Curriculum for the Master’s Program in Lighting Design

Aalborg University
September 2017

Copenhagen Campus
Preface
Pursuant to Act 261 of March 18, 2015 on Universities (the University Act) with subsequent changes, the following curriculum for the Master's program in Lighting Design is stipulated. The program also follows the Joint Programme Regulations and the Examination Policies and Procedures for The Technical Faculty of IT and Design, The Faculty of Engineering and Science, and The Faculty of 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
  1.4 External examiners corps ....................................................................................... 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 ................................................................................. 9
Lighting Fundamentals ..................................................................................................... 11
Rendered Lighting Simulation/CGI .................................................................................. 12
Creating with Light: Interactive Lighting ..................................................................... 13
Evidence-based Lighting Design .................................................................................... 14
Light and Context ........................................................................................................... 15
Intelligent Lighting Design ............................................................................................ 17
Lighting Design Innovation ............................................................................................ 19
Focus Area ...................................................................................................................... 20
User Experience Design for Service Interaction ............................................................. 21
Advanced A/V Production .............................................................................................. 22
Project-Oriented Work in a Company ............................................................................ 25
Master’s Thesis .............................................................................................................. 26
Chapter 4: Entry into Force, Interim Provisions and Revision ........................................... 28
Chapter 5: Other Provisions ............................................................................................ 28
  5.1 Rules concerning written work, including the Master’s thesis .................. 28
  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 .... 28
  5.3 Rules for examinations ......................................................................................... 28
  5.4 Exemption ............................................................................................................... 28
  5.5 Exemption and the Faculty of Medicine ................................................................. 28
  5.6 Additional information ............................................................................................ 29
Chapter 1: Legal Basis of the Curriculum, etc.

1.1 Basis in ministerial orders
The Master’s program in Lighting Design is organised in accordance with the Ministry of Higher Education and Science’s Order no. 1328 of November 15, 2016 on Bachelor’s and Master’s Programs at Universities (the Ministerial Order of the Study Programs) and Ministerial Order no. 1062 of June 30, 2016 on University Examinations (the Examination Order). Further reference is made to Ministerial Order no. 258 of March 18, 2015 (the Admission Order) and Ministerial Order no. 114 of February 3, 2015 (the Grading Scale Order) with subsequent changes.

1.2 Faculty affiliation
The Master’s programme falls under the Technical Faculty of IT and Design, Aalborg University.

1.3 Board of Studies affiliation
The Master’s programme falls under the Board of Studies of Media Technology, SICT

1.4 External examiners corps
The Master’s programme is associated with the external examiners corps “Ingeniøruddannelselsernes landsdækkende censorkorps for design”.

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.

Applicants without legal claim to admission
- Bachelor of Science (BSc) in Engineering (Architecture and Design), Aalborg University
- Bachelor of Science (BSc) in Engineering (Sustainable Design), Aalborg University
- Bachelor of Science (BSc) in Mediaology, Aalborg University
- Bachelor of Science (BSc) in IT, Communication and New Media, Aalborg University
- Bachelor of Science (BSc) in Engineering (Electronics and Computer Engineering), Aalborg University
- Bachelor of Science (BSc) in Engineering (Mechatronics), University of Southern Denmark
- Bachelor of Science (BSc) in Digital Media and Design. IT University of Copenhagen
- Bachelor of Science (Bsc) in Engineering (Architectural Engineering), Technical University of Denmark
- Bachelor of Science (BSc) in Engineering (Architectural Design), Aarhus University

Students with another Bachelor's degree may, upon application to the Board of Studies, 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

- 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.
- Be able to understand and synthesize at the highest international level the knowledge of light in the subject areas of architecture, media technology and engineering.
- 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
- Be able to identify scientific issues across the subject areas by designing with light

Skills

- Must master the lighting design scientific methodologies, tools and general skills related to employment within the field of lighting design
- Must be able to evaluate and select among theories, methods, tools and general skills to create new lighting analyses and solutions
- Must be able to set up new analysis and solution models on a scientific basis
- 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

Competencies

- 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
- 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
- Has the ability to apply acquired knowledge in research, innovation and practice
- Must be able to independently take responsibility for own professional development and specialisation in lighting design
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 3rd semester it is possible to make a larger thesis project of 50 ECTS plus two courses on 3rd semester.

The following options may be chosen:

Option 1:
3rd semester: 20 ECTS semester project, supplemented by courses
4th semester: 30 ECTS thesis project

Option 2:
3rd semester: Project-oriented work in a company in Denmark or abroad or exchange in Denmark or abroad (in this case mandatory courses on the 3rd semester may be waived)
4th semester: 30 ECTS thesis project

Option 3 (long thesis project):
A thesis project of 50 ECTS plus two 5 ECTS courses extending over 2 semesters
### 3.2 Courses

<table>
<thead>
<tr>
<th>Semester</th>
<th>Module</th>
<th>ECTS</th>
<th>Assessment</th>
<th>Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Seeing the Light</td>
<td>15</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Meaning of Light: Light and Space</td>
<td>5</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Lighting Fundamentals</td>
<td>5</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Rendered Lighting Simulation/CGI</td>
<td>5</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td>2nd</td>
<td>Creating with Light: Interactive Lighting</td>
<td>15</td>
<td>7-point scale</td>
<td>External</td>
</tr>
<tr>
<td></td>
<td>Evidence-based Lighting Design</td>
<td>5</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Light and Context</td>
<td>5</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Intelligent Lighting Design</td>
<td>5</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td>3rd</td>
<td>Lighting Design Innovation</td>
<td>20</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td><strong>Choose 2 from the following:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Focus Area</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>User Experience Design for Service Interaction</td>
<td>5</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Advanced A/V Production</td>
<td>5</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Methodology and Theories of Science</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Project-Oriented Work in a Company</td>
<td>30</td>
<td>Possibly 20</td>
<td>Pass/Fail</td>
</tr>
<tr>
<td></td>
<td><strong>or</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>or</strong></td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>or</strong></td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th</td>
<td>Master’s Thesis</td>
<td>30</td>
<td>7-point scale</td>
<td>External</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>120</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Problem Based Learning**

A compulsory course in Problem Based Learning (PBL) is offered as an integrated part of the project module to students not acquainted with PBL at Aalborg University.
Semester project:  
**Seeing the Light**  
(At opleve lys)  
Workload: 15 ECTS, consisting of project work  
Semester: 1st semester

### 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 **identify** 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 Joint Programme Regulations and directions on examination from the Study Board for Media Technology:
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 scale.
Evaluation criteria:
The criteria for the evaluation are specified in the Joint Programme Regulations.
Title:
Problem Based Learning (PBL) at Aalborg University
Problembaseret læring på Aalborg Universitet
(1st semester)

Prerequisites: None, but the course is compulsory for students not acquainted with the PBL model at Aalborg University

Objectives:
After completion of the course the student should

Knowledge:
- know how to describe in own words some of the fundamental principles of Problem Based Learning (PBL) as implemented in the Aalborg PBL model at the Faculty of Engineering and Science
- know how to identify similarities and differences between the Aalborg PBL study environment and previous study environments, incl. strengths and weaknesses in both environments

Skills:
- be able to structure project management activities based on a well-formulated problem formulation
- be able to assess project documentation based on scientific codes of conduct competences
- to plan for effective collaborative learning in an intercultural environment and manage group conflicts
- be able to reflect on, plan and manage a study project in a PBL learning environment

Type of Instructions: Lectures, discussions and group work. The course will take place during three Wednesday afternoons.

Assessment: Internal assessment during the course/class participation according to the rules in the Examination Policies and Procedures of the Technical Faculty of IT and Design. 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 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. The assessment is pass/fail.

Evaluation criteria: The criteria for the evaluation are specified in the Joint Programme Regulations.
Title: Meaning of Light: Light and Space  
(Lysets betydning: Lys og rum)

Size: 5 ECTS

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 Joint Programme.
Regulations and directions are decided and given by the Study Board for Media Technology.

**Exam format:** In accordance with the current Joint Programme Regulations 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 7-point scale.

**Evaluation criteria:** The criteria for the evaluation are specified in the Joint Programme Regulations.
Objectives:
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.

Students who complete the course module will obtain the following qualifications:

Knowledge:
- Ability to **describe** the basic photometry terms and fundamental laws
- Ability to **relate** to the physiology of the human eye and visual perception
- Ability to **understand and describe** light propagation and light interaction with matter
- Ability to **relate** to the possibilities offered by materials with embedded nanoparticles or diffractive surfaces
- Ability to **describe** the basic colorimetry systems
- **Understand** the characteristics and performance of all light sources (including daylight)
- The assignments will allow the student to **demonstrate** the achievement of this knowledge and **apply** this in practical and theoretical situations.

Skills:
- Ability to **compute** illuminances for various light sources (point and area light sources)
- Ability to **assess** contribution of light reflexion on surfaces
- Ability to **measure** luminous quantities with portable equipment
- The ability to **select** the most appropriate light source for a given application
- The ability to **communicate** results of measurements and calculations
- Ability to **apply** objective methods of observation and analysis of lighting conditions based on a scientific approach to light

Competencies:
- **Understanding** of the basic photometric and colorimetric systems used in international standards
- **Understanding** of the rational system of measurement of lighting qualities based on photometric and colorimetric calculations
- Ability to **understand and analyse** various lighting patterns occurring 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 Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.

Exam format: In accordance with the current Joint Programme Regulations 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 7-point scale.

Evaluation criteria: The criteria for the evaluation are specified in the Joint Programme Regulations.
**Title:**
**Rendered Lighting Simulation/CGI**
*(Digitale simuleringer med lys/CGI)*

**Size:** 5 ECTS

**Objectives:**
In order to communicate and develop lighting designs it is essential to be able to develop and communicate rendered lighting simulations. The course rational 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.

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

**Knowledge:**
- **Understanding** of how photometric/radiometric illumination concepts transfer to, and are simulated by, rendering software
- **Understanding** of the advanced rendering techniques for global illumination simulation, in particular ray tracing, final gather and photon mapping
- Understanding of aspects of the trade-offs between rendering quality and rendering time
- **Understanding** of High Dynamic Range imaging (HDRi)
- **Understanding** of computational day light models
- **Understanding** of shaders

**Skills:**
- Ability to apply rendering packages (3dsMAX, Maya, LuxRender, RADIANCE, PBRT, or similar) to simulating radiance/luminance, or irradiance/illuminance levels in complex scenes, with complex illumination conditions
- Ability to apply virtual reproduction of exterior and interior illumination and analyse the object appearance
- Ability to use shadows in rendering to achieve greater depth and realism
- Ability to apply HDRi light probe techniques for capturing real-world illumination conditions and re-creating them in a simulation

**Competencies:**
- Ability to **analyse, synthesize, and evaluate** 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

**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 Joint Programme Regulations 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

**Exam format:** In accordance with the current Joint Programme Regulations 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 7-point scale.

**Evaluation criteria:** The criteria for the evaluation are specified in the Joint Programme Regulations.
Semester project:
**Creating with Light: Interactive Lighting**
(At skabe med lys: Interaktivt lysdesign)
Workload: 15 ECTS, consisting of project work
Semester: 2nd semester

**Prerequisites:**
The module adds to the knowledge obtained in the 1st semester.

**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 Joint Programme Regulations and directions on examination from the Study Board for Media Technology:
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 scale.

**Evaluation criteria:** The criteria for the evaluation are specified in the Joint Programme Regulations.
Title: Evidence-based Lighting Design (Evidensbaseret lysdesign)

Size: 5 ECTS

Prerequisites: The module adds to the knowledge obtained in the 1st semester.

Objectives: 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. 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. 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.

Students who complete this module will obtain the following qualifications:

Knowledge:
- **Understanding** on the characteristics of the human visual system
- **Understanding** on vision of the elderly and the visually impaired
- Will be able to **analyse** perceived lighting quality
- **Understanding** on lights effect on circadian rhythms
- **Understand** health risks affiliated with lighting
- **Understanding** on optimal lighting for plants

Skills:
- Ability to **assess** the performance of a given lighting scheme, based on scientific evidence
- Ability to **analyse** a lighting scheme using the appropriate metric, going beyond state of the art
- Ability to read and **understand** scientific material related to evidence based lighting issues.
- Ability to **understand** existing standards (IEC, CIE, WMO, etc.)

Competencies:
- Ability to **create** lighting schemes which comply with various constraints issued from scientific research and evidence based requirements for specific applications
- Ability to **create** sound solutions, and create innovative lighting schemes
- Ability to **analyse and evaluate** on lighting solutions based on up to date knowledge from the scientific literature

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 Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.

Exam format: In accordance with the current Joint Programme Regulations 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 7 point scale.

Evaluation criteria: The criteria for the evaluation are specified in the Joint Programme Regulations.
Title: Light and Context (Lys og kontekst)

Size: 5 ECTS

Prerequisites: The module adds to the knowledge obtained in the 1st semester.

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.

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.

Knowledge:

- Critical understanding of theories and references of cultural and aesthetic responses to light and the space/time continuum
- Understand the process of identifying qualities of light and define desired effects through design
- Recognize various contexts such as environment, people’s need, legislation, energy and atmosphere and integrate in the design process
- Understand the qualitative and scientific methods for research by design
- Understand how to illustrate, communicate and model natural light and electric lighting design solutions
- Understand daylight design and control; sustainable architecture; building automation

Skills:

- Evaluate light in different context verbally and visually
- Choose, implement and apply lighting design solutions in a context that include aesthetic, social and functional considerations.
- Evaluate and compare research-based knowledge supplemented by knowledge from practical design competences and apply the methods for a specific design problem/solution
- Apply the taught methods to solve concrete practical design problems

Competencies:

- Upon successful completion of this module the student will acquire a thorough knowledge and training of practice various aspects of designing with daylight and artificial lighting in different context:
  - Evaluate and document design solutions of lighting in different contexts
  - Synthesize knowledge, technical and functional aspects of lighting design with an understanding of context
  - Predict lighting performance in relation to sustainability and energy
  - Communicate to professional designers and design team
  - Synthesize lighting design for specific environments
**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 Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.

**Exam format:** In accordance with the current Joint Programme Regulations 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 7 point-scale.

**Evaluation criteria:** The criteria for the evaluation are specified in the Joint Programme Regulations.
Title: Intelligent Lighting Design
(Intelligent lysdesign)

Size: 5 ECTS

Prerequisites:
The module adds to the knowledge obtained in the 1st semester.

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.

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.

Students who complete the course module will obtain the following qualifications:

Knowledge:
- Understand the design process and methodologies in interactive systems
- Understanding emerging lighting technologies in designing intelligent or interactive lighting systems, both for indoor and outdoor applications as well as virtual representations
- Understanding of principles for designing, prototyping, programming, realizing, analysing and evaluating of the highest level for an intelligent or interactive lighting system
- Critical understanding of the scientific and aesthetic processes according to international research in the use of human centred interactive technologies for lighting design
- Synthesis of methodological consideration to describe the theoretical and empirical foundation of the project

Skills:
- Ability to apply design methodologies and processes in the development of an intelligent or interactive lighting system for real and virtual applications
- Ability to plan, design, implement and evaluate systematic tests of the intelligent or interactive lighting design from a human-centred and system-based perspective (analysis)
- Ability to implement and discuss feasibility, design requirement specifications and sustainability of the developed interactive lighting system including human physiological and psychological factors (evaluation)

Competencies:
- Can independently synthesize knowledge in aesthetic design methods, choice of material, theories and techniques in interactive lighting systems
- Expertise in communicating and presenting 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)
- Must have competencies in comparing and assessing complex interactive lighting technologies, and methods in order to make the proper design choices
- for optimum functionality (synthesis)
- Can independently **mediate** collaboration with professionals such as city planners, designers, and architects in order to implement interactive lighting system

<table>
<thead>
<tr>
<th>Type of instruction:</th>
<th>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 Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam format:</td>
<td>In accordance with the current Joint Programme Regulations 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 7 point-scale.</td>
</tr>
<tr>
<td>Evaluation criteria:</td>
<td>The criteria for the evaluation are specified in the Joint Programme Regulations.</td>
</tr>
</tbody>
</table>
Semester project:  
**Lighting Design Innovation**  
(Innovativt lysdesign)  
Workload: 20 ECTS, consisting of project work  
Semester: 3rd semester

**Prerequisites:**  
The module adds to the knowledge obtained in the 1st and 2nd semester.

**Objectives:**  
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.

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

**Knowledge:**
- **Evaluation** of core state-of-the-art concepts, theories, techniques and methodologies related to lighting design
- Ability to **synthesize** relevant lighting concepts, theories and techniques with a significant focus on process and context in lighting design
- **Evaluation** of the design phases including identifying problems, concept, design development, detailed design, specification, laboratory experiments, model building, mock-ups

**Skills:**
- Ability to **synthesize** market and trend analysis methods to a lighting product or installation based on light and the principals related to lighting design
- Ability to **evaluate** 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

**Competencies:**
- Ability to **evaluate** and select relevant lighting theories, methods and tools with the specific aim of working towards **creating** new qualitative products, commercially viable products/installations, or new knowledge
- Ability to **create** lighting drawings and lighting layouts that support the design process and communicate the project

**Type of instruction:** Academically supervised student-governed problem oriented project work

**Exam format:** In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:  
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 scale.

**Evaluation criteria:** The criteria for the evaluation are specified in the Joint Programme Regulations.
**Title:**
*Focus Area*
(Fokusområde)

**Size:** 5 ECTS

**Prerequisites:**
The module adds to the knowledge obtained in the 1\(^{st}\) and 2\(^{nd}\) semester.

**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.

**Knowledge:**
- **Understand** how useful knowledge in a specific area is based on international scientific knowledge, practice and development
- **Synthesise** knowledge in a specific area with lighting design
- **Understand** strategies and processes for creating new knowledge, products or events

**Skills:**
- **Identify, select and apply** appropriate knowledge in a specific area
- **Develop** an appropriate problem statement
- **Synthesise** specific knowledge with light in a high professional and mixed methods process

**Competencies:**
- **Creating** synergy and new innovative solutions by **synthesising** a specific area with lighting design

**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 Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.

**Exam format:** In accordance with the current Joint Programme Regulations 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/fail grade.

**Evaluation criteria:** The criteria for the evaluation are specified in the Joint Programme Regulations.
## Objectives:
The course trains students to research, analyse, prototype and conceptualise design considering all system aspects including the social and cultural contexts of use. The course gives a comprehensive knowledge about user involvement in the design process, going beyond traditional methods such as usability lab testing. Experience prototyping techniques and interaction design methods will be introduced with the aim of better understanding and representing the different levels of interaction within a service. The objectives are realised by presenting methods and tools in a case based framework and through the students’ active participation in workshops and assignments.

Students who complete the course module will obtain the following qualifications:

### Knowledge:
- **Knowledge** about the system design methods including the social and cultural contexts of use.
- **Knowledge** about ethnographic study methods for user behaviour research
- **Knowledge** about advanced qualitative research methods involving both design, data collection, data analysis and reporting.
- **Knowledge** about validity and reliability within qualitative methods
- **Knowledge** about interaction design methods

### Skills:
- **Apply** the taught methods to solve concrete design problems.
- Able to **evaluate** and compare and apply the methods for a specific design problem.
- **Understand** user analysis and organise data from and interaction in a way that can be used in the design process (synthesis).
- **Apply** knowledge to facilitate the design process involving users in real-life contexts.
- **Apply** personas and scenario based design methods in different contexts for facilitating both different user types and system descriptions.
- **Apply** data into specific strategies for implementation taken different stakeholders into consideration.

### Competencies:
- Ability to choose the appropriate methods to suit different dimensions of a design problem at different stages in the process and the pitfalls of each approach (synthesis)
- **Understanding** the strengths and weaknesses of methods.

## Type of instruction:
See general description of the types of instruction described in the introduction to chapter 3

## Exam format:
Individual oral (based on presentation and discussion) or written (based on a report) examination with internal censor. The assessment is performed in accordance with the 7-point scale.

## Evaluation criteria:
The criteria for the evaluation are specified in the Joint Programme Regulations
Students who complete the course module will obtain the following qualifications:

Knowledge:
- **Understanding** of concept- and iterative format development
- **Understanding** the dramatic premise as the basis of the three-act paradigm
- **Understanding** of the elements of propulsion within fiction: conflicts, obstacles, complications, expectations, foretellings, tests, timelimits, suspense, surprise, and changes
- **Understanding** of the elements of propulsion within entertainment formats: competition, assignment, challenge, randomizer, the vote and the unexpected visitor
- **Understanding** of AV-production management concepts and tools – and the application of such
- **Understanding** and application of various advanced lighting setups including greenscreen lighting
- **Understanding** the effects of combining multicam and singlecam within fictional and factual programming

Skills:
- Ability to **analyse** and methodically produce and analyse productions that feature more than one shot shown simultaneously
- Ability to **analyse** and choose the means of expression that manage the audience’s perception in multishot productions
- Ability to **analyse** and edit factual material and combine it with fictioncodes
- Ability to discuss and **analyse** three different editing methods: the formalists’ five methods of montage, the valuebased Rule of Six and the Kuleshov effect
- Ability to **analyse** advanced lighting set-ups combining hard light, soft light and eye light
- Ability to **analyse** and methodically produce using POV and POA
- Ability to **analyse** methodical uses of long takes
- Ability to **analyse** and methodically produce greenscreen shots on pre-produced material

Competencies:
- Must be able to **apply** the general framework of advanced A/V-production in new contexts. This includes choosing the relevant methods and the ability to evaluate the output
- Must be able to **synthesize** the different means of expression and understand the resulting effect they have on the audio-visual entity

Exam format: In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology.

To be eligible to take the exam the student must have fulfilled:
- handing in of written assignments or the like
- completion of certain – or all – study activities
Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in. If the student hands in a paper/exercises after the deadline, the student has used an examination attempt.

The exam: Oral or written examination with internal censor. The assessment is performed with the 7-point scale.
### Title
Methodology and Theories of Science
Forskningsmetode og videnskabsteori


### Size
5 ECTS

### Prerequisites:
The module adds to the knowledge obtained in the 2\textsuperscript{nd} semester.

### Objectives:
The objective is to give the students the necessary skills to participate in the academic and professional practice within the fields of Architecture, Design and Planning (or related areas) as contributing scholars and researchers by training the basic academic skills of paper writing and design of research methodology seen in light of the adequate positions within theories of science / philosophy of science.

### Knowledge:
- Must have knowledge about the academic production process, the systems of research quality assessments and monitoring governing the field of research and the channels for publication and dissemination of academic knowledge
- Must be able to understand societal and contextual conditions for a situation of increasing ‘scientification’ of practice fields
- Must be able to understand how the 'state-of-the-art' within academic fields of relevance are emerging and how these are evolving

### Skills:
- Must be able to apply established models for paper writing and methodological reflection to a specific case within architecture, design or planning
- Must be able to write a methodologically reflective paper which positions itself in relation to relevant and adequate positions within theories of science / philosophy of science
- Must be able to evaluate the paper in relation to established practices and systems of academic research

### Competencies:
- Must have competencies to write an academic paper and/or a design for research methodology relating to the state-of-the-art of knowledge production within architecture, design or planning

### Type of instruction:
See general description of the types of instruction described in the introduction to Chapter 3.

### Exam format:
The module is assessed with a written assignment based on central parts of the objectives for the course module through one or more written assignments (including reports/analyses/posters/drawings/models or the like). A written assignment is developed during the execution of the course module. The module is assessed by internal examiner and a pass/fail assessment is given. In case of re-examination the original evaluation format will be employed.

### Evaluation criteria:
As stated in the Joint Programme Regulations
**Project-Oriented Work in a Company**  
(Projekt orienteret forløb i en virksomhed – Lysdesign )  
Workload 30 ECTS  
Semester: 3rd semester

**Prerequisites:**  
The module adds to the knowledge obtained in the 1st and 2nd semester.

The Academic Internship must have a scope that corresponds the ECTS load.

**Objectives:**  
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.

The purpose of this project module is to give the student the opportunity to acquire practical, real-world experience with developing Lighting Design products within the context of a company or an organization. The development must be subject to relevant constraints and conditions of the real-world context.

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

**Knowledge:**
- **Evaluation** of core state-of-the-art concepts, theories, techniques and methodologies related to lighting design
- Ability to **synthesize** relevant lighting concepts, theories and techniques with a significant focus on process and context in lighting design
- **Evaluation** of the design phases including identifying problems, concept, design development, detailed design, specification, laboratory experiments, model building, mock-ups
- Must be able to **understand** professional, business-related and organizational concepts that are relevant for the hosting organization and the developed project.

**Skills:**
- Ability to **synthesize** market and trend analysis methods to a lighting product or installation based on light and the principals related to lighting design
- Ability to **evaluate** 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
- Must be able to **apply** host relevant constraints and affordances in the product design

**Competencies:**
- Ability to **evaluate** and select relevant lighting theories, methods and tools with the specific aim of working towards creating new qualitative products, commercially viable products/installations, or new knowledge
- Ability to **create** lighting drawings and lighting layouts that support the design process and communicate the project

**Type of instruction:** Academically supervised student-governed problem oriented project work

**Exam format:**  
Evaluation criteria: The criteria for the evaluation are specified in the Joint Programme Regulations.

<table>
<thead>
<tr>
<th>Master's Thesis (Kandidatspeciale)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size:</strong> 30 ECTS</td>
</tr>
<tr>
<td><strong>Semester:</strong> 4th semester</td>
</tr>
<tr>
<td><strong>Prerequisites:</strong> The module adds to the knowledge obtained in the first three semesters.</td>
</tr>
</tbody>
</table>

The master thesis can be conducted as a long master thesis. If choosing to do a long master thesis, it has to include experimental work and has to be approved by the study board. The amount of experimental work must reflect the allotted ECTS.

**Objective:**
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.

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

**Knowledge:**
- Must have knowledge and **understanding** about relevant theories and methods in relation to the chosen project theme
- Must have knowledge and **understanding** in one or more subject areas that are representative of the state of the art in the research community of the chosen specialisation
- Can **synthesize** and, on a scientific basis, **apply** an area of the chosen specialisation and identify scientific problems
- Must be able to **understand** and **synthesize** the theories and methods applied in relation to the practice of lighting design profession

**Skills:**
- Must be able to **synthesize** scientific methods and tools and general skills related to the chosen specialisation
- Can **evaluate and select** among scientific theories, methods, tools and general skills and, on a scientific basis, **create** new analyses and solutions in the chosen specialisation
- Can **synthesize** research-based knowledge and discuss professional and scientific problems with both peers and non-specialists
- Must be able to **make** proposals for design, strategies and interventions of relevance to the lighting design field

**Competencies:**
- Must have competencies to **synthesize** knowledge and use mixed methods to create design solutions of an aesthetic, technical and functional character
- Must have competencies to **synthesize and create** solutions and that are complex, unpredictable and require new solutions
- Must have competencies to independently **synthesize** and take responsibility for one’s own professional development and specialisation
**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.

**Exam format:** In accordance with the current Joint Programme Regulations 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-technological product plus an A/V-production illustrating and summarizing the project. The assessment is performed in accordance with the 7-point scale.

**Evaluation criteria:** The criteria for the evaluation are specified in the Joint Programme Regulations
Chapter 4: Entry into Force, Interim Provisions and Revision

The curriculum is approved by the Dean of the Technical Faculty of IT and Design and enters into force as of September 1, 2017.

Students who wish to complete their studies under the previous curriculum from 2013 must conclude their education by the summer examination period 2018 at the latest, since examinations under the previous curriculum are not offered after this time.

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) program elements from other Master’s programs in lieu of program elements in this program (credit transfer). The Board of Studies can also approve successfully completed (passed) program elements from another Danish program or a program outside of Denmark at the same level in lieu of program elements within this curriculum. Decisions on credit transfer are made by the Board of Studies based on an academic assessment. See the Joint Programme Regulations 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 Technical Faculty of IT and Design, The Faculty of Engineering and Science, and the Faculty of 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.

5.5 Rules and requirements for the reading of texts
At programmes that are taught in Danish, it is assumed that the student can read academic texts in modern Danish, Norwegian, Swedish and English and use reference works, etc., in other European languages. At programmes taught in English, it is assumed that the student can read academic text and use reference works, etc., in English.

¹ Or another foreign language (upon approval from the Board of Studies).
² The Board of Studies can grant exemption from this.
5.6 Additional information
The current version of the curriculum is published on the Board of Studies' website, including more detailed information about the program, including exams.