

Curriculum for the Master's Programme in

**Lighting Design  
(Lysdesign)**

**Semester 1-4**

The Faculties of Engineering and Science  
Aalborg University  
2013

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## Preface

Pursuant to Act 652 of June 24, 2012 on Universities (the University Act) with subsequent changes, the following curriculum for the Master's programme in Lighting Design is stipulated. The programme also follows the Framework Provisions and the Examination Policies and Procedures for the Faculties of Engineering, Science and Medicine.

## Table of Contents

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 ..... and Competence Profile.....	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
2.5 Competence profile of the programme: .....	3
Chapter 3: Content and Organization of the Programme.....	4
3.1 Overview of the programme .....	4
3.2 Courses.....	5
Seeing the Light .....	6
Meaning of Light: Light and Space .....	8
Lighting Fundamentals .....	10
Rendered Lighting Simulation/CGI .....	11
Creating with Light: Interactive Lighting.....	12
Evidence-based Lighting Design .....	13
Light and Context .....	14
Intelligent Lighting Design .....	16
Lighting Design Innovation .....	18
Creative Innovation and Entrepreneurship .....	19
Mini Project .....	20
Master's Thesis .....	21
Chapter 4: Entry into Force, Interim Provisions and Revision.....	23
Chapter 5: Other Provisions.....	23
5.1 Rules concerning written work, including the Master's thesis.....	23
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.....	23
5.3 Rules for examinations.....	23
5.4 Exemption .....	23
5.5 Additional information.....	24

## ***Chapter 1: Legal Basis of the Curriculum, etc.***

### **1.1 Basis in ministerial orders**

The Master's programme in Lighting Design 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 Programmes at Universities (the Ministerial Order of the Study Programmes) 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 Masters Programme 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 of Media Technology, SICT

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

### **2.1 Admission**

Admission to the Master's programme in Lighting Design requires documented knowledge of Mathematics equivalent to at least Mathematics B level and a Bachelor of Science (BSc) in Engineering (Architecture and Design), Bachelor of Science (BSc) in Engineering (Sustainable Design), Bachelor of Science (BSc) in Medialogy, Bachelor of Science (BSc) in IT Communication, Bachelor's degree in Architecture, Building Engineering, Design, Media Technology or equivalent.

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 cand.scient. i lysdesign. The English designation is: Master of Science (MSc) in Lighting Design.

### **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 in 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 methods in both an academic and occupational/professional context.

## 2.5 Competence profile of the programme:

### The graduate of the Master's programme:

- |              |  |
|--------------|--|
| Knowledge    | <ul style="list-style-type: none"><li>• Must have knowledge of theory based on the highest international research in relation to designing with daylight and electric light in virtual and real space.</li><li>• Be able to understand and synthesise at the highest international level the knowledge of light in the subject areas of architecture, media technology and engineering.</li><li>• Be able to critically relate the knowledge and understand the importance and potential of artistic and scientific innovation, creativity and entrepreneurship in designing with light</li><li>• Be able to identify scientific issues across the subject areas by designing with light</li></ul>   |
| Skills       | <ul style="list-style-type: none"><li>• Must master the lighting design scientific methodologies, tools and general skills related to employment within the field of lighting design</li><li>• Must be able to evaluate and select among theories, methods, tools and general skills to create new lighting analyses and solutions</li><li>• Must be able to set up new analysis and solution models on a scientific basis</li><li>• Must be able to discuss professional issues across disciplinary research-based and practice related knowledge and discuss professional and scientific problems and solutions with both peers and non-specialists</li></ul>  |
| Competencies | <ul style="list-style-type: none"><li>• Must be able to manage work situations and developments that are complex, unpredictable and that require new solutions that can be used to explore and exploit the great potential of new lighting design with a media- and light technological, architectural and sustainable approach</li><li>• Must be able to independently initiate and carry out discipline-specific and cross-disciplinary collaboration by combining the art and science of designing with light</li><li>• Has the ability to apply acquired knowledge in research, innovation and practice</li><li>• Must be able to independently take responsibility for own professional development and specialisation in lighting design</li></ul> |

## **Chapter 3: Content and Organization of the Programme**

The programme is structured in modules and organized as a problem-based study. A module is a programme element or a group of programme elements, which aims to give students a set of professional skills within a fixed time frame specified in ECTS credits, and concluding with one or more examinations within specific exam periods. Examinations are defined in the curriculum. Each semester has an overall theme, which is reflected in the scope of the (mandatory) course modules and semester projects.

The programme is based on a combination of academic, problem-oriented and interdisciplinary approaches and organized based on the following work and evaluation methods that combine skills and reflection:

- lectures
- classroom instruction
- project work
- workshops
- exercises (individually and in groups)
- teacher feedback
- reflection
- field studies
- portfolio work

### **3.1 Overview of the programme**

An overview of the ECTS credit breakdown for the various semesters by modules is shown in table form below.

In general, students may choose different options for the semester. The thesis project must have a size of at least 30 ECTS. If the thesis project is initiated in the 3<sup>rd</sup> semester it is possible to make a larger thesis project of 35, 40, 45, 50, 55 or 60 ECTS. Depending on the ECTS choice, there will be room for 2-3 elective courses on the 3<sup>rd</sup> semester. The following options may be chosen:

#### **Option 1:**

3<sup>rd</sup> semester: 15 ECTS semester project, supplemented by courses  
4<sup>th</sup> semester: 30 ECTS thesis project

#### **Option 2:**

3<sup>rd</sup> semester: internship in Denmark or abroad, or exchange in Denmark or abroad (in this case mandatory courses on the 3<sup>rd</sup> semester may be waived)  
4<sup>th</sup> semester: 30 ECTS thesis project

#### **Option 3 (long thesis project):**

A thesis project of 35, 40, 45, 50, 55 or 60 ECTS, extending over 2 semesters, if necessary supplemented by courses on the 3<sup>rd</sup> semester in order to achieve the required number of ECTS

### 3.2 Courses

Semester	Module	ECTS	Assessment	Exam
1st	Seeing the Light	15	7-point scale	Internal
	Lighting Fundamentals	5	Pass/Fail	Internal
	Meaning of Light: Light and Space	5	Pass/Fail	Internal
	Rendered Lighting Simulation/CGI	5	Pass/Fail	Internal
2nd	Creating with Light: Interactive Lighting	15	7-point scale	External
	Evidence-based Lighting Design	5	Pass/Fail	Internal
	Light and Context	5	Pass/Fail	Internal
	Intelligent Lighting Design	5	Pass/Fail	Internal
3rd	Lighting Design Innovation	20	7-point scale	Internal
	<b>Choose 2 from the following:</b>			
	Creative Innovation and Entrepreneurship	5	Pass/Fail	Internal
	Focus Area	5	Pass/Fail	Internal
	Elective course *	5		
4th	Master's Thesis	30	7-point scale	External
Total		120		

\* Elective courses may include courses offered by the Study Board for Media Technology, by other study boards at Aalborg University, or by other Danish or foreign universities. The list of approved elective courses is maintained by the Study Board for Media Technology. Students who wish to follow courses not included in the list of approved elective courses, must apply in writing for approval to the Study Board for Media Technology.

Semester project:

## **Seeing the Light**

(At opleve lys)

Workload: 15 ECTS, consisting of project work

Semester: 1st semester

### **Prerequisites:**

See 2.1

### **Objectives:**

Develop an understanding and skills in designing with light by synthesizing the fundamental principles of lighting design from the fields of architecture and design, science and media technology. The students must understand the complexity and possibilities that lie in the interplay between the specialized fields. The students will combine the art and science of designing with light in real and virtual spaces.

Students are required to work according to a scientific method and to report results and processes in scientific forms, such as posters, papers or reports.

Students who complete the module will gain knowledge, skills and competences as follows:

#### **Knowledge**

- **Understand** the fundamentals of light from an architectural, scientific and media technological approach
- **Understand** of lighting design methods and ability to understand light as a holistic tool to create spaces with different purposes
- **Understand** central issues related to how different light designs effect human experience

#### **Skills**

- Ability to **analyze** and measure, calculate and animate how light relates to the user experience of space and how different designs have different effects and functions
- Ability to **apply** mixed methods to demonstrate design solutions of an aesthetic, technical and functional character
- Ability to **identity** problems that meet needs, **apply** appropriate goals and **create** solutions

#### **Competencies**

- Ability to **create** a light design project in a simple space using mixed methods such as registration, calculations, animations, models, user observations, etc.
- Ability to **analyze** how to choose the appropriate method and technology to suit different dimensions of lighting design problems at different stages in the design process
- Ability to **apply** and synthesize relevant theoretical, methodological and practical knowledge of lighting
- Ability to **apply** presentation techniques and communication skills

### **Type of instruction:**

Academically supervised student-governed problem oriented project work

### **Exam format:**

In accordance with the current Framework Provisions and directions on examination from the Study Board for Media Technology:

Individual oral exam with an internal censor based on a scientific paper written in English and a product, illustrating and summarizing the project, a poster in English, and edited worksheets/portfolio documenting project details.  
The assessment is performed in accordance with the 7-point grading scale.

**Evaluation criteria:** The criteria for the evaluation are specified in the Framework Provisions.

Title:

**Meaning of Light: Light and Space**

(Lysets betydning: Lys og rum)

**Size:** 5 ECTS

**Prerequisites:**

See 2.1

**Objectives:**

The module covers understanding and synthesizing the fundamental principles of the interplay between light, space, technology, and human perception. Theory on the sensory and qualitative parameters of lighting design is introduced for natural- and electrical lighting, together with examples of lighting techniques. The starting point of this course is the “experience of light and space”. Real world studies of the interplay between light, space, texture, and the human experience are included. The Nordic light and design tradition will be explored to demonstrate a sensibility to designing with light.

Students who complete the module will gain knowledge, skills and competences as follows:

**Knowledge:**

- **Understand** classical theories of cultural and aesthetic responses to light and the space/time continuum
- **Understanding** of a group of reference buildings, places and indoor and outdoor spaces where light plays a specific role
- **Understand** core elements of lighting design in regard to the interplay between daylight and electric light in spaces: form, function, sustainability, location, technique and human significance
- **Understand** lighting design methodologies including scenarios and social contexts of use
- **Applying** qualitative methods for research by design, including end-user interview techniques, analysis and experience sampling
- **Analyse** the qualities of light in space and present the analysis verbally and visually
- **Understanding** of historical and cultural aspects of lighting; theory of current lighting design practice

**Skills:**

- Ability to **understand** light’s functional applications and light used as a design element
- Ability to **apply** light in space through sketching and/or modelling to **demonstrate** design solutions of an aesthetic and functional character
- Ability to **apply** research-based knowledge into practice design
- Ability to **apply** knowledge to facilitate the design process involving users in real-life contexts
- Ability to **demonstrate** understanding of relation between characteristics of lighting schemes (daylight and electric light) with the associated luminous effects

**Competencies:**

- Ability to **synthesize** relevant theoretical, methodological and practical knowledge of lighting
- Ability to **apply** the design process involving users in context
- Ability to **synthesize and apply** experienced and measured/calculated qualities of light in space

**Type of instruction:** Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Framework Provisions and directions are decided and given by the Study Board for Media Technology.

**Exam format:** In accordance with the current Framework Provisions and directions on examination from the Study Board for Media Technology:  
Individual oral or written examination with internal censor. The assessment is performed with the Pass/Non-Pass grade.

**Evaluation criteria:** The criteria for the evaluation are specified in the Framework Provisions.

<p>Title:  <b>Lighting Fundamentals</b>  (Grundlæggende viden om lys)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites:  See 2.1</p>
<p>Objectives</p> <p>The objective of this module is to introduce students to the basic photometric and colorimetric terms, quantities and relationships as well as the processes involved in the perception and appreciation of the luminous environment. The course will propose to master the link between subjective observation and the metrics behind. This covers: real scenes, indoor, outdoor, stage, automotive and virtual spaces.</p> <p>Students who complete the course module will obtain the following qualifications:</p> <ul style="list-style-type: none"> <li> <p><b>Knowledge</b></p> <ul style="list-style-type: none"> <li>• Ability to <b>describe</b> the basic photometry terms and fundamental laws</li> <li>• Ability to <b>relate</b> to the physiology of the human eye and visual perception</li> <li>• Ability to <b>understand and describe</b> light propagation and light interaction with matter</li> <li>• Ability to <b>relate</b> to the possibilities offered by materials with embedded nanoparticles or diffractive surfaces</li> <li>• Ability to <b>describe</b> the basic colorimetry systems</li> <li>• <b>Understand</b> the characteristics and performance of all light sources (including daylight)</li> <li>• The assignments will allow the student to <b>demonstrate</b> the achievement of this knowledge and <b>apply</b> this in practical and theoretical situations.</li> </ul> </li> <li> <p><b>Skills</b></p> <ul style="list-style-type: none"> <li>• Ability to <b>compute</b> illuminances for various light sources (point and area light sources)</li> <li>• Ability to <b>assess</b> contribution of light reflexion on surfaces</li> <li>• Ability to <b>measure</b> luminous quantities with portable equipment</li> <li>• The ability to <b>select</b> the most appropriate light source for a given application</li> <li>• The ability to <b>communicate</b> results of measurements and calculations</li> <li>• Ability to <b>apply</b> objective methods of observation and analysis of lighting conditions based on a scientific approach to light</li> </ul> </li> <li> <p><b>Competencies</b></p> <ul style="list-style-type: none"> <li>• <b>Understanding</b> of the basic photometric and colorimetric systems used in international standards</li> <li>• <b>Understanding</b> of the rational system of measurement of lighting qualities based on photometric and colorimetric calculations</li> <li>• Ability to <b>understand</b> and <b>analyse</b> various lighting patterns occurring in space</li> </ul> </li> </ul>
<p>Type of instruction: Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Framework Provisions and directions are decided and given by the Study Board for Media Technology.</p>
<p>Exam format: In accordance with the current Framework Provisions and directions on examination from the Study Board for Media Technology:  Individual oral or written examination with internal censor. The assessment is performed with the Pass/Non-Pass grade.</p>
<p>Evaluation criteria: The criteria for the evaluation are specified in the Framework Provisions.</p>

<p>Title:  <b>Rendered Lighting Simulation/CGI</b>  (Digitale simuleringer med lys/CGI)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites:  See 2.1</p>
<p>Objectives:  In order to communicate and develop lighting designs it is essential to be able to develop and communicate rendered lighting simulations. The course rationale is that students need to have an understanding of how rendered lighting simulations are essential as reproduction of illuminations of a context and how the rendering can be used as design tool and to communicate and develop different aspects of lighting designs.</p> <p>Students who complete the module will gain knowledge, skills and competences as follows:</p> <ul style="list-style-type: none"> <li> <p><b>Knowledge</b></p> <ul style="list-style-type: none"> <li>• <b>Understanding</b> of how photometric/radiometric illumination concepts transfer to, and are simulated by, rendering software</li> <li>• <b>Understanding</b> of the advanced rendering techniques for global illumination simulation, in particular ray tracing, final gather and photon mapping</li> <li>• Understanding of aspects of the trade-offs between rendering quality and rendering time</li> <li>• <b>Understanding</b> of High Dynamic Range imaging (HDRi)</li> <li>• <b>Understanding</b> of computational day light models</li> <li>• <b>Understanding</b> of shaders</li> </ul> </li> <li> <p><b>Skills</b></p> <ul style="list-style-type: none"> <li>• Ability to <b>apply</b> rendering packages (3dsMAX, Maya, LuxRender, RADIANCE, PBRT, or similar) to simulating radiance/luminance, or irradiance/illuminance levels in complex scenes, with complex illumination conditions</li> <li>• Ability to <b>apply</b> virtual reproduction of exterior and interior illumination and analyse the object appearance</li> <li>• Ability to <b>use</b> shadows in rendering to achieve greater depth and realism</li> <li>• Ability to <b>apply</b> HDRi light probe techniques for capturing real-world illumination conditions and re-creating them in a simulation</li> </ul> </li> <li> <p><b>Competencies</b></p> <ul style="list-style-type: none"> <li>• Ability to <b>analyse, synthesize, and evaluate</b> illumination designs through physics-based, realistic simulation using rendering packages, and to use such simulations in an iterative process to balance functional and aesthetic elements of the illumination design</li> </ul> </li> </ul>
<p>Type of instruction: Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Framework Provisions and directions are decided and given by the Study Board for Media Technology. The course module will be taught as a mixture of lectures and individual assignments</p>
<p>Exam format: In accordance with the current Framework Provisions and directions on examination from the Study Board for Media Technology:  Individual oral or written examination based on completed and submitted assignments. Internal censor. The assessment is performed with the Pass/Non-Pass grade.</p>
<p>Evaluation criteria: The criteria for the evaluation are specified in the Framework Provisions.</p>

Semester project:  
**Creating with Light: Interactive Lighting**  
(At skabe med lys: Interaktivt lysdesign)  
Workload: 15 ECTS, consisting of project work  
Semester: 2nd semester

**Prerequisites:**  
1<sup>st</sup> semester or similar

**Objectives:**

Develop an understanding of creating with light with a focus on an interactive lighting design through media technology and human/conceptual interaction. The students must find a specific context, function and theme where it is possible to define a lighting design project that must show solutions on several levels such as functional, technical, aesthetic, etc.

Students who complete the module will gain knowledge, skills and competences as follows:

**Knowledge**

- **Understanding** of the core elements of lighting in regards to the interactive interplay between human, context, function and light
- Ability to **describe** the lighting fundamentals and the relationship between simulations/renderings of light as design elements
- **Understanding** how light can be used as an interactive design element
- Knowledge of **creating** a project – from concept sketches, programming, mock-ups, tests, technical drawings and realisation
- Must be able to see, appreciate and **analyse** lighting design projects, theories, principles and methods

**Skills**

- Ability to **apply** light and use technology to create intelligent and/or interactive effects in a virtual or real space
- Ability to **analyse** lighting designs according to scientific lighting theories
- Ability to **apply** light design theories, principles and methods to the process of creating lighting design
- Ability to **identify** problems and programmes where lighting design creates holistic solutions

**Competencies**

- Ability to **create** and present holistic lighting design projects by applying the right knowledge about light design, tools and scientific methods into the design process
- Ability to **analyse, communicate and discuss** research-based knowledge in the area of lighting design

**Type of instruction:**

Academically supervised student-governed problem oriented project work

**Exam format:**

In accordance with the current Framework Provisions and directions on examination from the Study Board for Media Technology:  
Individual oral exam with an external censor based on a scientific paper written in English and a product, illustrating and summarizing the project, a poster in English, and edited worksheets/portfolio documenting project details.  
The assessment is performed in accordance with the 7-point grading scale.

**Evaluation criteria:** The criteria for the evaluation are specified in the Framework Provisions.

<p>Title:  <b>Evidence-based Lighting Design</b>  (Evidens baseret lysdesign)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites:  1<sup>st</sup> semester or similar</p>
<p>Objectives</p> <p>The objective of this module is to provide students with evidence concerning the relationship between causes and effects of lighting, particularly in relation to the way we perceive our luminous environment and the possible physiological effects of light.</p> <p>The facts that will be presented are obtained through scientific testing protocols, and the robustness of the scientific literature will be discussed. The results will be used to improve lighting designs and to identify possible risks attached to lighting schemes.</p> <p>References will be provided and the students will be required to verify the validity of the information, which will relate to any context of lighting design. Light source and luminaire specification claims will be verified by the students themselves on product level as well as application level.</p> <p>Students who complete this module will obtain the following qualifications:</p> <ul style="list-style-type: none"> <li> <p><b>Knowledge</b></p> <ul style="list-style-type: none"> <li>• <b>Understanding</b> on the characteristics of the human visual system</li> <li>• <b>Understanding</b> on vision of the elderly and the visually impaired</li> <li>• Will be able to <b>analyse</b> perceived lighting quality</li> <li>• <b>Understanding</b> on lights effect on circadian rhythms</li> <li>• <b>Understand</b> health risks affiliated with lighting</li> <li>• <b>Understanding</b> on optimal lighting for plants</li> </ul> </li> <li> <p><b>Skills</b></p> <ul style="list-style-type: none"> <li>• Ability to <b>assess</b> the performance of a given lighting scheme, based on scientific evidence</li> <li>• Ability to <b>analyse</b> a lighting scheme using the appropriate metric, going beyond state of the art</li> <li>• Ability to read and <b>understand</b> scientific material related to evidence based lighting issues.</li> <li>• Ability to <b>understand</b> existing standards (IEC, CIE, WMO, etc.)</li> </ul> </li> <li> <p><b>Competencies</b></p> <ul style="list-style-type: none"> <li>• Ability to <b>create</b> lighting schemes which comply with various constraints issued from scientific research and evidence based requirements for specific applications</li> <li>• Ability to <b>create</b> sound solutions, and create innovative lighting schemes</li> <li>• Ability to <b>analyse and evaluate</b> on lighting solutions based on up to date knowledge from the scientific literature</li> </ul> </li> </ul>
<p>Type of instruction: Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Framework Provisions and directions are decided and given by the Study Board for Media Technology.</p>
<p>Exam format: In accordance with the current Framework Provisions and directions on examination from the Study Board for Media Technology:  Individual oral or written examination with internal censor. The assessment is performed with the Pass/Non-Pass grade.</p>
<p>Evaluation criteria: The criteria for the evaluation are specified in the Framework Provisions.</p>

<p>Title:  <b>Light and Context</b>  (Lys og kontekst)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites:  1<sup>st</sup> semester or similar</p>
<p>The module covers aspects of designing with light, with focus on the understanding and practical application of aesthetic, functional, legislative and environmental design parameters in different contexts.</p> <p>Objectives:  The module will enable the student to acquire theoretical and applied knowledge of light in different context with emphasis on its qualitative aspects; to see, to understand, to be inspired, to design with light and to communicate light in a conceptual framework.  The objectives are realized by presenting scientific methods and tools in a case-based framework and through the students' active participation in workshops and assignments to deepen an understanding of the various design contexts and opportunities for the experience, knowledge and application of light.  The module will develop students' ability to create design solutions in different scales and areas of application, through the combination of research-based theory with examples from practice and exercises through small exercises.</p> <ul style="list-style-type: none"> <li>• <b>Knowledge</b></li> <li>• Critical <b>understanding</b> of theories and references of cultural and aesthetic responses to light and the space/time continuum</li> <li>• <b>Understand</b> the process of identifying qualities of light and define desired effects through design</li> <li>• <b>Recognize</b> various contexts such as environment, people's need, legislation, energy and atmosphere and integrate in the design process</li> <li>• <b>Understand</b> the qualitative and scientific methods for research by design</li> <li>• <b>Understand</b> how to illustrate, communicate and model natural light and electric lighting design solutions</li> <li>• <b>Understand</b> daylight design and control; sustainable architecture; building automation</li> <li>• <b>Skills</b></li> <li>• <b>Evaluate</b> light in different context verbally and visually</li> <li>• <b>Choose, implement and apply</b> lighting design solutions in a context that include aesthetic, social and functional considerations.</li> <li>• <b>Evaluate and compare</b> research-based knowledge supplemented by knowledge from practical design competences and apply the methods for a specific design problem/solution</li> <li>• <b>Apply</b> the taught methods to solve concrete practical design problems</li> <li>• <b>Competencies</b></li> <li>• Upon successful completion of this module the student will acquire a thorough knowledge and training of practice various aspects of <b>designing</b> with daylight and artificial lighting in different context:</li> <li>• <b>Evaluate and document</b> design solutions of lighting in different contexts</li> <li>• <b>Synthesize</b> knowledge, technical and functional aspects of lighting design with an understanding of context</li> <li>• <b>Predict</b> lighting performance in relation to sustainability and energy</li> <li>• <b>Communicate</b> to professional designers and design team</li> <li>• <b>Synthesize</b> lighting design for specific environments</li> </ul>

Type of instruction: Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Framework Provisions and directions are decided and given by the Study Board for Media Technology.

Exam format: In accordance with the current Framework Provisions and directions on examination from the Study Board for Media Technology:  
Individual oral or written examination with internal censor. The assessment is performed with the Pass/Non-Pass grade.

Evaluation criteria: The criteria for the evaluation are specified in the Framework Provisions.

<p>Title:  <b>Intelligent Lighting Design</b>  (intelligent lysdesign)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites:  1. semester or similar</p>
<p>This module has a focus on interactive lighting design, Interactive applications and multimedia Interaction, using digital media, for both indoor and outdoor applications centred around human factors.</p> <p>Objectives  In this module the student will gain an understanding of the principles of intelligent lighting design and development using computational media. The student will gain knowledge in contemporary lighting design in real life and in virtual representations. The student will understand innovation in the field of intelligent and/or interactive lighting, based on research in aesthetics and science. The student will gain an understanding of design processes in prototyping tools and techniques, programming and interaction technology. The student will also get practical exercises in a variety of new materials, scenario techniques, and usability studies.</p> <p>Students who complete the course module will obtain the following qualifications:</p> <ul style="list-style-type: none"> <li>• <b>Knowledge</b></li> <li>• <b>Understand</b> the design process and methodologies in interactive systems</li> <li>• <b>Understanding</b> emerging lighting technologies in designing intelligent or interactive lighting systems, both for indoor and outdoor applications as well as virtual representations</li> <li>• <b>Understanding</b> of principles for designing, prototyping, programming, realizing, analysing and evaluating of the highest level for an intelligent or interactive lighting system</li> <li>• <b>Critical understanding</b> of the scientific and aesthetic processes according to international research in the use of human centred interactive technologies for lighting design</li> <li>• <b>Synthesis</b> of methodological consideration to describe the theoretical and empirical foundation of the project</li> <li>• <b>Skills</b></li> <li>• Ability to <b>apply</b> design methodologies and processes in the development of an intelligent or interactive lighting system for real and virtual applications</li> <li>• Ability to <b>plan, design, implement and evaluate</b> systematic tests of the intelligent or interactive lighting design from a human-centred and system-based perspective (analysis)</li> <li>• Ability to <b>implement and discuss</b> feasibility, design requirement specifications and sustainability of the developed interactive lighting system including human physiological and psychological factors (evaluation)</li> <li>• <b>Competencies</b></li> <li>• Can independently <b>synthesize</b> knowledge in aesthetic design methods, choice of material, theories and techniques in interactive lighting systems</li> <li>• Expertise in <b>communicating and presenting</b> the project, applying aesthetic and scientific-based descriptions of aspects such as design, construction, analysis and evaluation of an interactive lighting system, including consideration of human factors (evaluation)</li> <li>• Must have competencies in <b>comparing and assessing</b> complex interactive lighting technologies, and methods in order to make the proper design choices</li> </ul>

- for optimum functionality (synthesis)  
• Can independently **mediate** collaboration with professionals such as city planners, designers, and architects in order to implement interactive lighting system

Type of instruction: Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Framework Provisions and directions are decided and given by the Study Board for Media Technology.

Exam format: In accordance with the current Framework Provisions and directions on examination from the Study Board for Media Technology:  
Individual oral or written examination with internal censor. The assessment is performed with the Pass/Non-Pass grade.

Evaluation criteria: The criteria for the evaluation are specified in the Framework Provisions.

<p>Semester project:  <b>Lighting Design Innovation</b>  (innovativt lysdesign)  Workload: 20 ECTS, consisting of project work  Semester: 3rd semester</p>
<p><b>Prerequisites:</b>  1<sup>st</sup> and 2<sup>nd</sup> semester or similar</p>
<p><b>Objectives:</b>  Develop and evaluate new solutions where cross-disciplinary knowledge in the field of lighting design can be synthesized to create innovative solutions. The focus can be exploring commercial aspects as well as socio-cultural implications and/or its use in generating scientific knowledge.</p> <p>Students who complete the module will gain knowledge, skills and competences as follows:</p> <p><b>Knowledge:</b></p> <ul style="list-style-type: none"> <li>• <b>Evaluation</b> of core state-of-the-art concepts, theories, techniques and methodologies related to lighting design</li> <li>• Ability to <b>synthesize</b> relevant lighting concepts, theories and techniques with a significant focus on process and context in lighting design</li> <li>• <b>Evaluation</b> of the design phases including identifying problems, concept, design development, detailed design, specification, laboratory experiments, model building, mock-ups</li> </ul> <p><b>Skills:</b></p> <ul style="list-style-type: none"> <li>• Ability to <b>synthesise</b> market and trend analysis methods to a lighting product or installation based on light and the principals related to lighting design</li> <li>• Ability to <b>evaluate</b> lighting design related to scientific design methods, tools and technologies to create lighting designs that meet specific needs and are viable from a product, commercial, socio-cultural, and/or scientific perspective</li> </ul> <p><b>Competencies:</b></p> <ul style="list-style-type: none"> <li>• Ability to <b>evaluate</b> and select relevant lighting theories, methods and tools with the specific aim of working towards <b>creating</b> new qualitative products, commercially viable products/installations, or new knowledge</li> <li>• Ability to <b>create</b> lighting drawings and lighting layouts that support the design process and communicate the project</li> </ul>
<p><b>Type of instruction:</b>  Academically supervised student-governed problem oriented project work</p>
<p><b>Exam format:</b>  In accordance with the current Framework Provisions and directions on examination from the Study Board for Media Technology:  Individual oral exam with an external censor based on a scientific paper written in English and a product, illustrating and summarizing the project, a poster in English, and edited worksheets/portfolio documenting project details.  The assessment is performed in accordance with the 7-point grading scale.</p>
<p><b>Evaluation criteria:</b> The criteria for the evaluation are specified in the Framework Provisions.</p>

<p>Title:  <b>Creative Innovation and Entrepreneurship</b>  (Kreativ innovation og entreprenørship)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites:  1<sup>st</sup> and 2<sup>nd</sup> semester or similar</p>
<p>Objectives:  This course will give an in-depth introduction of the various factors that are in play when starting a business in the media and entertainment lighting industry. It will provide the necessary background for startup of business both in context of a team working inside an existing organisation (Intrepreneurship) and startup of new businesses (Entrepreneurship).</p> <p>Students who complete the module will gain knowledge, skills and competences as follows:</p> <ul style="list-style-type: none"> <li> <p><b>Knowledge</b></p> <ul style="list-style-type: none"> <li>• Must have knowledge about methods and concepts for startup of businesses</li> <li>• Must be able to <b>understand</b> market potentials for new media products or productions</li> <li>• Must be able to <b>understand</b> different business forms in relation to specific products or productions</li> </ul> </li> <li> <p><b>Skills</b></p> <ul style="list-style-type: none"> <li>• Must be able to <b>analyse</b> a business case</li> <li>• Must be able to <b>synthesize</b> a business plan</li> <li>• Must be able to <b>understand</b> property rights and patents</li> <li>• Must be able to <b>understand, design and conduct</b> media culture analysis</li> </ul> </li> <li> <p><b>Competencies</b></p> <ul style="list-style-type: none"> <li>• Must be able to <b>understand</b> how to collaborate within teams developing and implementing new business plans within existing companies or for startup companies</li> <li>• Be able to <b>analyse, compare and discuss</b> different business strategies</li> <li>• Be able <b>analyse and evaluate</b> the potential market for new media products or productions</li> </ul> </li> </ul>
<p>Type of instruction: Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Framework Provisions and directions are decided and given by the Study Board for Media Technology.</p>
<p>Exam format: In accordance with the current Framework Provisions and directions on examination from the Study Board for Media Technology:  Individual oral or written examination with internal censor. The assessment is performed with the Pass/Non-Pass grade.</p>
<p>Evaluation criteria: The criteria for the evaluation are specified in the Framework Provisions.</p>

<p>Title:  <b>Focus area</b>  (Fokus område)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites:  1<sup>ST</sup> and 2<sup>nd</sup> semester or similar</p>
<p>Objective:  This mini project will develop the student's ability to collect knowledge in a specific chosen focus area that relates to lighting design to create new possibilities. Investigation of a specific area using mixed methods and synthesising it with lighting design explores the profession of lighting design and trains the student in methodologies and processes.</p> <p style="padding-left: 40px;"><b>Knowledge</b></p> <ul style="list-style-type: none"> <li>• <b>Understand</b> how useful knowledge in a specific area is based on international scientific knowledge, practice and development</li> <li>• <b>Synthesise</b> knowledge in a specific area with lighting design</li> <li>• <b>Understand</b> strategies and processes for creating new knowledge, products or events</li> </ul> <p style="padding-left: 40px;"><b>Skills</b></p> <ul style="list-style-type: none"> <li>• <b>Identify, select and apply</b> appropriate knowledge in a specific area</li> <li>• <b>Develop</b> an appropriate problem statement</li> <li>• <b>Synthesise</b> specific knowledge with light in a high professional and mixed methods process</li> </ul> <p style="padding-left: 40px;"><b>Competencies</b></p> <ul style="list-style-type: none"> <li>• <b>Creating</b> synergy and new innovative solutions by <b>synthesising</b> a specific area with lighting design</li> </ul>
<p>Type of instruction: Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Framework Provisions and directions are decided and given by the Study Board for Media Technology.</p>
<p>Exam format: In accordance with the current Framework Provisions and directions on examination from the Study Board for Media Technology:  Individual oral or written examination with internal censor. The assessment is performed with the Pass/Non-Pass grade.</p>
<p>Evaluation criteria: The criteria for the evaluation are specified in the Framework Provisions.</p>

<p><b>Master's Thesis</b> (kandidatspeciale)</p>
<p>Size: 30 ECTS Semester: 4<sup>th</sup> semester</p>
<p>Prerequisites: Have passed the first three semesters in M.Sc. Master of Lighting</p>
<p>Objective</p> <p>To give the students the ability to make a project as an experimental, empirical, artistic, technological /engineering and/or theoretical investigation of one or more central issues in the chosen specialisation within the field of lighting design. This happens with reflective incorporation of relevant scientific theories and mixed methods acquired throughout the master's programme in lighting design. The final thesis must substantiate the student's ability to apply scientific theories and mixed methods from the fields of architecture, science of lightning and media technology into new solutions.</p> <p>Students who complete the module will gain knowledge, skills and competences as follows:</p> <p><b>Knowledge</b></p> <ul style="list-style-type: none"> <li>• Must have knowledge and <b>understanding</b> about relevant theories and methods in relation to the chosen project theme</li> <li>• Must have knowledge and <b>understanding</b> in one or more subject areas that are representative of the state of the art in the research community of the chosen specialisation</li> <li>• Can <b>synthesise</b> and, on a scientific basis, <b>apply</b> an area of the chosen specialisation and identify scientific problems</li> <li>• Must be able to <b>understand</b> and <b>synthesise</b> the theories and methods applied in relation to the practice of lighting design profession</li> </ul> <p><b>Skills</b></p> <ul style="list-style-type: none"> <li>• Must be able to <b>synthesise</b> scientific methods and tools and general skills related to the chosen specialisation</li> <li>• Can <b>evaluate and select</b> among scientific theories, methods, tools and general skills and, on a scientific basis, <b>create</b> new analyses and solutions in the chosen specialisation</li> <li>• Can <b>synthesise</b> research-based knowledge and discuss professional and scientific problems with both peers and non-specialists</li> <li>• Must be able to <b>make</b> proposals for design, strategies and interventions of relevance to the lighting design field</li> </ul> <p><b>Competencies</b></p> <ul style="list-style-type: none"> <li>• Must have competencies to <b>synthesise</b> knowledge and use mixed methods to create design solutions of an aesthetic, technical and functional character</li> <li>• Must have competencies to <b>synthesise and create</b> solutions and that are complex, unpredictable and require new solutions</li> <li>• Must have competencies to independently <b>synthesise</b> and take responsibility for one's own professional development and specialisation</li> </ul>
<p>Type of instruction: Academically supervised student-governed problem oriented project work. The project is carried out individually or in small groups of a maximum of three students. At least one internal supervisor is assigned, who deals with the primary area of the project in his or her research.</p>
<p>Exam format: In accordance with the current Framework Provisions and directions on examination from the Study Board for Media Technology: Individual oral examination with external censor based on a written project report and a media-</p>

technological product plus an A/V-production illustrating and summarizing the project. The assessment is performed in accordance with the 7-point grading scale.

Evaluation criteria: The criteria for the evaluation are specified in the Framework Provisions

## **Chapter 4: Entry into Force, Interim Provisions and Revision**

The curriculum is approved by the Dean of the Faculties of Engineering, Science and Medicine and enters into force as of September 1, 2014.

Students who wish to complete their studies under the previous curriculum from xx must conclude their education by the summer examination period xx 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 Faculties of Engineering, Science and 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.<sup>1</sup> If the project is written in English, the summary must be in Danish.<sup>2</sup> 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 Faculties of Engineering, Science and Medicine 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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<sup>1</sup> Or another foreign language (upon approval from the Board of Studies).

<sup>2</sup> The Board of Studies can grant exemption from this.

### **5.5 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.

#### **Completion of the Master's programme**

The Master's programme must be completed no later than four years after it was begun.

#### **Rules and requirements concerning the reading of texts in foreign languages and a statement of the foreign language knowledge this assumes**

It is assumed that the student can read academic texts in English.