rules for examinations ...................................................................................................... 22
  5.4 Exemption ......................................................................................................................... 22
  5.5 Completion of the Master's programme ............................................................................ 23
  5.6 Rules and requirements for the reading of texts ............................................................... 23
  5.7 Additional information ...................................................................................................... 23
Chapter 1: Legal Basis of the Curriculum, etc.

1.1 Basis in ministerial orders
The Master’s programme is organized in accordance with the Ministry of Science, Technology and Innovation’s Ministerial Order no. 814 of June 29, 2010 on Bachelor’s and Master’s Programs at Universities (the Ministerial Order of the Study Programs) and Ministerial Order no. 857 of July 1, 2010 on University Examinations (the Examination Order) with subsequent changes. Further reference is made to Ministerial Order no. 233 of March 24, 2011 (the Admission Order) and Ministerial Order no. 250 of March 15, 2007 (the Grading Scale Order) with subsequent changes.

1.2 Faculty affiliation
The Master’s programme falls under the Faculty of Engineering and Science, Aalborg University.

1.3 Board of Studies affiliation
The Master’s programme falls under the Board of Studies for Electronics and IT.

Chapter 2: Admission, Degree Designation, Programme Duration and Competence Profile

2.1 Admission
Admission to the Master’s programme requires a Bachelor’s or Bachelor of Engineering degree in Electronic Engineering and IT, Computer Engineering or the like.

Students with another Bachelor's degree, upon application to the Board of Studies, will be admitted after a specific academic assessment if the applicant is deemed to have comparable educational prerequisites. The University can stipulate requirements concerning conducting additional exams prior to the start of study.

2.2 Degree designation in Danish and English
The Master’s programme entitles the graduate to the designation civilingeniør, cand.polyt. (candidatus/candidata polytechnices) i trådløse kommunikationssystemer. The English designation is: Master of Science (MSc) in Engineering (Wireless Communication Systems).

2.3 The programme’s specification 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.

2.4 Competence profile on the diploma
The following competence profile will appear on the diploma:

A graduate of the Master’s programme has competencies acquired through an educational programme that has taken place in a research environment.

The graduate of the Master’s programme can perform highly qualified functions on the labour market on the basis of the educational programme. Moreover, the graduate has prerequisites for research (a Ph.D. programme). Compared to the Bachelor’s degree, the graduate of the Master’s programme has developed her/his academic knowledge and independence, so that the graduate can independently apply scientific theory and method in both an academic and occupational/professional context.
2.5 Competence profile of the programme:

The graduate of the Master’s programme:

Knowledge
- **Must know** fundamental theories and methods for analysis of a wireless communication system and its subcomponents,
- **Be able to understand** how to describe and account for a block level of a full wireless communication systems.
- **Must possess knowledge of** existing wireless communication systems, including their multiple access principle, basic terminology and overall architecture
- **Must know** some key features of international standards for one or several wireless communication systems
- **Must understand** channel allocation principles and radio resource management as it applies to wireless communication systems
- **Be able to understand** the terminology and methods used to characterize electromagnetic properties of antennas and propagation for wireless communication
- **Be able to understand** the terminology and parameters used to describe and characterize radio propagation mechanisms and channel response, including their impact to functionality and performance of multiple antenna systems

Skills
- **Must be able to choose between** a series of advanced analysis, simulation or experiments and model tests with relevance to wireless communication
- **Must be able to conduct** a study within a limited context and critically account for the observations and their implication
- **Must be able to plan** a wireless communication system for a given set of relevant system specifications and requirements
- **Must be able to evaluate and select** among different multi antenna or radio system techniques for channel stabilization and capacity enhancement
- **Must be able to characterize** propagation channel response as relevant for the wireless communications formats under investigation
- **Must be able to choose** between and apply different numerical methods and theories, for the solution of electromagnetic antenna and wave propagation behaviors in wireless communication settings
- **Must be able to 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 the aforementioned problems.

Competencies
- **Must be able to formulate and hypothesize** problems of relevance to the performance of practical wireless communication systems and critically **analyze** these on a link or system level
- **Must be able to account** for the complex multi-agent interaction on a link or system level
- **Must be able to choose between and apply** relevant methods and theories for evaluation and design of specific
subsystems or components of particular wireless communication systems under investigations

- Must be able to perform a rational selection of practical communication system solutions, including a judicious selection of techniques, procedures and algorithms within the field of knowledge

Chapter 3: Content and Organization 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 instruction
- project work
- workshops
- exercises (individually and in groups)
- teacher feedback
- reflection
- portfolio work
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).

<table>
<thead>
<tr>
<th>Semester</th>
<th>Module</th>
<th>ECTS</th>
<th>P/C *)</th>
<th>Assessment</th>
<th>Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Wireless radio transmission</td>
<td>20</td>
<td>P</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>PBL and Wireless radio transmission</td>
<td>20</td>
<td>P</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Stochastic processes</td>
<td>5</td>
<td>C</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Wireless PHY/MAC fundamentals</td>
<td>5</td>
<td>C</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td>2nd</td>
<td>Wireless communication in dynamic settings (with focus on antenna systems) (elective)</td>
<td>25</td>
<td>P</td>
<td>7-point scale</td>
<td>External</td>
</tr>
<tr>
<td></td>
<td>Wireless communication in dynamic settings (with focus on radio system) (elective)</td>
<td>25</td>
<td>P</td>
<td>7-point scale</td>
<td>External</td>
</tr>
<tr>
<td></td>
<td>Wireless systems performance</td>
<td>5</td>
<td>C</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td>3rd</td>
<td>Multi agent wireless systems</td>
<td>20</td>
<td>P</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Multi agent radio communication</td>
<td>5</td>
<td>C</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Antennas and propagation</td>
<td>5</td>
<td>C</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td>4th</td>
<td>Master’s thesis</td>
<td>30, possibly 50</td>
<td>P</td>
<td>7-point scale</td>
<td>External</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>120</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*) P = Project -  C = Course
Descriptions of modules

**Wireless Radio Transmission (P)**

*Trådløs radiotransmission*

**Prerequisites:**
B.Sc. in electrical engineering with some background in communication systems

Competencies in Project-Oriented and Problem-Based Learning.

**Objective:**
Students who complete the module:

**Knowledge**

Must have knowledge about

- The impact of basic channel variations of stochastic nature - to communication system behavior
- Link budget establishment for a communication system
- Modern techniques for wireless radio transmission
- The block level description of a full wireless communication system (including transmitter, channel and receiver parts) – and the corresponding procedures required for its operation
- The scientific communication processes related to conference presentations and related to publishing in peer-reviewed scientific journals
- How to organize a scientific publication

**Skills**

The students must be able to

- Design, implement and analyze a solution to a practically occurring communication problem
- Apply theories to transmit signals over stationary stochastic channel
- Establish a communication system chain
- Perform suitable test of implemented application to verify its consistency with established specifications.
- Explain the process of and criteria for peer reviewed scientific communications,
- Write a paper for a scientific conference/journal
- Prepare and give an oral and poster presentation for a scientific conference

**Competencies**

The students must have ability to:

- Make a basic design, test and verification of a wireless communication problem
- Generate a set of specifications to perform a stepwise refinement process of the given application
- Judge and prioritize the validity of various sources of scientific information.
- Apply internationally recognized principles for acknowledging and citing work of others properly.
- Formulate and explain scientific hypotheses and results achieved through scientific work
- Analyze results and draw conclusions on a scientific basis
Type of instruction:
Students are organized in groups of up to six members working according to the POPBL concept at Aalborg University. Each group will be supervised by at least one staff member doing research within the main topic(s) addressed in the project.

On this semester the project has to be documented in the following forms (all in English):

- A scientific article
- An oral presentation
- A poster
- Edited worksheets, providing all relevant project details

For further information see the introduction to Chapter 3.

Exam format:
Individual oral examination based on written documentation including: a scientific article, slides from the oral presentation at the student conference (SEMCON), a poster and edited worksheets.

Evaluation criteria:
As stated in the Framework Provisions
PBL and Wireless Radio Transmission (P)

Prerequisites:
B.Sc. in electrical engineering with some background in communication systems.

Objective:
Students who complete the module:

Knowledge
Must have knowledge about
- The impact of basic channel variations of stochastic nature - to communication system behavior
- Link budget establishment for a communication system
- Modern techniques for wireless radio transmission
- The block level description of a full wireless communication system (including transmitter, channel and receiver parts) – and the corresponding procedures required for its operation
- The phases that a project will go through
- Various theories and methods applied in problem based learning and group organized project work

Skills
The students must be able to
- Design, implement and analyze a solution to a practically occurring communication problem
- Apply theories to transmit signals over stationary stochastic channel
- Establish a communication system chain
- Perform suitable test of implemented application to verify its consistency with established specifications.
- Plan and take part in a small group of students working on a problem based project
- Reflect on experiences obtained through problem based learning and group project work
- Communicate the result of the project work in an appropriate form
- Demonstrate skills in project management

Competencies
The students must have ability to:
- Make a basic design, test and verification of a wireless communication problem o generate a set of specifications to perform a stepwise refinement process of the given application
- Organize and contribute to a team based project work
- Take part in project work and problem based learning in a global/multicultural environment
- Manage work and development situations that are complex, unpredictable and require new solutions.
- Independently initiate and implement discipline-specific and interdisciplinary cooperation and assume professional responsibility.
- Independently take responsibility for own professional development and specialization
- Find, evaluate and reference literature within the professional field
- Apply internationally recognized principles for acknowledging and citing work of others properly.

Type of instruction:
Project work.

Exam format:
Individual oral examination based on a written report.
Evaluation criteria:
As stated in the Framework Provisions
Stochastic Processes (C)
Stokastiske processer

Prerequisites:
Solid knowledge in probability, statistics, linear algebra, Fourier theory, and programming

Objective:
Students who complete the module:

Knowledge
• Have knowledge about the theoretical framework in which stochastic processes are defined.
• Be able to understand the properties of the stochastic processes introduced in the course, such as white-sense stationary (WSS) processes, Auto Regressive Moving Average (ARMA) processes, Markov models, and Poisson point processes.
• Be able to understand how WSS process are transformed by linear time-invariant systems.
• Be able to understand the theoretical context around the introduced estimation and detection methods ((non-parametric and parametric) spectral estimation, Linear Minimum Mean Square Error (LMMSE) estimation, Wiener filter, Kalman filter, detection of signals, ARMA estimation, etc.)

Skills
• Be able to apply the stochastic processes taught in the course to model real random mechanisms occurring in engineering problems.
• Be able to simulate stochastic processes using a standard programming language.
• Be able to apply the taught estimation and detection methods to solve engineering problems dealing with random mechanisms.
• Be able to evaluate the performances of the introduced estimation and detection methods.

Competencies
• Have the appropriate "engineering" intuition of the basics concepts and results related to stochastic processes that allow – for a particular engineering problem involving randomness – to design an appropriate model, derive solutions, assess the performance of these solutions, and possibly modify the model, and all subsequent analysis steps, if necessary

Type of instruction:
As described in the introduction to Chapter 3.

Exam format:
Individual oral or written examination

Evaluation criteria:
As stated in the Framework Provisions
Wireless PHY and MAC Fundamentals (C)
Trådløse PHY og MAC grundbegreber

Prerequisites:
A basic understanding of wireless communications fundamentals, mathematics and statistics corresponding to a BSc in Electrical Engineering.

Objective:
Students who complete the module:

Knowledge
Must have knowledge about the following:

- Wireless channel
  - Radio propagation elements
  - Channel modeling
  - Imperfect channel, impact of Noise
- Basic Channel access
  - Fundamental single carrier access schemes
  - Modulation
  - Coding
- Transceiver operation
  - Transceiver structures and Synchronization
  - Channel estimation
  - Equalization
  - Link adaption
- Capacity and advanced antenna systems
  - Channel capacity – multi users
  - Multi antennas systems
    - Diversity
    - Space multiplexing
- Advanced Access
  - Multi carrier access
  - Spread spectrum
  - Resource allocation

Skills
Must be able to:

- Establish a link budget
- Illustrate the information flow on a block level
- Perform system simulations

Competencies
- Must be able to set up a model and/or simulation of a wireless communication (sub-)system and identify the crucial parameters

Type of instruction:
As described in the introduction to Chapter 3.
Exam format:
Individual oral or written examination

Evaluation criteria:
As stated in the Framework Provisions
Prerequisites:
1st semester MSc in Wireless Communication Systems or equivalent

Objective:
Students who complete the module:

Knowledge
Must have knowledge about

- Digital communication of analog or digital data over a stochastic fading channel.
- A basic wireless communication system and identify the individual blocks and their interaction. Thus, comprising the ends of the communication links, the transmission technique, the access technology as well as the fading channel
- Performance enhancing properties of multi antenna system or other technology, in a wireless communication system, with focus on the lower layers of the communication chain

Skills
The students must be able to

- Extract the specific operating conditions of selected system block(s) in context of the overall communication chain
- Compare and evaluate the individual stochastically varying links between two communicating entities.
- Evaluate the space and frequency dispersive behavior of the channel.
- Must be able to evaluate and select among different multi antenna techniques for channel stabilization and capacity enhancement.

Competencies
The students must have ability to:

- Analyze, evaluate and model a given wireless communication problem
- Communicate the project work in sound scientific and academic form
- Contribute successfully to team work within the problem area and make a common presentation of the project work

Type of instruction:
Project work.

Exam format:
Individual oral examination based on a written report.

Evaluation criteria:
As stated in the Framework Provisions
Wireless Communication in Dynamic Settings with Focus on Radio System (P)

Trådløs kommunikation i dynamiske forhold samt radiosystem

Prerequisites:
1st semester MSc in Wireless Communication Systems or equivalent

Objective:
Students who complete the module:

Knowledge
Must have knowledge about
- Digital communication of analogue or digital data over a stochastic fading channel.
- A basic wireless communication system and identify the individual blocks and their interaction. Thus, comprising the ends of the communication links, the transmission technique, the access technology as well as the fading channel
- Radio resources management in a multi-cell system, considering a space and frequency dispersive channel
- Channel allocation principles and its application to planning of wireless communication systems

Skills
The students must be able to
- Extract the specific operating conditions of selected system block(s) in context of the overall communication chain
- Compare and evaluate the individual stochastically varying links between two communicating entities.
- Apply and assess stabilization methods to compensate for these variations – and their impact on the wireless communication system capacity. Such as
  - Scheduling
  - Link adaptation
  - Channel allocation

Competencies
The students must have ability to:
- Analyze, evaluate and model a given wireless communication problem
- Communicate the project work in sound scientific and academic form
- Contribute successfully to team work within the problem area and make a common presentation of the project work

Type of instruction:
Project work.

Exam format:
Individual oral examination based on a written report.

Evaluation criteria:
As stated in the Framework Provisions
Wireless Systems Performance (C)
*Performans af trådløse systemer*

**Prerequisites:**
Basics in probability

**Objective:**
Students who complete the module:

**Knowledge**
Must have knowledge about the following:
- Link budget analysis
- Wave types
- Power vs protection margins
- Dynamic radio channel characterization
- Short terms descriptions
- Channel hardening/Diversity
- Radio Resource allocation
- Methods for fixed and dynamic channel allocation
- Cellular concept and hand-over
- Link and MAC control, Power control, AMC
- Wireless network performance and traffic analysis
- Dynamic routing
- Transport – congestion control – performance impact
- Wireless network architectures
- Short range infra-structures
- Cellular infra-structure

**Skills**
The students must be able to
- Establish a link budget with account for dynamic protection margins for a given wireless communication system
- Select the relevant metrics to establish and estimate Quality of Service (QoS) performance
- Establish radio resource requirements based on traffic load
- Evaluate feasibility of routing strategies based on system properties and requirements
- Evaluate and select different wireless networking architectures based on system requirements
- Evaluate properties of dynamic channels and apply stabilization techniques

**Competencies**
The students must be able to
- Analyze, evaluate and model the chain from PHY to Transport layer and how it combines towards the total performance and QoS of a wireless communication system

**Type of instruction:**
As described in the introduction to Chapter 3.
**Exam format:**
Individual oral or written examination.

**Evaluation criteria:**
As stated in the Framework Provisions
Multi Agent Wireless Systems (P)
*Multi agent trådløse systemer*

**Prerequisites:**
The 1st and 2nd semesters of the WCS MSc program, or equivalent

**Objective:**
Students who complete the module:

**Knowledge**
Must have knowledge about
- Item the interaction of multiple communication links which are jointly considered to optimize system performance
- Wireless communications technologies for multi-user/multi-network setting.
- Specific in-depth knowledge about at least one advanced method or technology
- applied to wireless communications. Such as
- The generic multiple access principles as it applies to time, frequency, code and space - and know their advanced formats for multi agent support.
- Methods used to model electro-magnetic properties of antennas and propagation for wireless communication, and exploit their characteristics for terminal or system performance.
- Channel characterization and processing algorithms to exploit multi link radio propagation mechanisms of multiple antenna systems

**Skills**
The students must be able to
- Evaluate the impact on system performance, by joint treatment of links in a multi-user/multi-network scenario – or other interaction mechanisms.
- Apply multi-agent or other modern/advanced techniques to a practical problem in modern wireless communications and evaluate their applicability.
- Excel in least one advanced method or technology applied to wireless communications.

**Competencies**
The students must have ability to:
- Assess and exploit the space domain, the multiple user dimensions - or other modern/advanced technologies, to provide additional degrees of freedom to the system design.
- Communicate the project work in sound scientific and academic form.
- Contribute successfully to team work within the problem area and make a common presentation of the project work.

**Type of instruction:**
Project work.

**Exam format:**
Individual oral examination based on a written report.

**Evaluation criteria:**
As stated in the Framework Provisions
**Multi Agent Radio Communication (C)**

*Multi agent radio kommunikation*

**Prerequisites:**
Wireless system performance (8th Semest Wireless Communication Systems and Networks and Distributed Systems) Introduction to probability, statistics and stochastic processes, Stochastic processes, Matrix computations and convex optimization or equivalent.

**Objective:**
Students who complete the module:

**Knowledge**
Must have knowledge about

- Advanced Access
- CDMA for multi-user systems
- Multicarrier systems (OFDM and OFDMA)
- Space division multiple access (SDMA)
- Distributed antenna systems
- Short range communications
- Passive communications/RFID-enabled devices
- Energy-cost-performance balancing
- Network level
- Device level
- Cooperative communications
- Ad-hoc
- Cognitive radio and dynamics spectrum sharing
- Network coding
- Space and time processing
- Spatial data multiplexing and space-time coding
- Time reversal techniques

**Skills**
The students must be able to

- Determine advantages vs disadvantages of a chosen access technique
- Compare different cooperative communication schemes and their operation in interference scenarios
- Assess different technology features on cost-resource balancing in practical settings
- Apply processing methods for time and space exploitation of the wireless radio channel

**Competencies**
The students must be able to:

- Compare and assess tradeoffs for performance optimization in heterogeneous (advanced) wireless communications.
- Choose the technology most suitable under given practical implications and limitations

**Type of instruction:**
As described in the introduction to Chapter 3.
**Exam format:**
Individual oral or written examination.

**Evaluation criteria:**
As stated in the Framework Provisions
Antennas and Propagation (C)
Antenner og Udbredelse

Prerequisites:
Understanding of electro-magnetics, antennas and their connection to stochastic radio channels

Objective:
Students who complete the module:

Knowledge
Must have knowledge about
- Antennas
- Basic antennas
- Requirements for antennas in a scattering radio environment
- Multi-antenna/ correlation analysis
- Antenna measurement principles
- Near field (antenna design)
- Finite Difference Time Domain (FDTD) Method
- Method of Moments
- Far field (propagation)
- Ray tracing
- Phase screen methods and diffraction
- Propagation scattering modeling for multiple antenna systems

Skills
- Identify connection between antenna system and radio channel behavior
- Assess performance of antenna elements and antenna systems
- Select appropriate Electro-magnetic near and far field Simulation methodology for realistic antenna and propagation settings

Competencies
- Apply antenna(system) and propagation conditions in new/real-world constellations for analyzing wireless communication system impact and performance optimization
- Evaluate limits of the methods and theories as applied to more general problems

Type of instruction:
As described in the introduction to Chapter 3.

Exam format:
Individual oral or written examination.

Evaluation criteria:
As stated in the Framework Provisions
Prerequisites:
Passed three previous semesters or the like

Objective:
Students who complete the module:

Knowledge
- have knowledge, at the highest international level of research, of at least one of the core fields of the education
- have comprehension of implications of research (research ethics)

Skills
- are able to reflect on a scientific basis on their knowledge,
- can argue for the relevance of the chosen problem to the education including specifically account for the core of the problem and the technical connections in which it appears
- can account for possible methods to solve the problem statements of the project, describe and assess the applicability of the chosen method including account for the chosen delimitation and the way these will influence on the results of the product
- can analyze and describe the chosen problem applying relevant theories, methods and experimental data
- are able to describe the relevant theories and methods in a way that highlights the characteristics and hereby document knowledge of the applied theories, methods, possibilities and delimitations within the relevant problem area
- have the ability to analyze and assess experimental data, including the effect the assessment method has on the validity of the results.

Competencies
- are able to communicate scientific problems in writing and orally to specialist and non-specialist.
- are able to control situations that are complex, unpredictable and which require new solutions,
- are able to independently initiate and to perform collaboration within the discipline and interdisciplinary as well, and to take professional responsibility,
- are able to independently take responsibility for his or her own professional development and specialization.

If the project is carried out as a long master’s thesis the learning objectives include those defined for the 3rd semester of the education.

Type of instruction:
As described in the introduction to Chapter 3.

Problem based project oriented project work individual or in groups of 2-3 persons

Exam format:
Individual oral examination based on a written report.

Evaluation criteria:
As stated in the Framework Provisions
Chapter 4: Entry into Force, Interim Provisions and Revision

The curriculum is approved by the Dean of the Faculty of Engineering and Science.

Students who wish to complete their studies under the previous curriculum from 2008 must conclude their education by the summer examination period 2012 at the latest, since examinations under the previous curriculum are not offered after this time.

In accordance with the Framework Provisions and the Handbook on Quality Management for the Faculty of Engineering and Science and The Faculty of Medicine at Aalborg University, the curriculum must be revised no later than 5 years after its entry into force.

Chapter 5: Other Provisions

5.1 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.1 If the project is written in English, the summary must be in Danish.2 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.

5.2 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

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

5.3 Rules for examinations

The rules for examinations are stated in the Examination Policies and Procedures published by the Faculty of Engineering and Science on their website.

5.4 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.

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1 Or another foreign language (upon approval from the Board of Studies.
2 The Board of Studies can grant exemption from this.
5.5 Completion of the Master’s programme
The Master’s programme must be completed no later than four years after it was begun.

5.6 Rules and requirements for the reading of texts
It is assumed that the student can read academic texts in his or her native language as well as in English and use reference works etc. in other European languages.

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