Curriculum

Master's Program (cand.tech.) in Surveying and Planning

AALBORG UNIVERSITY
Technical Faculty of IT and Design
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Aalborg University
September 2015
Preface:
Pursuant to Act 960 of August 14, 2014 on Universities (the University Act) with subsequent changes, the following curriculum for the Master's program is stipulated. The program also follows the Framework Provisions and the Examination Policies and Procedures for the Faculty of Engineering and Science.

Commencement of this curriculum is 1. September 2015.
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Chapter 1: Legal Basis of the Curriculum, etc.

1.1 Basis in ministerial orders
The Master’s program (cand.tech.) in Surveying and Planning is organized in accordance with the Ministry of Higher Education and Science’s Ministerial Order no. 1520 of December 16, 2013 on Bachelor’s and Master’s Programmes at Universities (the Ministerial Order of the Study Programmes) and Ministerial Order no. 670 of June 19, 2014 on University Examinations (the Examination Order) with subsequent changes. Further reference is made to Ministerial Order no. 1488 of December 16, 2013 (the Admission Order) and Ministerial Order no. 250 of March 15, 2007 (the Grading Scale Order) with subsequent changes.

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

1.3 Board of Studies affiliation
The Master’s program falls under the Board of Studies for Surveying, Planning and Land Management (Studienævn for Landinspektøruddannelsen)

1.4 Censorship
The Master’s program falls under the Danish “censorkorps for Landinspektøruddannelsen”.

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

2.1 Admission
Admission to the Master’s program in Surveying and Planning requires a Bachelor’s degree in Geography

All international students applying to Aalborg University must document English language qualifications comparable to an ‘English B level’ in the Danish upper secondary school (minimum average grade 02).

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 program entitles the graduate to the Danish designation:
Cand.tech. i landinspektørvidenskab med specialisering i:
- opmåling og kortlægning
- geoinformatik, eller
- arealforvaltning og planlægning

The English designation is:
Master of Science (MSc) in Technology (Surveying and Planning with specialisation in Surveying and Mapping) or Master of Science (MSc) in Technology (Surveying and Planning with specialisation in Geoinformatics), or Master of Science (MSc) in Technology (Surveying and Planning with specialisation in Land Management)

2.3 The program’s specification in ECTS credits

The Master’s program is a 2-year, research-based, full-time study program. The program 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 program has state-of-the-art competencies acquired through an educational program that has taken place in a research environment.

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

2.5.1. Competence profile of the Master’s program (cand.tech.) with specialisation in Surveying and Mapping

The graduate of the Master’s program must:

Knowledge

- be knowledgeable about technologies and theories/methods for collecting spatial data.
- be knowledgeable about theories/methods for processing/integrating spatial data.
- be knowledgeable about theories/methods for assessing the quality of spatial data.

Skills

- master theories/methods related to collecting/processing/integrating spatial data
- be able to evaluate theories/methods related to collecting/processing/integrating spatial data.
- be able to identify problems related to collecting/processing/integrating spatial data.
- be able to assess/analyse problems related to collecting/processing/integrating spatial data.
- be able to suggest solutions to problems related to collecting/processing/integrating spatial data in consideration of various criterions (e.g. completeness, precision, resource consumption).
- be able to assess the quality of the suggested solutions.
- be able to assess the quality of spatial data coming from various sources.
- be able to communicate/discuss problems related to collecting/processing/integrating spatial data with both peers and non-specialists.
- be able to give advice regarding problems related to collecting/processing/integrating spatial data.

Competencies

- be able to master selected data collecting technologies.
- be able to master general skills required to solve typical data collecting/processing/integrating tasks.
- be able to initiate/plan/implement cross-disciplinary working relationships.
- be able to ensure his/hers further professional development.
2.5.2. Competence profile of the Master’s program (cand.tech.) with specialisation in Geoinformatics

The graduate of the Master’s program:

Knowledge
- Has knowledge in geospatial information technology, distributed geo-services, 3D-visualisation, spatial data infrastructure, and geocomputation based on the highest international research in the subject areas
- Can understand and, on a scientific basis, make reflections on the knowledge and identify scientific problems regarding the development of spatial enabled services, advanced geovisualisation technologies, spatial data infrastructures, geocomputation, image processing and spatial decision support systems

Skills
- Excels in the scientific methods and tools and general skills related to all aspects of geographic information
- Can evaluate and select among the scientific theories, methods, tools regarding data storage, flow, processing, and visualisation - and on a scientific basis, advance new analyses and solutions
- Can communicate research-based knowledge and discuss professional and scientific problems with both peers and non-specialists on geographic information technology.

Competencies
- Can use advanced geospatial theories, methods and tools to manage work and development situations that are complex, unpredictable and require new solutions.
- Can independently initiate and implement discipline-specific and interdisciplinary cooperation and assume professional responsibility on all aspects of geographic information technology.
- Can independently take responsibility for own professional development and specialisation on geographic information
2.5.3. Competence profile of the Master’s program (cand.tech.) with specialisation in Land Management

The graduate of the Master’s program:

Knowledge

- Has knowledge in land management based on research and practices concerning development and regulation of property and land use, spatial development and planning, land economics and land governance.
- Has knowledge in spatial planning and governance based on state-of-the-art international research.
- Understands legal issues concerning real property and legal and economic issues concerning public intervention in the property market.
- Understands legal issues concerning the use of and public interventions of private property, based on the highest research in the field.
- Can understand and, on a scientific basis, reflect over the knowledge areas and identify scientific as well as practical problems or challenges regarding urban and rural development. Including how this relates to societal values and norms of relevance for land management.

Skills

- Excels in main theories that relate to the knowledge areas and in scientific methods and tools and general skills related to planning and management activities for urban and rural development.
- Can apply, evaluate and select among the scientific theories, methods and tools regarding planning and land management for urban and rural development - and on a scientific basis, advance new analyses and solutions.
- Can communicate research-based knowledge and discuss professional and scientific problems with both peers and non-specialists concerning planning and land management for urban and rural development.

Competencies

- Can apply and combine theories, methods and tools to manage work and development situations that are complex, unpredictable and require new solutions.
- Can independently initiate and implement discipline-specific and interdisciplinary cooperation and assume professional responsibility on relevant aspects of planning and land management for urban and rural development.
- Can independently take responsibility for own professional development and specialisation on planning and land management for urban and rural development.
Chapter 3: Content and Organization of the Program

The program is structured in modules and organized as a problem-based study. A module is a program element or a group of program elements, which aims to give students a set of professional skills within a fixed time frame specified in ECTS credits, and concluding with one or more examinations within specific exam periods that are defined in the curriculum.

The program 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

By prior agreement with the study board, it is possible for students to attend modules offered at other relevant master programmes.
3.1 Specialisation in Surveying and Mapping

Overview of the program

All modules are assessed through individual grading according to the 7-point scale or Pass/Fail. All modules are assessed by external examination (external grading) or internal examination (internal grading or by assessment by the supervisor only).

<table>
<thead>
<tr>
<th>Semester</th>
<th>Module</th>
<th>ECTS</th>
<th>Assessment</th>
<th>Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td><strong>Positioning</strong></td>
<td>20</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Positioning Technologies</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Land Governance and Geographic Information in a Societal Context</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td><strong>Sensor and Data Integration</strong></td>
<td>20</td>
<td>7-point scale</td>
<td>External</td>
</tr>
<tr>
<td></td>
<td>Mapping Technologies and Data Fusion</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Statistical Methods in Surveying and Mapping</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td><strong>Professional Development</strong></td>
<td>30</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td><strong>Master’s Thesis</strong></td>
<td>30/60</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>

Modules are described in section 3.4 and 3.4.1
3.2 Specialisation in Geoinformatics

Overview of the program

All modules are assessed through individual grading according to the 7-point scale or Pass/Fail. All modules are assessed by external examination (external grading) or internal examination (internal grading or by assessment by the supervisor only).

<table>
<thead>
<tr>
<th>Semester</th>
<th>Module</th>
<th>ECTS</th>
<th>Assessment</th>
<th>Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td><strong>GI Technology and Information Systems</strong></td>
<td>20</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Geospatial Information Technology</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Land Governance and Geographic Information in a Societal Context</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td><strong>GI – Integration, Applications and Society</strong></td>
<td>20</td>
<td>7-point scale</td>
<td>External</td>
</tr>
<tr>
<td></td>
<td>Geocomputation and Spatial Analytics</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Geovisualisation</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td><strong>Professional Development</strong></td>
<td>30</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td><strong>Master’s Thesis</strong></td>
<td>30/60</td>
<td>7-point scale</td>
<td>External</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>120</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Modules are described in section 3.4 and 3.4.2
3.3 Specialisation in Land Management

Overview of the program

All modules are assessed through individual grading according to the 7-point scale or Pass/Fail. All modules are assessed by external examination (external grading) or internal examination (internal grading or by assessment by the supervisor only).

<table>
<thead>
<tr>
<th>Semester</th>
<th>Module</th>
<th>ECTS</th>
<th>Assessment</th>
<th>Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Development and Regulation of Real Property</td>
<td>20</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Managing the use of Land</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Land Governance and Geographic Information in a Societal Context</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td>2nd</td>
<td>Spatial Development and Planning</td>
<td>20</td>
<td>7-point scale</td>
<td>External</td>
</tr>
<tr>
<td></td>
<td>Spatial Planning and Governance</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Land Use Regulations and Land Economics</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td>3rd</td>
<td>Professional Development</td>
<td>30</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td>4th</td>
<td>Master's Thesis</td>
<td>30/60</td>
<td>7-point scale</td>
<td>External</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>120</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Modules are described in section 3.4 and 3.4.3
3.4 Descriptions of modules. 1st and 2nd semester

Title (course): Land Governance and Geographic Information in a Societal Context

(Styring af arealanvendelsen og geografisk information i en samfundsmæssig kontekst)

Prerequisites: Students must have a bachelor degree in surveying, land management, urban planning, environmental planning, geography or study programs with similar contents.

Objective: Students who complete the module will acquire the following knowledge, skills and competencies:

Knowledge:
- about the role of geographic information and spatial data infrastructures (SDI) as a basis for societal infrastructures in large, including land administration systems (LAS).
- of principles of data collection, structuring and management geographic information – including property related data in land administration systems
- about standardization activities – including INSPIRE – and the national implementation here of
- about spatial data infrastructure in the Nordic countries - exemplified by the development of land administration systems
- of technologies and organizational structures for building and managing geographic information systems (GIS)
- of the role of SDI in e-Government

Skills:
- be able to identify core issues – of both a legal, ethical, technical, environmental, organizational, economic and social nature – in relation to the development and implementation of SDI in support of societal infrastructures.
- be able to understand geographic information technology as an element in land administration systems and e-government
- be able to understand the importance of standardization and data quality, including the understanding of metadata
- understand the collection, management, distribution and use of geographic information - for example in relation to Public Participation GIS

Competencies:
- in advising on the understanding and use of geographical information
- in advising on the development and implementation of SDI, GIS and LAS
<table>
<thead>
<tr>
<th>Type of instruction:</th>
<th>Lectures, workshops, seminars, assignments, presentations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam format:</td>
<td>Active participation, completed through a presentation or essay</td>
</tr>
<tr>
<td>Evaluation criteria:</td>
<td>Stated in the framework provisions</td>
</tr>
</tbody>
</table>
3.4.1 Surveying and Mapping

Title (project): Positioning (Positionering)

Prerequisites: Students must have a bachelor degree in Surveying, Planning and Land Management or a bachelor degree with a similar content.

Objective: To give the students the opportunity to work with problems related to collecting/processing spatial data. Students who complete the project module must:

Knowledge:
• be knowledgeable about technologies and theories/methods for collecting spatial data.
• be knowledgeable about theories/methods for processing spatial data.
• be knowledgeable about theories/methods for assessing the quality of spatial data
• be knowledgeable about the fundamental principles of Problem Based Learning (PBL) as implemented in the Aalborg PBL model at the Faculty of Engineering and Science (*)

Skills
• master theories/methods related to collecting/processing spatial data.
• be able to evaluate theories/methods related to collecting or processing spatial data.
• be able to identify problems related to collecting/processing spatial data.
• be able to assess/analyse problems related to collecting/processing spatial data.
• be able to suggest solutions to problems related to collecting/processing spatial data.
• be able to assess the quality of the suggested solutions.
• be able to assess the quality of spatial data coming from various sources.
• be able to communicate/discuss problems related to collecting/processing spatial data with both peers and non-specialists.
• be able to give advice regarding problems related to collecting/processing spatial data.
• be able to structure project management activities based on a well-formulated problem formulation (*)

Competencies
• be able to master selected data collecting technologies.
• be able to master general skills required to solve typical data collecting/processing tasks.
• be able to reflect on, plan and manage a study project in a PBL learning environment (*)
Type of instruction: Project work.
Exam format: Oral examination based on project report.
Evaluation criteria: Stated in the framework provisions.

(*)
To obtain the knowledge, skills and competence marked with (*) it is presupposed that students follow the course in Problem Based Learning and Project Management that the school offers all foreign students in the beginning of 1st semester.
| **Title (course):** | **Positioning Technologies**  
(***Positioneringsteknologier***) |
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Prerequisites:</strong></td>
<td>Students must have a bachelor degree in Surveying, Planning and Land Management or a bachelor degree with a similar content.</td>
</tr>
<tr>
<td><strong>Objective:</strong></td>
<td>To give the students thorough knowledge of various technologies and theories/methods related to collecting/processing spatial data. Students who complete the course module must:</td>
</tr>
</tbody>
</table>
  | Knowledge:  
  | • be knowledgeable about surveying/positioning methods and technologies like GNSS, photogrammetry, and IMU used for collection spatial data. |
  | Skills:  
  | • be able to master and evaluate surveying/positioning theories/methods in relation to collecting spatial data. |
  | Competencies:  
  | • be able to master selected surveying/positioning technologies required to solve typical positioning tasks. |
| **Type of instruction:** | The module consists of a number of educational elements that support the achievement of the module objective. |
| **Exam format:** | Written or oral examination. |
| **Evaluation criteria:** | Stated in the framework provisions. |
Title (project): *Sensor and Data Integration*  
*(Sensor- og data-integration)*

Prerequisites: Having completed the first semester of the Master’s program with specialisation in Surveying and Mapping or similar qualifications.

Objective: To give the students the opportunity to work with problems related to processing/integrating spatial data.  
Students who complete the project module must:

Knowledge  
- be knowledgeable about theories/methods for processing/integrating spatial data.  
- be knowledgeable about theories/methods for assessing the quality of spatial data.

Skills  
- be able to master theories/methods related to processing/integrating spatial data.  
- be able to evaluate theories/methods related to processing/integrating spatial data.  
- be able to identify problems related to processing/integrating spatial data.  
- be able to assess/analyse problems related to processing/integrating spatial data.  
- be able to suggest solutions to problems related to processing/integrating spatial data.  
- be able to assess the quality of the suggested solutions.  
- be able to assess the quality of spatial data coming from various sources.  
- be able to communicate/discuss problems related to processing/integrating spatial data with both peers and non-specialists.  
- be able to give advice regarding problems related to processing/integrating spatial data.

Competencies  
- be able to master general skills required to solve typical data processing/integrating tasks.

Type of instruction: Project work.

Exam format: Oral examination based on project report.

Evaluation criteria: Stated in the framework provisions.
Title (course): **Mapping Technologies and Data Fusion (Kortlægning og data fusion)**

Prerequisites: Having completed the first semester of the Master’s program with specialisation in Surveying and Mapping or similar qualifications.

Objective: To give the students thorough knowledge of methods for relating spatial coordinate systems and for defining map projections. To give the students thorough knowledge of various technologies and theories/methods related to mapping and data fusion. Students who complete the course module must:

Knowledge:
- be knowledgeable about theories/methods concerning construction of map projections and conversions between spatial coordinate systems
- be knowledgeable about various mapping technologies like remote sensing and laser scanning
- be knowledgeable about theories/methods for fusing mapping related data sets
- be knowledgeable about selected theories/methods for analysing mapping related data sets

Skills:
- be able to master and evaluate the use of spatial coordinate systems and map projections
- be able to master and evaluate relevant theories/methods in relation to data fusion
- be able to master and evaluate relevant theories/methods in relation to various mapping technologies
- be able to master and evaluate selected data analysis techniques

Competencies:
- be able to master general skills required to solve typical tasks in relation to defining and using map projection and spatial coordinate system
- be able to master general skills required to solve typical tasks related to data fusion and mapping

Type of instruction: The module consists of a number of educational elements that support the achievement of the module objective.

Exam format: Written or oral examination.

Evaluation criteria: Stated in the framework provisions.
Title (course): Statistical Methods in Surveying and Mapping
(Statistiske metoder i landmåling og kortlægning)

Prerequisites: Students must have a bachelor degree in Surveying, Planning and Land Management or a bachelor degree with a similar content.

Objective: To give the students thorough knowledge of statistical methods in surveying and mapping.
Students who complete the course module must:

Knowledge:
• be knowledgeable about statistical concepts and achieve an understanding of the statistical way of thinking.
• be knowledgeable about the method of least squares applied to reliability assessment blunder detection, and deformation analysis.
• be knowledgeable about least squares adjustment

Skills:
• be able to master and evaluate statistical methods in relation to surveying and mapping.

Competencies:
• be able to master general skills required to solve typical statistical tasks in relation to surveying and mapping.

Type of instruction: The module consists of a number of educational elements that support the achievement of the module objective.

Exam format: Written or oral examination.

Evaluation criteria: Stated in the framework provisions.
3.4.2 Geoinformatics

**Title (project):** GI Technology and Information Systems (GI Teknologi og Informationssystemer)

**Prerequisites:** Basic knowledge about geographic information and information technology. Following the modules ‘Geospatial Information Technology’ and ‘Land Governance and Geographic Information in a societal context’ in parallel.

**Objective:** To give students the opportunity to work with self-defined problems related to Spatial databases and Internet based GIS

**Knowledge in:**
- The fundamental principles of Problem Based Learning (PBL) as implemented in the Aalborg PBL model at the Faculty of Engineering and Science (*)

**Skills in**
- Analysing problems related to the development of geospatial applications
- Assessing different distributed GIS architectures
- Evaluate the role of standards in spatial information systems
- Structuring project management activities based on a well-formulated problem formulation (*)

**Competencies in**
- Mastering the full systems development path for self-defined problems
- Developing and setting up simple distributed GIS solutions
- Designing a Spatial Data Infrastructure for a minor organisation
- Reflecting on, planning and managing a study project in a PBL learning environment (*)

**Type of instruction:** Self-study work with supervision.

**Exam format:** Oral examination taking outset in the project report.

**Evaluation criteria:** Stated in the framework provisions.

(*) To obtain the knowledge, skills and competence marked with (*) it is presupposed that students follow the course in Problem Based Learning and Project Management that the school offers all foreign students in the beginning of 1st semester.
Title (course): Geospatial Information Technology  
(Geospatial informationsteknologi)

Prerequisites
Entrance requirements for the study programme and following the course 'Land Governance and Geographic Information in a societal context' in parallel.

Objective:
Students who complete the module will acquire the following knowledge, skills and competencies:

Knowledge about
- Systems design by AGILE methods
- System development for geospatial applications
- Spatial databases and query languages
- Principles of Distributed GIS
- Standards for web-based GI applications

Skills in
- Understanding the path from user requirements over design to implementation and test.
- Applying up-to-date system development methods and programming tools
- Evaluating the various approaches to systems design and development.

Competencies
- Must have the ability to design and build simple spatial enabled applications using modern object orientated development tools

Type of instruction: Combined lectures and exercises.

Exam format: Portfolio examination.

Evaluation criteria: Stated in the framework provisions.
Title (project): GI – Integration, Applications and Society (GI – Integration, anvendelser og samfundet)

Prerequisites: 1. Semester completed or similar qualifications.

Objective: To give students the opportunity to work with self-defined problems related to the role of GI in decision-making applying geocomputation techniques, geovisualisation, image processing and decision support technology.

Skills in
- The use of different spatial analysis and geocomputation technologies and understanding their strengths and weaknesses in decision-making processes
- Being aware of the potential role of geovisualisation in all steps of decision-making
- Evaluating various types of spatial decision support systems

Competencies in
- Designing and setting up advanced systems for knowledge based e-government in smaller organisations

Type of instruction: Self-study works with supervision.

Exam format: Oral examination taking outset in the project report.

Evaluation criteria: Stated in the framework provisions.
Title (course): Geocomputation and Spatial Analytics (Geografisk analyse og modellering)

Prerequisites: 1. semester or similar qualifications

Objective: Students who complete the module will acquire the following knowledge, skills and competencies:

Knowledge about
- A wide range of advanced analysis and modelling methods like spatial statistics, cell based modelling, network analysis, cellular automata, multivariate analysis and classification
- Multi-criteria evaluation and decision support systems.

Skills in
- Being able to understand the strengths and weaknesses of the different geoprocessing methods and tools.
- Identifying and applying advanced geocomputation and decision analysis to solve practical problems

Competencies in
- Having the ability to design and develop decision support systems from identifying appropriate data and tools to present the results to the decision makers and the public

Type of instruction: Combined lectures and exercises.

Exam format: Portfolio examination.

Evaluation criteria: Stated in the framework provisions.
Title (course): Geovisualisation (Geovisualisering)

Prerequisites: 1. semester or similar qualifications.

Objective: Students who complete the module will acquire the following knowledge, skills and competencies:

Knowledge about
- The use of geovisualisation as a way of communication
- Interpolation and geostatistical methods as a means of visualising scattered point observations
- The principles for web-based geovisualisation
- Multi-spectral imaging
- Methods and standards for 3D visualisation

Skills in
- Being able to design simple web-based geovisualisation solutions
- Evaluating different geovisualisation methods from a user’s point of view
- Assessing multi-spectral data sources and visualisation techniques
- Being able to use tools and standards for developing simple 3D visualisations

Competencies in
- Carry out advisory tasks concerning appropriate geovisualisation solutions
- Designing and setting up advanced geovisualisation systems

Type of instruction: Combined lectures and exercises.

Exam format: Written examination.

Evaluation criteria: Stated in the framework provisions.
3.4.3 Land Management

Title (project): Development and Regulation of Real Property (Udvikling og regulering af fast ejendom)

Prerequisites: Students must have a bachelor degree in surveying, planning and land management or urban, energy and environmental planning or geography or programmes with similar contents.

Objective: The main focus of the project module is on legal, financial and administrative issues related to the change and development of real property. The topic may come from property owners requesting a certain development of a property, the wish of the public sector for a concrete development of a particular area or it may be a topic of a scientific nature related to public and private regulation of real property. It is also possible to select themes related to the maintenance and development of registration of real property - both in relation to national and international issues.

Having carried out the project module, the students

Knowledge
- must have knowledge of land use challenges and development issues – with respect to the chosen challenge.
- must have knowledge of spatial data infrastructures related to the chosen land use challenge.
- must have knowledge of practical and scientific challenges concerning the management of the use of land through land administration systems – to the extent that it is relevant for the chosen challenge.
- must have basic knowledge of problem-based learning in project work.
- must have knowledge about the fundamental principles of Problem Based Learning (PBL) as implemented in the Aalborg PBL model at the Faculty of Engineering and Science (*)

Knowledge
- must have knowledge of the potential of public and private regulation of real property
- must have knowledge of the legal framework for the management, regulation and registration of properties
- have knowledge of the possibility of public acquisition of real property and the principles for determining compensation
- must have knowledge of the possibility of public acquisition of real property and the principles for determining compensation
- must have knowledge of property registration system and the importance of property rights and property values
- must have knowledge of property registration systems in other countries and the development and implementation of the Land Administration Systems (LAS)
- must have knowledge of practical and scientific challenges concerning the management of the use of land through land
administration systems – to the extent that it is relevant for the chosen challenge.

- must have knowledge about the fundamental principles of Problem Based Learning (PBL) as implemented in the Aalborg PBL model at the Faculty of Engineering and Science (*).

Skills
- must be able to identify and analyze the selected property related issues
- must be able to apply theories and methods of relevance to the chosen challenges
- must be able to analyze the relevant considerations, interests, rights and obligations in connection with the adjustment of real property
- must be able to make an assessment of the legal, economic and administrative issues related to the chosen issues.
- must be able to structure project management activities based on a well-formulated problem formulation (*).

Competencies
- must be able to analyze property-related problems - for example in relation to counseling
- must be able to structure and combine theoretical discussions with practical challenges throughout the project work and its result (the project report)
- must be able to independently initiate and carry out tasks of real property/land administration and must be able to take on professional responsibility.
- must be able to reflect on, plan and manage a study project in a PBL learning environment (*).

Type of instruction: Problem-oriented project work in groups.
Exam format: Oral examination, based on a project report.
Evaluation criteria: Stated in the framework provisions.

(*) To obtain the knowledge, skills and competence marked with (*) it is presupposed that students follow the course in Problem Based Learning and Project Management that the school offers all foreign students in the beginning of 1st semester.
Title (course): Managing the Use of Land (Arealforvaltning)

Prerequisites: Students must have a bachelor degree in surveying, planning and land management or a similar degree in planning that provides a comprehensive understanding of land use planning, including knowledge of land use regulation, governing systems and property rights.

Objective The aim of the module is to acquire general knowledge of regulation of land use and land management. Emphasis is placed on different levels of administration, including legal, policy and institutional contexts in relation to managing the use of land. The module also stresses international comparisons of spatial planning land administration systems and sectorial land-use regulations from different European countries and beyond.

Having completed the course module, the students

Knowledge
- must have knowledge and understanding of Land Management and regulation of land use, both in Denmark and abroad
- must acquire knowledge of theories of the state in relation to national, regional and local government, and the changing political landscapes that influence the scope of policy and decision-making at different levels of land administration
- must develop an understanding of the legal and administrative options in relation to planning, administration and regulation of land use

Skills
- must be able to develop analyses of land use situations in light of international comparisons, and to assess particular courses of action in relation to land administration in connection with sectorial land-use regulations.
- must be able to critically reflect on land administration decisions at the local level, and to assess such decisions in accordance with theoretical and practical understandings of changing contexts and political settings
- must be able identity core issues – of both a legal, technical, organizational, economic and social nature – in relation to the development real property.

Competencies
- must be able to work in developing critical understandings, analyses and assessments of theoretical aspects of land management and regulation of land use.
- must be able to perform comparative international analyses in relation to approaches at different spatial scales.

Type of instruction: Lectures, workshops, seminars, assignments, presentations.

Exam format: Portfolio / student presentations /active participation/ completed through the assignment of an essay.
Evaluation criteria: Stated in the framework provisions.
**Title (project):** Spatial Development and Planning  
(Spatial udvikling og planlægning)

**Prerequisites:** Students must have a bachelor degree in surveying, planning and land management or urban, energy and environmental planning or geography or programmes with similar content.

**Objective:** The main focus of the project module is on managing and facilitating urban and/or rural spatial development, land use and planning in a societal context and on levels above the individual property. The project must identify and analyse a specific spatial development challenge in an urban or rural context, and must be able to develop this into a specific land use policy or planning challenge. The project analyses relevant political, legal and administrative frameworks and practices, including relevant norms, interests, actors, regulations, organisational settings, procedures and processes related to the chosen challenge. If relevant, aspects of land economics and/or e-governance can also be included. Finally, the project discusses, critically relates to and concludes the implications of the analysis. The project can propose specific changes and solutions to relevant policies, plans and/or settings, procedures and processes. The overall aim of the project is to provide the students with abilities to advice, manage, facilitate and develop land use and spatial policy, planning and management processes.

Having carried out the project module, the students

**Knowledge**
- must have knowledge and understanding of relevant theories and practices concerning the framework conditions, organisation and processes of spatial development, policy, planning, management and governance – with respect to the chosen challenge.
- must have knowledge of different norms and interests related to the specific activities of spatial policy, planning and governance associated with the chosen challenge, e.g. norms of democracy, participation, efficiency and economic, socio-cultural and environmental sustainability.
- must have knowledge of the integration of e-governance and spatial data infrastructures in spatial policy, planning and land management if this is particularly relevant for the chosen challenge.
- must have knowledge of and be able to critically relate to practical and scientific challenges concerning policy-making, planning, management, facilitation, administration and implementation of spatial development and land use – to the extent that it is relevant for the chosen challenge.

**Skills**
- must be able to identify and analyse a specific urban and/or rural spatial development challenge, and must be able to relate and develop this into a specific spatial policy, planning or governance challenge.
• must be able to apply theories and methods of relevance to the chosen challenge. Must be able to argue the design and general methods of the project in relation to scientific methodology.

• must be able to analyse and critically assess relevant interests, actors, legislation, organisational settings, procedures and processes related to the chosen challenge, e.g. in relation to different societal norms, such as sustainability and democracy. Must be able to identify conflicting or mutually reinforcing aspects.

• must be able to conclude and discuss the theoretical and/or practical implications of the analysis and assessments performed in the project. Must be able, if relevant, to propose specific changes and solutions to relevant policies, plans and/or organisational settings, procedures and processes related to the chosen challenge.

Competencies

• must be able to advice, manage, facilitate and develop policy-making, planning and administrative settings, procedures and processes concerning spatial development and land use.

• must be able to structure and combine theoretical discussions with practical challenges throughout the project work and its result (the project report).

• must be able to independently initiate and carry out tasks of planning, management and administration in interdisciplinary cooperation, and must be able to take on professional responsibility.

Type of instruction: Problem-oriented project work in groups. Workshops, seminars, assignments and/or mini projects that supplements the project work.

Exam format: Oral examination, based in a project report. Potential supplementary activities are evaluated as an integrated part of the project work.

Evaluation criteria: Stated in the framework provisions.
Title (course): **Spatial Planning and Governance**  
*(Fysisk planlægning og styringsprocesser)*

**Prerequisites:** Students must have a bachelor degree in surveying, planning and land management or urban, energy and environmental planning or geography or programmes with similar content.

**Objective:** Having carried out the course module, the students

**Knowledge**
- must have knowledge and understanding of theories, ideas and norms of spatial planning, management and governance, from rational to postmodern perspectives.
- must have understanding of the role of power, interests, democracy, participation and knowledge in spatial policy, planning and governance.
- must have understanding of the role of cultures, institutions and discourses in spatial policy, planning and governance.
- must have knowledge of theories of territorial policy integration, networking and governance across sectors and levels.

**Skills**
- must be able to apply theories and models of urban and rural planning, governance and land management in order to facilitate spatial development.
- must be able to analyse and assess spatial policy, planning and governance in relation to sustainability, power and democracy.
- must be able to analyse and assess the practices and roles of different actors and networks in spatial policy, planning and governance, ranging from government-lead top-down activities to stakeholder and bottom-up citizen involvement activities.

**Competencies**
- must be able to manage spatial policy, planning and governance as a complex and relational technical, political, administrative and socio-cultural process.
- must be able to combine and integrate theoretical discussions with practical challenges, across both disciplines and sectors.
- must be able to advice, manage, facilitate and develop spatial policy, planning and governance settings and processes in cooperation and networks across disciplines, sectors and actors.

**Type of instruction:** Lectures, workshops, seminars, assignments, presentations.

**Exam format:** Active participation/portfolio.

**Evaluation criteria:** Stated in the framework provisions.
Title (course): Land Use Regulation and Land Economics (Arealregulering og økonomi)

Prerequisites
Students must have a bachelor degree that provides a comprehensive understanding of land use planning, including knowledge of land use regulation, governing systems and property rights. Students with a bachelor degree in surveying, planning and land management are directly qualified.

Objective: Having carried out the course module, the students

Knowledge
- must have knowledge of the organisation, principles and administration of governing systems, authorities, legislation and legal procedures related to spatial planning and regulation of land use.
- must have knowledge of the conditions, limitations and opportunities as well as the competence of planning and land management authorities.
- must have knowledge of the relationship between public sector planning and regulation and land and property economics, including financing of urban development and housing.
- must have knowledge of challenges and opportunities concerning public-private partnerships and agreements related to spatial development and planning.

Skills
- must be able to identify and apply theories and models of legislation and administration concerning the development of urban and rural areas.
- must be able to assess the role of the public sector in land economics.
- must be able to identify, analyse and assess challenges and opportunities for public-private interaction in spatial planning, administration and property development, in particular concerning public-private partnerships and agreements.
- must be able to critically analyse and discuss scientific and practical challenges to relations between the public and private sector, planning legislation and administration, as well as between urban development and financing.
- must be able to communicate research based knowledge and discuss problems and challenges concerning the relation between public and private actors in development of urban and rural areas.

Competencies
- must be able to advice and manage complex spatial development situations and produce solution models for specific measures, including planning and regulation of land use, financing of land and the built environment and infrastructures, and public-private interaction.
Type of instruction: Lectures, workshops, seminars, assignments, presentations, mini-project (possibility).

Exam format: Active participation/portfolio.

Evaluation criteria: Stated in the framework provisions.
3.5 Description of modules. 3rd semester

Title: Professional Development
(Faglig og professionel udvikling)

Prerequisites: Students must have completed the 1st semester (and have followed courses and exams at the 2nd semester) or have another education after specific assessment.

At the 3rd semester the student can choose between more options:

Option 1: Project semester – with or without an integrated project-oriented stay in a company (Internship)

The student may choose to carry through a traditional project semester which will normally develop the professional competence that the student has acquired within the 1st-2nd semester and/or prepare for the subject about which the student wants to write his/her thesis. The semester comprises preparation of a project report or a scientific article – possibly with the supervisor as the last author of the article.

The student may choose to integrate a project-oriented stay in a company either in Denmark or abroad in the project semester. The project-oriented stay must be of maximum 2-4 months’ duration and must be approved in advance by the Study Board of the Programme in Surveying and Planning. For each individual project-oriented stay specific learning goals have to be drawn up, clearly reflecting the professional problem of the project.

Objective: Students completing the project module acquire the following:

Knowledge:
- Must within a selected part of his/her professional field of specialisation have knowledge that bases on the highest international research.
- Must be able to understand and relate critically to the knowledge of the professional field and be able to identify either scientific or practical problems in a given complex context.

Skills:
- Must be able to master the scientific methods and tools of the professional field and to master general skills connected with the solution of the chosen problem.
- Must be able to assess and choose among the scientific methods, tools and general skills and prepare new analysis and solution models.
- Must be able to discuss professional and scientific problems with both colleagues and non-specialists.

Competencies:
- Must be able to control work and development situations that are complex, unpredictable and to imply new solution models.
• Must be able to start and carry through professional and interprofessional cooperation independently and to take a professional responsibility.
• Must be able to independently take the responsibility for own professional development and specialization.

Type of instruction: Project work, possibly with an internship integrated into the project course.

Exam format: Internal oral examination based on the project report or article.

Evaluation criteria: Stated in the framework provisions.

Option 2: 1st semester of another specialisation
A student who has followed the 1st and 2nd semester under one specialisation may alternatively choose to follow the 1st semester of another specialisation on the Programme of Surveying and Planning. In that case the student follows course and project modules at this semester in full and will in this way acquire the knowledge, skills and competences, etc. indicated in the curriculum of the 1st semester of the specialisation in question.

Option 3: International or national credit
After preceding approval by the Study Board the 3rd semester can be carried through at another educational institution in Denmark or abroad. Preceding approval (pre-credit) may be expected if studies at another educational institution will impart knowledge, skills and competences which correspond to the knowledge, skills and competences that could otherwise be obtained by following “Project semester – with or without an integrated project-oriented stay in a company (Internship)”, see above.

Option 4: Long final project (thesis)
Students may choose to complete the 3rd and 4th semesters as one long thesis (60 ECTS). Long final project is especially recommended to work with project topics, where an extraordinarily large collection of data is necessary. Final projects must be approved in advance by the Study Board, and the student must fulfil knowledge, skills and competences as indicated for Master’s theses.
3.6 Description of modules. 4th semester:

Title: Master’s Thesis (Kandidatspeciale)

Prerequisites: Students must have passed the first three semesters of the education.

Objective: Students completing the module acquire the following:

Knowledge
- Has thorough knowledge of relevant theories and methods in relation to the chosen problem and can reflect on them.
- Is able to describe the used theory or theories so that the special characteristics of this theory are brought to light and in this way document understanding of it or the potentials and limitations of the used theory within the problem field concerned.
- Has knowledge of the scientific-theoretical and methodical roots of the used theories and can reflect on them.
- Has thorough knowledge of the research roots of the chosen problem including knowledge of the most important national and international research in the field.

Skills
- Is independently able to plan and complete a project progress at a high professional level.
- Is able to account for possible methods for solving the problem of the project and describe and assess the suitability of the chosen methods and also account for chosen limitations and their significance to the results of the product.
- Is able to account for the relevance of the chosen problem to the education, including a precise account of the core of the problem and the professional context in which it appears.
- Is able to analyse and describe the chosen problem by using relevant theories and empirical investigations.
- Is able to analyse and assess the results of empirical investigations, whether it is a question of the students’ own investigations or those of others, including an assessment of the importance of the investigation method to the validity of the results.
- Is able to point at relevant forward-directed strategies, possibilities of change and/or solution proposals.
- Is able to communicate knowledge of the problem to both professionals and non-professionals.

Competencies
- Is able to form a synthesis between the professional problem, theoretical and empirical investigations and to make a critical assessment of the formed synthesis and the other results of the project work.
- Is able to independently participate in interdisciplinary discussions and develop work based on the acquired knowledge of the problem.
• Is able to independently acquire the newest knowledge within the field and on this basis currently improve the professional skills and competences.

Type of instruction: Problem-oriented project work in groups.

Exam format: External oral examination based on the project report of the group.

Evaluation criteria: Stated in the framework provisions.
Chapter 4: Entry into Force, Interim Provisions and Revision

The curriculum is approved by the Dean of the Faculty of Engineering and Science and enters into force as of 1\textsuperscript{st} of September 2015.

Students who wish to complete their studies under the previous curriculum from 2011 must conclude their education by the summer examination period 2016 at the latest, since examinations under the previous curriculum are not offered after this time.

In accordance with the Framework Provisions for the Faculty of Engineering and Science 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 poor 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 program 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 Framework Provisions for the rules on credit transfer.

5.3 Rules for examinations

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

5.4 Exemption

In exceptional circumstances, the Board of Studies study can grant exemption from those parts of the curriculum that are not stipulated by law or ministerial order. Exemption regarding an examination applies to the immediate examination.

5.5 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.
Completion of the Master's program
The Master's program 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 modern Danish, Norwegian, Swedish and English and use reference works, etc., in other European languages.

1 Or another foreign language (upon approval from the Board of Studies.
2 The Board of Studies can grant exemption from this.

Remarks: The curriculum has been revised in proportion to the degree designation in November 2017.