Faculty of Engineering and Science
Board of Studies for Biotechnology, Chemical and Environmental Engineering

AALBORG UNIVERSITY

# Curriculum for the MSc.Eng. Programme in Chemistry

2010
Version 3 – 2013

Aalborg University

The programme is offered in Aalborg

# Preface

Pursuant to Act 695 of June 22, 2011 on Universities (the University Act) with subsequent changes, the following curriculum for the Master's program in Environmental Engineering is stipulated. The program also follows the Framework Provisions and the Examination Policies and Procedures for the Faculties of Engineering, Science and Medicine. The Study Regulations are approved by the Study Board of Biotechnology, Chemical and Environmental Engineering at Aalborg University.

Aalborg University, 2013

Niels T. Eriksen

Chair of Study Board

Approval date: 2010 – revised 2013

Dean of Faculty of Science and Engineering

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# Chapter 1. Legal basis of the Study Regulations

## 1.1 The Ministerial Order Basis

The Master's program in Chemistry 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. 213 of February 21, 2012 (the Admission Order) and Ministerial Order no. 250 of March 15, 2007 (the Grading Scale Order) with subsequent changes.

## 1.2 The Faculty of Science and Engineering affiliation

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

## 1.3 The Study Board affiliation

The 1st to 4th semesters of the Master's programme fall under the Study Board for Biotechnology, Chemical and Environmental Engineering.

# Chapter 2. Admission, title, programme duration and competence profile

## 2.1 Admission

Admission to the Master's programme in Chemistry requires a Bachelor's degree in Chemistry, Environmental Engineering, or Biotechnology, or a similar degree.

## 2.2 Degree/title in Danish, Latin and English

The Master's program entitles the graduate to the designation civilingeniør, cand.polyt. (candidatus/candidata polytechnices) i kemi. The English designation is: Master of Science (MSc) in Engineering (Chemistry).

## 2.3 The programme's specification in ECTS

The Master's programme is a 2-year, research based, full-time study programme. The programme is set to120 ECTS.

## 2.4 The programme's competence profile

The competence profile below will appear on the diploma:

A graduate of the Master's programme has competences acquired through a course of study that has taken place in a research environment.

The graduate of the Master's program can perform highly qualified functions on the labour market on the basis of the educational program. Moreover, the graduate has prerequisites for research (a Ph.D. program). Compared to the Bachelor's degree, the graduate of the Master's program 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 contexts. Description of qualifications:

***Description of qualifications:***

Individuals who attain the MSc degree in Chemistry

| | |
|---|---|
| *Knowledge* | Knowledge field<br>Have knowledge within chemistry that in selected areas, such as process technology, materials technology and polymer technology, is based on the highest international research. |
| | Understanding and reflection level<br>Understand the principles of the above-mentioned areas, can reflect upon their knowledge in these areas at a scientific level, and use their knowledge to identify technological problems and industrial applications. |
| *Skills* | Type of skills<br>Master the scientific methods, models and tools of the above-mentioned areas and the general skills that are tied to work within the area of chemical and molecular engineering. |
| | Evaluation and decision making<br>Are able to evaluate and select among scientific theories, methods, tools and general skills used in chemical engineering and technology, develop and establish new analysis protocols and solution models in industrial and |

laboratory settings, and participate in the development and manufacturing of novel compounds and materials based on inorganic and organic chemistry.

Communication
Are able to communicate research based knowledge and discuss professional and scientific problems with both peers and non-specialists.

*Competences*

Action space
Are able to carry out research, development, and manufacturing in areas of process chemistry, materials technology, and polymer technology.

Collaboration and responsibility
Are able to independently initiate and carry out discipline specific and cross-disciplinary cooperation and to assume professional responsibility within the area of chemical engineering.

Learning
Are able to independently take responsibility for own professional development and specialization.

# Chapter 3. Content of the Study Programme

The program is structured in modules and organised as a problem-based study. A module is a program element or a group of program 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 program is based on a combination of academic, problem-oriented and interdisciplinary approaches and can be organized 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

Outline of the Master's programme in Chemistry

| Semester | Module | | ECTS | Grading | Assessment |
|---|---|---|---|---|---|
| 1. | Materials Technology | | 15 | 7-point scale | Internal |
| | Materials Chemistry | | 5 | 7-point scale | Internal |
| | Processing of Materials | | 5 | 7-point scale | Internal |
| | Physical Chemistry of Materials | | 5 | 7-point scale | Internal |
| 2. | Industrial applications of macromolecules | | 15 | 7-point scale | Internal |
| | Polymer Chemistry | | 5 | Pass/fail | Internal |
| | Supramolecular Chemistry | | 5 | 7-point scale | Internal |
| | Carbohydrate Chemistry | | 5 | 7-point scale | Internal |
| 3. | Elec-tives | Individual semester* | 30** | 7-point scale | External |
| | | External studies | 30 | | |
| 4. | Master's thesis Project | | 30 | 7-point scale | External |

* Aalborg University organises a number of cross-disciplinary 5 ECTS modules at 3rd semester. If one or more of these are followed, the project module is reduced in size accordingly.

**cf. Framework Provisions section 9.4.1, students are given several choices of composing an individual planned semester, including extending the master's thesis to up to 60 ECTS.

The study board can cancel modules if the number of enrolled students is low.

A compulsory course in Problem based learning (PBL) and student responsibility is offered as an integrated part of all project modules to students not acquainted with PBL at Aalborg University.

## 3.1 1st semester – Materials Technology

### 3.1.1 Materials Technology

| | |
|---|---|
| *English title* | *Materials Technology* |
| *Danish title* | *Materialeteknologi* |
| Placement | Autumn, 1st semester |
| Prerequisites | Inorganic Chemistry, Unit Operations, Materials Chemistry, Materials Physical Chemistry, Processing of Materials |
| Aim | To solve material technological problems in connection to industrial production and development |
| Learning outcomes | After the project module the student should be able to<br>Knowledge<br>• Account for inorganic materials chemistry, synthesis and materials forming process<br>• Clarify the relationships among production process, materials selection, microstructure and material properties within the selected project<br>• Demonstrate insight in unit operations with respect to processing of materials for the selected problem/project<br>Skills<br>• Analyse and solve problems related to materials technology<br>• Synthesize and characterize materials<br>• Apply mathematical models for, e.g., prediction of material properties, implementation or scale-up of unit operations<br>Competences<br>• Select, evaluate and implement solutions for problems<br>• related to materials processing |
| Content | Projects will deal with industrial problems where knowledge in materials chemistry And unit operations will be applied for the understanding and solving the problem. Projects cover materials preparation, synthesis, characterization, development, post-treatment and application. Projects should be related to optimization of materials processing or development of new materials.<br><br>Objects of materials are mainly inorganic materials such as ceramics, glasses, cements, composites, refractory materials, thin films, inorganic nano-materials and hybrid-materials. |
| Duration | 15 ECTS |
| Language | English or Danish |
| Assessment | Oral examination based on a written report |
| Grading | 7-point scale |
| Assessment Criteria | As stated in the framework provisions |

### 3.1.2 Materials Chemistry

| | |
|---|---|
| *English title* | *Materials Chemistry* |
| *Danish title* | *Materialekemi* |
| Placement | Autumn, 1st semester |
| Prerequisites | Inorganic Chemistry and Physical Chemistry |
| Aim | The purposes of the course are to introduce both fundamental chemical principles of materials and nano-materials, and main |

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|---|---|
| | methods for developing, optimizing, post-treating and characterizing materials regarding different physical and chemical performances. The focus will be placed on the relation between chemical composition, structure and properties. The course will introduce the current status of materials and nano-materials technologies. |
| Learning outcomes | After the project module the student should be able to<br>Knowledge<br>• Understand the fundamental principles of materials chemistry and how it relates to practical use<br>• Explain different application areas of materials and ways to optimize the production process of materials<br>Skills<br>• Prepare, synthesize and modify materials to reach target properties using theoretical and practical knowledge in materials chemistry<br>• Design, synthesize, and produce nanostructured materials with given properties.<br>• Characterize conventional materials and nano-materials |
| Content | Materials chemistry focuses on the fundamental principles and applications of both conventional and advanced inorganic materials. The course is divided into the following two parts.<br>1. General inorganic materials chemistry and characterization of inorganic materials (e.g., glass chemistry, ceramic chemistry, metal chemistry, cement industry)<br>2. Chemistry of organic and inorganic nano-materials (e.g., thin films, nano-crystals and –particles, nanotubes, mesoporous materials, nano wires, etc.). |
| Duration | 5 ECTS |
| Language | English |
| Assessment | Written or oral examination |
| Grading | 7-point scale |
| Assessment Criteria | As stated in the framework provisions |

### 3.1.3 Processing of Materials

| | |
|---|---|
| *English title* | *Processing of Materials* |
| *Danish title* | *Materialeforarbejdning* |
| Placement | Autumn, 1st semester |
| Prerequisites | Materials Chemistry, Unit Operations, Modelling of heterogeneous processes |
| Aim | The purpose is to introduce students to knowledge about materials manufacturing, post-treatment and the impact of the manufacture conditions on the structure and properties of materials. To introduce students to the analysis of large-scale industrial systems as well as methods and principles of environmental evaluation. To enable students in chemical engineering to collaborate with mechanical engineeres |
| Learning outcomes | After course module the student should be able to<br>Knowledge<br>• Clarify the relationship among chemical composition, structure, properties and manufacturing<br>Skills<br>• Conduct calculations of manufacture parameters and |

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| | mechanical, physical and chemical properties<br>• Apply materials manufacturing technologies and their engineering applications<br>• Predict certain properties of materials based on their manufacturing parameters<br>• Design manufacturing and post-treatment processes that can improve physical and chemical performances of materials<br>• Carry out analysis of large-scale production processes<br>Competences<br>• Use principles and methods for environmental management |
| Content | The courses cover the introduction to e.g.:<br>• Application areas and development tendencies of plastics<br>• Chemical performances of materials<br>• Manufacturing technology of polymers<br>• Manufacturing technology of ceramics, cements and glasses<br>• Environmental analysis and management<br>• Industrial processes by visiting relevant industries |
| Duration | 5 ECTS |
| Language | English |
| Assessment | Written or oral examination |
| Grading | 7-point scale |
| Assessment Criteria | As stated in the framework provisions |

### 3.1.4 Physical Chemistry of Materials

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|---|---|
| *English title* | *Physical Chemistry of Materials* |
| *Danish title* | *Materialers fysiske kemi* |
| Placement | Autumn, 1st semester |
| Prerequisites | Physical Chemistry and Analytical Chemistry |
| Aim | The course focuses on materials physical chemistry and electrochemistry. The course focuses on the thermodynamics, kinetics and phase transition in materials. The analytical methods for obtaining thermodynamic and kinetic data will be introduced to students. Further, the course aims to give students a deep theoretical and practical understanding of the modern electrochemistry and its applications in connection to quantitative analysis, metallic corrosion and materials manufacturing. |
| Learning outcomes | After the course module the student should be able to<br>Knowledge<br>• Understand and apply the link between electrochemistry and thermodynamics<br>• Explain and utilize phase diagram of materials<br>• Clarify mechanisms behind the phase transitions<br>Skills<br>• Solve physical chemical problems in the fields of materials science and chemical processes<br>• Collect and evaluate physical-chemical data by doing experiments such as the viscometric and calorimetric measurements |

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| | • Apply different types of electron-ion conductor junction to understand their electrodynamic, thermodynamic and kinetic backgrounds<br>• Apply different analytical methods based on electrochemical reactions<br>• Apply the knowledge about chemistry, technology and economy of electrochemical processes in materials industry<br>• Design the processes in batteries, accumulators and fuel cells<br>Competences<br>• Design experimental routes for synthesis and treatment of new materials based on physical chemistry and electrochemical principles |
| Content | The course covers<br>• Materials thermodynamics<br>• Chemical reaction kinetics and dynamics in materials<br>• Phase equilibrium in materials<br>• Order and disorder in solid<br>• Experimental methods for collecting thermodynamic and kinetic data of materials, e.g., viscometric and calorimetric methods<br>• General electrochemistry<br>• Analytical electrochemistry<br>• Application of electrochemistry in materials science<br>• Description of electron-ion conductor junction as electrochemical electrode<br>• Electrolytes and their properties, redox reactions, conductivity and determination<br>• Links between electrochemical potentials, thermodynamic parameters and concentrations<br>• Electrochemical methods: Impedance spectroscopy, voltammetry, and other analytical methods and its instrumentation<br>• Type of electrodes, electrode kinetics and electrode related effects<br>• Description of the different type of batteries, accumulators and fuel cells |
| Duration | 5 ECTS |
| Language | English |
| Assessment | Written or oral examination |
| Grading | 7-point scale |
| Assessment Criteria | As stated in the framework provisions |

## 3.2 2nd semester – Synthesis and Chemistry of Polymers

### 3.2.1 Industrial Applications of Macromoles

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|---|---|
| *English title* | *Industrial Application of Macromolecules* |
| *Danish title* | *Industriel anvendelse af makromolekyler* |
| Placement | Spring, 2nd semester |
| Prerequisites | Organic Chemistry, Physical Chemistry, Unit Operations |
| Aim | To give the students an extensive knowledge and competences in molecular applications of natural and synthetic macromolecules, principles of their production and characterisation of polymers from molecular architecture to properties in relation to their industrial use. |
| Learning outcomes | After the project module the student should be able to<br>Knowledge<br>• understand and account for the chemical properties of selected natural and synthetic macromolecules on molecular and macroscopic level<br>• relate the chemical properties to the production of natural and synthetic macromolecules<br>Skills<br>• select relevant techniques for the characterization of macromolecules and the study of their applications<br>• synthesize, modify and characterize macromolecules with selected physical and chemical functionalities<br>• apply separation principles for manufacturing, purification and characterization of macromolecules<br>Competences<br>• analyze and solve problems related to industrial use of macromolecules, implementing knowledge of molecular ans macroscopic properties of macromolecules |
| Content | Projects will deal with industrial problems related to the chemistry and application of macromolecules. Projects could cover macromolecule synthesis, modification and/or characterization as well as applications of macromolecules. |
| Duration | 15 ECTS |
| Language | English or Danish |
| Assessment | Oral examination based on a written report |
| Grading | 7-point scale |
| Assessment criteria | As stated in the framework provisions |

### 3.2.2 Polymer Chemistry

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|---|---|
| *English title* | *Polymer Chemistry* |
| *Danish title* | *Polymerkemi* |
| Placement | Spring, 2nd semester |
| Prerequisites | Fundamental Organic Chemistry, Experimental Organic Chemistry |
| Aim | To introduce the students majoring in chemistry or engineering a broad knowledge of polymer chemistry, such as principles of polymerization, polymer morphologies, polymer properties and so on. Meanwhile, some basic experimental techniques will be included in the lab course. |

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| Learning outcomes | After completion of the course module the student should be able to<br>Knowledge<br>• Account for different categories of polymers and their use in selected applications<br>• Characterize and categorize polymers<br>• Explain different polymerization and modificaion principles<br>Skills<br>• Design synthetic routes of functional monomers<br>• Perform polymerization under various conditions<br>• Modify polymer surfaces<br>Competences<br>• Characterize macromolecules: from chemical structure to molecular weights and distributions |
| Content | • Basic Principles: Molecular weight and polymer solutions,<br>• Chemical Structure and Polymer Properties<br>• Polymer Morphology<br>• Step-reaction and ring opening polymerization and its lab course<br>• Free radical polymerization and its lab course<br>• Ionic Polymerization and its lab course<br>• Vinyl polymerization with complex coordination catalysts<br>• Characterization of polymers, Polyethers, -sulfides, and related polymers, Polyamides and related polymers. Heterocyclic polymers. Miscellaneous organic polymers, Inorganic and partially inorganic polymers. Natural Polymers.<br>• Recent developments in the frontier research for novel polymerization technique of new materials<br>• Basic experimental techniques will be included in laboratory exercises |
| Duration | 5 ECTS |
| Language | English |
| Assessment | Written report |
| Grading | Passed/failed |
| Assessment criteria | As stated in the framework provisions |

### 3.2.3 Supramolecular Chemistry

| | |
|---|---|
| *English title* | *Supramolecular Chemistry* |
| *Danish title* | *Supramolekylær kemi* |
| Placement | 2nd semester |
| Prerequisites | Organic Chemistry and Physical Chemistry |
| Aim | To introduce the students to supramolecular chemistry with focus on the physical chemistry of molecular interactions. |
| Learning outcomes | After completion of the course module the student should be able to<br>Knowledge<br>• Explain the principles of design of artificial ligands<br>• Relate similarities and differences of intra- and intermolecular forces of large molecules and aggregates<br>• Describe the thermodynamics of molecular interactions and account for the importance of solvents and additives on the strength of molecular interactions<br>Skills |

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| | • Apply theories and methods for analysis of molecular interactions<br>• Apply experimental and computational models in the study of molecular interactions<br>Competences<br>• Predict the molecular interactions of macromolecules and their implications on macroscopic behaviour |
| Content | The course includes lectures and theoretical assignments, including<br>• The basic concepts of supramolecular chemistry<br>• Intermolecular forces and equilibrium considerations<br>• Thermodynamics and solvent effects<br>• Cation-and anion-specific ligands<br>• The supramolecular chemistry of biological systems<br>• The self-organization of molecules<br>• Self-assembly of macromolecules and polymers<br>• Experimental assessment and computational modelling of molecular interactions |
| Duration | 5 ECTS |
| Language | English |
| Assessment | Written or oral examination |
| Grading | 7-point scale |
| Assessment Criteria | As stated in the framework provisions |

### 3.2.4 Carbohydrate Chemistry

| | |
|---|---|
| *English title* | *Carbohydrate Chemistry* |
| *Danish title* | *Kulhydratkemi* |
| Placement | Spring, 2nd semester |
| Prerequisites | Organic chemistry and biochemistry |
| Aim | The student will obtain basic knowledge of the chemistry, biology and biosynthesis of carbohydrates as well as carbohydrate active enzymes and their catalytic reaction mechanisms. Furthermore the student will obtain knowledge of the structure, function and technical utilization of oligo- and polysaccharides regarding industrial production and biomedical applications. |
| Learning outcomes | After completion of the course module the student should be able to<br>Knowledge<br>• explain and show in depth understanding of the structure and chemical properties of mono- and disaccharides as well as oligo- and polysaccharides<br>• demonstrate knowledge of industrially important carbohydrates including hydrocolloids and their gelation properties<br>• explain essential aspects of glycobiology<br>• demonstrate in depth knowledge of the substrate specificity, regio- and anomeric selectivity as well as the function and catalytic mechanisms of carbohydrate active enzymes<br>• demonstrate knowledge of the enzymology related to degradation and modification of plant based biomass including starch, cellulose and pectin.<br>Skills<br>• apply methods of carbohydrate synthesis and modification to solve problems in industrial processes and applications |

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| | • carry out enzyme catalysed starch liquefaction and saccharification<br>• carry out enzyme catalysed organic synthesis of glycoconjugates<br>• perform viscosimetric analysis<br>• perform preparative solid phase separation of glycoconjugates and their characterisation |
| Content | The course consists of lectures, theoretical exercises and individual studies focused on the following topics<br>• Nomenclature, structure and isomers of pentoses and hexoses<br>• Conformation of monosaccharides<br>• Structure, chemical and physical properties of mono-and disaccharides, oligo- and polysaccharides<br>• Technical and industrial utilization of carbohydrates including hydrocolloids<br>• Glycosylation<br>• Structure, function and catalytic mechanism of glycoside hydrolases<br>• The cellulosome<br>• Pectinolytic enzymes<br>• Glycoside transferase and glucosidase catalysed reactions<br>• Regioselective synthesis of sugar derivatives and glycoconugates |
| Duration | 5 ECTS |
| Language | English |
| Assessment | Written or oral examination |
| Grading | 7-point scale |
| Assessment Criteria | As stated in the framework provisions |

## 3.3 3rd & 4th semester – Master Thesis

### 3.3.1 Master thesis project

| | |
|---|---|
| *English title* | *Master's Thesis* |
| *Danish title* | *Kandidatspeciale* |
| Placement | 3rd and 4th semester (long Master's thesis), 4th semester (short Master's thesis) |
| Prerequisites | Completed 1st-2nd semester or 1st-3rd semester |
| Aim | To plan, conduct and report on a larger scientific research project within chemical engineering |
| Learning outcomes | After completion of the project the student should be able to<br>Skills<br>• plan, execute and report an extensive individual research project within an agreed time frame<br>• conduct technological development and research, and solve complicated technical problems using scientific methods<br>Competences<br>• compare and critically evaluate the results of the project in relation to existing knowledge and accepted theories within the subject area<br>• consider economic consequences and impact on society, environmental and safety issues related to the project<br>• communicate a balanced view of the results and conclusions of the project in well-organized written and oral presentation |
| Content | MSc projects will usually be related to on-going research at the Section of Chemistry. Project may also be conducted in collaboration with external companiesand research institution. The MSc project will normally be carried out individually and contain both theoretical and experimental parts. The project outcome must be presented in an MSc thesis or a scientific paper in agreement with accepted scientific principles, written by the student. |
| Duration | 30-60 ECTS |
| Language | English or Danish |
| Assessment | Oral examination based on a written report |
| Grading | 7-point scale |
| Assessment criteria | As stated in the framework provisions |

## 3.4 Problem-based Learning (PBL) and Student Responsibility at Aalborg University

### 3.4.1 Problem-based Learning (PBL) and Student Responsibility at Aalborg University

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|---|---|
| *English title*<br>*Danish title* | *Problem-based Learning (PBL) and Student Responsibility at Aalborg University*<br>*Problembaseret læring og studerendes ansvar for læring på Aalborg University* |
| Placement | Spring, 2nd semester |
| Prerequisites | None, but the course is compulsory for students not acquainted with the Aalborg PBL model |
| Aim | To introduce the students majoring in chemistry or engineering a broad knowledge of polymer chemistry, such as principles of polymerization, polymer morphologies, polymer properties and so on. Meanwhile, some basic experimental techniques will be included in the lab course. |
| Learning outcomes | After completion of the course the student should<br>Knowledge<br>• know about the organization at Aalborg University and where to ask for help in different matters<br>• know about how to communicate both in the project groups and during courses<br>• know how a semester is structured and for the different examination forms used at Aalborg University<br>• know how project work and laboratory work are carried out at Aalborg University including safety issues in the laboratories<br>• know about issues concerning plagiarism and its consequences<br>• know about the software which is used during the study<br>• know about the IT systems used and how to get started<br>• know about the specialist student counselors and how they may provide assistance<br>Skills<br>• be able to use problem-based learning and group work in project and courses at Aalborg University<br>• be able to use Moodle to find lecture plans, timetables, and other relevant information<br>Competences<br>• be able to apply the concepts, theories and methods for problem-based learning and group work<br>• be able to account for the considerations involved in the process of formulating project reports in practice. |
| Content | Lectures, discussions and group work. The course will take place during two Wednesday afternoons. |
| Duration | |
| Language | English |
| Assessment | Internal assessment during the course/class participation according to the rules in the Examination Policies and Procedures, Addendum to the Framework Provision of the Faculty of Engineering and Science, Aalborg University. In this case the assessment is primarily based on the oral performance during the course. This means that the student has to be active during the course time and participate in discussions. The course is an integrated part of the project and a precondition for participation in the project examination for those |

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|---|---|
| | who are not acquainted with the Aalborg PBL model. Consequently, no diploma will be issued for the course nor will it appear on the academic transcripts. |
| Grading | Passed/failed |
| Assessment criteria | As stated in the framework provisions |

# Chapter 4. Entry into force, interim provisions and revision

The study regulations are adopted by the Study Board of Biotechnology, Chemical and Environmental Engineering, approved by the Dean of the Faculty of Engineering and Science and take effect from 1st September, 2013.

Students who wish to complete their studies under the former study regulations from 2007 must conclude their education by the summer examination period 2010 at the latest, since examinations under the former study regulations are not offered after this time.

In accordance with the Framework Provisions and the Handbook on Quality Management for the Faculties of Engineering, Science and Medicine at Aalborg University, the study regulations must be revised 5 years at the latest after their taking effect.

The current, valid version of the study regulations is published at www.ses.aau.dk.

# Chapter 5. Chapter 5: Other rules

## 5.1 3rd semester

On the 3rd semester in accordance with the framework provisions section 5.3 the students have on their own initiative the following options instead of an ordinary project.

- Documentation of the semester project through a scientific article
- Individual project preparing a scientific report or article
- Transversal studies
- Relevant internship
- Long dissertation (Master thesis) on 3rd and 4th semester on programmes experimental in nature.

The particular wishes of the students must be approved by the study board prior to semester start.

## 5.2 Rules for written assignments including the Master's thesis and its scope

An evaluation of the student's spelling and writing ability enters into the assessment of all written work, regardless of what language it is written in. Orthographic and grammatical correctness and stylistic proficiency are taken as a basis for the evaluation of language performance. Language performance must always enter in as an independent dimension of the total evaluation. However, no examination can be assessed as 'Pass' on the basis of language performance alone; similarly, an examination normally cannot be assessed as 'Fail' on the basis of poor language performance alone. The above applies unless other rules are stated in connection with the individual examination.

The Master's thesis must include a summary in a foreign language (English, French, Spanish or German subject to the study board's approval). If the project is written in a foreign language (English, French, Spanish or German) the summary can be written in Danish subject to the study board's approval. The summary must be at least 1 page and may be at most 2 pages (the summary is not counted in any fixed minimum and maximum page count per student). The summary enters into the evaluation of the project as a whole.

## 5.3 Credit transfer

Students with other programme elements from other Master's programmes can obtain credit/admission subject to the study board's evaluation of the individual application (meritering).

## 5.4 Rules for the maximum period of enrolment

The Master's programme must be completed within 4 years at the latest following enrolment, excluding leaves of absence.

## 5.5 Rules for examinations

The rules for examinations appear in "Examination Policies and Procedures" published on the Faculties of Engineering, Science and Medicine's website www.tek-nat.aau.dk.

## 5.6 Exemption

In the case of unusual circumstances, the study board can grant exemptions from those parts of the study regulations that are not fixed by law or ministerial order. Exemption regarding an examination applies to the immediate examination.