Faculty of Engineering and Engineering
Board of Studies for Surveying, Planning and Land Management

Curriculum

Master’s Program (cand.scient.techn.) in
Surveying, Planning and Land Management

Aalborg University
May 2013

Campus: Aalborg and Copenhagen
**Preface:**
Pursuant to Act 652 of June 24, 2012 on Universities (the University Act) with subsequent changes, the following curriculum for the Master’s program in 2013 is stipulated. The program also follows the Framework Provisions and the Examination Policies and Procedures for the Faculty of Engineering and Science.

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Chapter 1: Legal Basis of the Curriculum, etc.

1.1 Basis in ministerial orders
The Master's program (cand.scient.techn.) in Surveying, Planning and Land Management is organized in accordance with the Ministry of Science, Technology and Innovation's Ministerial Order no. 814 of June 29, 2010 on Bachelor's and Master's Programs at Universities (the Ministerial Order of the Study Programs) and Ministerial Order no. 666 of June 24, 2012 on University Examinations (the Examination Order) with subsequent changes. Further reference is made to Ministerial Order no. 240 of March 11, 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)
Chapter 2: Admission, Degree Designation, Program Duration and Competence Profile

2.1 Admission
Admission to the Master's program in Surveying, Planning and Land Management requires a Bachelor's degree in Geography.

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.scient.techn. i landinspektørvidenskab med specialisering i:
- opmåling og kortlægning
- geoinformatik, eller
- arealforvaltning og planlægning

The English designation is: Master of Science (MSc)/cand.scient.techn. in Surveying, Planning and Land Management with specialisation in:
- Surveying and Mapping
- Geoinformatics, or
- 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.scient.techn.) 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.scient.techn.) with Specialisation in Geoinformatics

The graduate of the Master's program:

Knowledge

- Has knowledge in 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, reflect over the knowledge and identify scientific problems regarding the development of spatial enabled services, advanced geovisualisation, 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 technology.
2.5.3. Competence profile of the Master's program (cand.scient.techn.) with Specialisation in Land Management

The graduate of the Master's program:

Knowledge

- Has knowledge in land use planning and land management based on state-of-the-art international research in the subject areas, such as the development and regulation of property and land use, spatial planning and implementation, land economics and land governance.
- Understands legal issues concerning the use of and public interventions of private property, based on the highest international 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 normative aspects, such as economic, socio-cultural and/or environmental sustainability.

Skills

- Excels in main theories that relate to the knowledge areas and in scientific methods, 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, 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>1st</td>
<td>Positioning</td>
<td>20/15</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>Spatial Data Infrastructure</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Land Administration Systems (optional)</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td>2nd</td>
<td>Sensor and Data Integration</td>
<td>15</td>
<td>7-point scale</td>
<td>External</td>
</tr>
<tr>
<td></td>
<td>Small Scale Mapping</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Large Scale Mapping</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>3rd</td>
<td>Professional Development</td>
<td>30/25/20</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Elective course (optional)</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Elective course (optional)</td>
<td>5</td>
<td>Pass/Fail</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></td>
<td>Total</td>
<td>120</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Regarding the optional courses on 3rd semester; it is also possible to choose other optional elective courses (the so-called “valgfag”) of maximum 10 ECTS in total – see: http://www.teknat.aau.dk/Officielle+dokumenter/Uddannelsesregler+og+ressourcer/F%C3%A6lles+AAU+valgfag+p%C3% A5+dil+9+semester. However, the courses in “Scientific Article Writing” and “Project Management” are recommended in particular.

Modules is 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).

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<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>20/15</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>Spatial Data Infrastructure</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Land Administration Systems <em>(optional)</em></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>15</td>
<td>7-point scale</td>
<td>External</td>
</tr>
<tr>
<td></td>
<td>Geocomputation and Spatial Decision Support Systems</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></td>
<td>Remote Sensing and Image Processing</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>30/25/20</td>
<td>7-point scale</td>
<td>Internal</td>
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<tr>
<td></td>
<td>Elective course <em>(optional)</em></td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
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<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
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However, the courses in “Scientific Article Writing” and “Project Management” are recommended in particular.

Modules is 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>
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<th>Module</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td><strong>Land Development and Property Law</strong></td>
<td>20</td>
<td>7-point scale</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Spatial Data Infrastructure</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Land Administration Systems</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td>2nd</td>
<td><strong>Spatial Development and Planning</strong></td>
<td>15</td>
<td>7-point scale</td>
<td>External</td>
</tr>
<tr>
<td></td>
<td>Development, Planning and Implementation</td>
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<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Land Use Regulation and Land Economics</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>Land Management and Governance</td>
<td>5</td>
<td>Pass/Fail</td>
<td>Internal</td>
</tr>
<tr>
<td>3rd</td>
<td><strong>Professional Development</strong></td>
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Regarding the optional courses on 3rd semester; it is also possible to choose other optional elective courses (the so-called valgfag) of maximum 10 ECTS in total – see: [http://www.teknat.aau.dk/Officielle+dokumenter/Uddannelsesregler-og+ressourcer/F%C3%A6lles+AAU+valgfag+p%C3%85+dit+9.+semester/](http://www.teknat.aau.dk/Officielle+dokumenter/Uddannelsesregler-og+ressourcer/F%C3%A6lles+AAU+valgfag+p%C3%85+dit+9.+semester/).

However, the courses in “Scientific Article Writing” and “Project Management” are recommended in particular.

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

Title (course): Spatial Data Infrastructure (Infrastruktur for geografisk information)

Prerequisites: Students must have a bachelor degree in surveying, land management, urban planning, environmental planning, geography or study programs with similar contents. Basic knowledge about geographic information and information technology is required.

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

Knowledge:
- about the historical development of Spatial Data Infrastructure (SDI) and understand basic SDI concepts (technically, organizational, legal and ethical).
- about standardisation in ISO, OGC and INSPIRE
- on structuring and management of spatial data as well as general IT architectures
- understand the Internet as a channel for distributing and handling Geographic information through services.
- have knowledge regarding various system design and implementation strategies.
- understand the role of SDI in e-Government

Skills:
- be able to apply basic IT building blocks to build a simple system for handling geographic information
- be able to evaluate the interplay between the various SDI building blocks, the general IT architectures, and the spatial enabled society

Competencies:
- be able to design a Spatial Data Infrastructure for smaller organizations considering technical, organizational, legal and ethical issues.

Type of instruction: Combined lectures and exercises.

Exam format: 24 hours written examination.

Evaluation criteria: Stated in the framework provisions.
Title (course): Land Administration Systems
(Landadministrationssystemer)

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

Objective: Having carried out the course module, the students will have

Knowledge
• of the historical development and basic principles of Land Administration Systems; the basic concepts of secure land tenure and property rights; and the benefits thereof to society
• the role and design of Land Administration Systems in providing the infrastructure for implementation of land policies and land management strategies in support of sustainable development and the significant role of the cadastre in this regard
• of technologies and organizational structures for building and managing Land Administration Systems
• of principles of data collection, structuring and management of property related data in Land Administration Systems
• of cadastral and property registration systems and associated infrastructures of different countries throughout the world.

Skills
• in identifying core issues – of both a legal, technical, organizational, economic and social nature – in relation to the development and implementation of property registration systems within the wider concept of Land Administration Systems
• in linking theory on land tenure and property rights protection with registration systems and practices in the Danish as well as a foreign country context.

Competencies
• in advising on the development and implementation of property registration systems within the wider concept of Land Administration Systems
• in contributing to future development tasks within the areas of Cadastre and Land Administration Systems.

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

Exam format: Active participation, completed through a presentation.

Evaluation criteria: Stated in the framework provisions.
3.4.1 Surveying and Mapping

**Title (project):** Positioning (Positionering)

**Prerequisites:**
- The students should be familiar with
  - Linear algebra
  - Least squares adjustment
  - Descriptive statistics
  - Photogrammetry
  - GNSS
  - Surveying
  - A high level programming language

**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.

**Skills:**
- in problem-based learning and project work
- master theories/methods related to collecting/processing spatial data.
- be able to evaluate theories/methods related to collecting/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.

**Competencies**
- be able to master selected data collecting technologies.
- be able to master general skills required to solve typical data collecting/processing tasks.
<table>
<thead>
<tr>
<th>Type of instruction:</th>
<th>Project work.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam format:</td>
<td>Oral examination based on project report.</td>
</tr>
<tr>
<td>Evaluation criteria:</td>
<td>Stated in the framework provisions.</td>
</tr>
</tbody>
</table>
Title (course): Positioning Technologies (Positioneringsteknologier)

Prerequisites: The students should be familiar with
- Linear algebra
- Least squares adjustment
- Descriptive statistics
- Photogrammetry
- GNSS
- Surveying
- A high level programming language

Objective: 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:

Knowledge:
- be knowledgeable about GNSS positioning models.
- be knowledgeable about surveying methods used for collection spatial data.
- be knowledgeable about photogrammetric methods used in connection with airborne/terrestrial positioning application.

Skills:
- be able to master and evaluate GNSS, surveying, and photogrammetric theories/methods in relation to collecting spatial data.

Competencies:
- be able to master selected positioning technologies required to solve typical positioning tasks.
- be able to master general skills 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 (to be decided upon at the beginning of the semester).

Evaluation criteria: Stated in the framework provisions.
| Title (project): | Sensor and Data Integration  
(Sensor- og dataintegration) |
|-----------------|-------------------------------|
| Prerequisites:  | The students should be familiar with  
- Linear algebra  
- Least squares adjustment  
- Descriptive statistics  
- Photogrammetry  
- GNSS  
- Surveying  
- A high level programming language |
| 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  
- 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/analyze 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): Small Scale Mapping  
(Kortlægning i små målforhold)

Prerequisites: The students should be familiar with  
• Linear algebra  
• Least squares adjustment  
• Descriptive statistics  
• Photogrammetry  
• GNSS  
• Surveying  
• A high level programming language

Objective: To give the students thorough knowledge of theories/methods related to  
small scale mapping.  
Students who complete the course module must:

Knowledge:  
• be knowledgeable about theories/methods applicable to small scale mapping.  
• be knowledgeable about coordinate systems, map projections, and  
other selected aspects of geometric geodesy.

Skills:  
• be able to master and evaluate relevant theories/methods in  
relation to small scale mapping.

Competencies:  
• be able to master general skills required to solve typical tasks in  
relation to small scale 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 (to be decided upon at the beginning of the  
semester).

Evaluation criteria: Stated in the framework provisions.
Title (course): Large Scale Mapping  
(Kortlægning i store målforhold)

Prerequisites: The students should be familiar with  
• Linear algebra  
• Least squares adjustment  
• Descriptive statistics  
• Photogrammetry  
• GNSS  
• Surveying  
• A high level programming language

Objective: To give the students thorough knowledge of theories/methods related to large scale mapping.  
Students who complete the course module must:

Knowledge:  
• be knowledgeable about theories/methods applicable to large scale mapping.  
• be knowledgeable about theories/methods for integrating spatial data.

Skills:  
• be able to master and evaluate relevant theories/methods in relation to large scale mapping.

Competencies:  
• be able to master general skills required to solve typical tasks in relation to large scale 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 (to be decided upon at the beginning of the semester).

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

Prerequisites: The students should be familiar with  
• Linear algebra  
• Least squares adjustment  
• Descriptive statistics  
• A high level programming language

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.

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 (to be decided upon at the beginning of the semester).

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 ‘Spatial Data Infrastructure’ in parallel.

**Objective:** To give students the opportunity to work with self-defined problems related to Internet based GIS and spatial data infrastructures.

**Knowledge**
- Must have knowledge about information technology including spatial databases, system design and systems development
- Must have a knowledge about the fundamental building blocks in Spatial Data Infrastructure (SDI)
- Must be familiar with the principles on distributed GIS.

**Skills**
- Must be able to analyse problems related to systems development
- Must be able to assess different distributed GIS architectures
- Must be able to evaluate the role of SDI in digital government

**Competencies**
- Must master the full systems development path for self-defined problems
- Must be able to develop and set up simple distributed GIS solutions
- Must be able to design an SDI for a minor organisation
- Must be able to use the relevant theory of science within the frames of Surveying, Planning and Land Management

**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.
Title (course): Geospatial Information Technology  
(Geospatial informationstechnologi)

Prerequisites: Basic knowledge about geographic information and information technology and the course in Spatial Data Infrastructure

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

Knowledge
- Must have knowledge about spatial concepts, models and operators, database design, system development methods and programming.
- Must be able to understand the path from user requirements over design to implementation and test.

Skills
- Must be able to apply up-to-date system development methods and programming tools
- Must be able to evaluate the various approaches to systems design and development against each other.

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.

Knowledge
- Must have a wide knowledge about advanced geocomputation methods
- Must have a wide knowledge about advanced techniques for geovisualisation.
- Must have the knowledge about sensor based technology and image processing

Skills
- Must be able to use different geocomputation techniques and understand their strengths and weaknesses in decision-making processes
- Must be able to assess various remotely sensed data and image processing algorithms
- Must be aware of the potential role of geovisualisation in all steps of decision-making
- Must be able to evaluate various types of spatial decision support systems

Competencies
- Must be able to design and set up advanced systems for knowledge based e-government in smaller organisations

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.
Title (course): Geocomputation and Spatial Decision Support Systems (Geografisk analyse og spatielle beslutningssystemer)

Prerequisites: 1. semester or similar qualifications

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

Knowledge
• Must have knowledge about a wide range of advanced geocomputation methods like interpolation, geostatistics, cellular automata, spatial optimisation, multi-criteria evaluation, and decision support systems.
• Must be able to understand the strengths and weaknesses of the different methods and tools.

Skills
• Must be able to identify and apply advanced geocomputation and decision analysis to solve practical problems

Competencies
• Must have 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 using Public Participation GIS

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
- Must have knowledge about the use of geovisualisation as a means of communication
- Must be able to understand the principles for web-based geovisualisation
- Must have knowledge on advanced principles of geovisualisation - concepts, standards and tools below here virtual reality.

Skills
- Must be able to design simple web-based geovisualisation solutions
- Must be able to evaluate different geovisualisation methods from a user’s point of view
- Must be able to use tools and standards for developing simple 3D visualisation

Competencies
- Must have sufficient knowledge to design and build simple web sites with dynamic map contents
- Must obtain sufficient knowledge and skill to set up advanced geovisualisation systems

Type of instruction: Combined lectures and exercises.

Exam format: Written examination.

Evaluation criteria: Stated in the framework provisions.
Title (course): Remote sensing and Image processing  
(Fjernanalyse og billedbehandling)

Prerequisites: The modules ‘Geovisualisation’ and ‘Geocomputation and Spatial Decision Support Systems’ in parallel.

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

Knowledge
- Must have knowledge about modern sensor and imaging technologies
- Must understand the physical principles of remote sensing
- Must be able to understand the principles of hyper-spectral imaging
- Must have knowledge about advanced image processing and algorithms

Skills
- Must be able to identify and assess various sources of remotely sensed data
- Must be able to carry out basic and advanced image processing techniques
- Must be able to use various image processing software for land cover, terrain mapping, climate variables, and environmental problems

Competencies
- Must have sufficient knowledge and skills to assess and apply remotely sensed data and image processing for solving practical problems

Type of instruction: Combined lectures and exercises.

Exam format: Portfolio examination.

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

Title (project): Land Development and Property Law (Regulering og udvikling 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 focus of the semester is the specific legal, economic and administrative problems connected with the utilization of real property. The problems dealt with may originate from the landowners’ desire for a certain development of a property, the desire of the public sector for a certain development in a given area or general problems of a scientific nature connected with public and civil law regulation of real property. It is further possible to raise problems with relation to the establishment, maintenance and development of property registration – seen in to both a national and an international context.

Having completed the project module, the students will have

Knowledge
- of both Danish and international legal system, principles and sources of law with special reference to legislation on real property
- of regulatory instruments, practices and legal limits in relation to real property
- of execution of authority over private property
- of property valuation and compensation determination in connection with public interventions

Skills
- in problem-based learning and project work
- in identifying and analyzing the chosen property-related problem
- in identifying and analyzing the theories and methods relevant to the problem dealt with
- in analyzing the relevant considerations, interests, rights and duties connected with the regulation of real property
- in making critical assessments of the legal, economic, registration and administrative subjects connected with the chosen problem.

Competencies
- must be able to analyze property-related problems and offer consulting services at a high level within the core fields of the profession of surveying within both the public and private sector.
- must be able to structure and combine complex theoretical discussions with practical challenges throughout the project work and its result.

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

Exam format: Oral examination, based in a project report.
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. 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 norms, interests, actors, organizational settings, procedures and processes related to the chosen challenge. Finally, the project discusses, critically relates to and concludes the implications of the analysis. And, if relevant, the project can propose specific changes and solutions to relevant policies, plans and/or settings, procedures and processes. The aim is to provide the students with skills 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, based in state-of-the-art international research, of theories and practices concerning the conditions, challenges, organisation and processes of spatial development, policy and planning – with respect to both comprehensive and sectoral activities.
- must have knowledge of different norms and interests related to processes of urban and/or rural development and planning, e.g. norms of democracy and economic, socio-cultural and environmental sustainability.
- must have knowledge of and be able to identify and critically relate to practical as well as scientific challenges concerning policy-making, planning, management, facilitation, administration and implementation of spatial development and land use.

Skills
- must be able to identify and analyse a specific urban or rural spatial development challenge, and must be able to relate and develop this into a specific policy-making or planning challenge.
- must be able to identify and apply scientific theories and methods of relevance to the chosen spatial development and planning 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, organisational settings, procedures and processes related to the chosen challenge, e.g. in relation to different normative aspects of 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.
Exam format: Oral examination, based in a project report.
Evaluation criteria: Stated in the framework provisions.
Title (course): Development, Planning & Implementation (Udvikling, planlægning & implementering)

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, based in state-of-the-art international research, of theories and practices concerning main driving forces, tendencies and challenges of spatial development, particularly at urban and rural scales. Including how this relates to normative aspects, such as economic, socio-cultural and/or environmental sustainability as well as with respect to both comprehensive and sectoral activities.
- must have knowledge of theories and methods related to the sociology of law, in particular concerning spatial development and land administration.
- must have knowledge and understanding of theories concerning the role of power, interests, conflicts, democracy and knowledge in spatial development, policy-making and planning activities.
- must have knowledge of, and be able to critically relate to, theories of planning and implementation, in particular concerning planning ideas, norms and values as well as concepts and models of, planning and implementation.

Skills
- must be able to identify and apply theories and models of mainly urban and rural spatial development, policy-making and planning.
- must be able to critically discuss scientific as well as practical challenges to spatial development, policy-making and planning activities.
- must be able to analyse and assess desirable spatial developments in relation to sustainability, power and democracy.

Competencies
- must be able to manage knowledge and practical development situations concerning spatial development and planning as a complex political, cultural and socio-economic process.
- must be able to combine theoretical discussions with main practical challenges and across disciplines and sectors.

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 ejendomsøkonomi)

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 and practices concerning the organisation, principles and administration of governing systems, authorities, legislation and legal procedures related to spatial planning and regulation of land use – mainly with respect to urban and rural development as well as with respect to both comprehensive and sectoral activities.
- must have knowledge of, and be able to critically relate to, theories, challenges and opportunities concerning the relationship between the public sector and land economics, including financing of urban development and housing.
- must have knowledge and understanding of state-of-the-art theories, practices, 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 organisation, legislation and administration concerning the governing of spatial development, planning and land use.
- 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 as well as conditions and procedures of licitation.
- 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.

Competencies
- must be able to manage knowledge and practical development situations concerning spatial development, planning and land use administration as a complex system of government, legislation and regulation procedures.
- must be able to advice, manage and develop public-private interaction settings and procedures in spatial development and planning in cooperation across disciplines and sectors.

Type of instruction: Lectures, workshops, seminars, assignments, presentations.
Exam format: Active participation/portfolio.
Evaluation criteria: Stated in the framework provisions.
Title (course): Land Management and Governance (Arealforvaltning 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, based in state-of-the-art international research, of theories and models concerning governance, organisation, management and facilitation of spatial development and planning processes, with respect to both comprehensive and sectoral activities.
- must have knowledge of theories and practices of different methods, approaches and roles concerning processes of policy-making and planning, in particular related to participation and inclusion.
- must have knowledge of, and be able to critically relate to, theories of planning cultures, institutions and discourses and their implications to spatial policy-making and planning practices and the implementation of spatial policies and plans.
- must have knowledge and understanding of theories and models of e-governance and –planning.
- must have knowledge and understanding of global, regional and national spatial data infrastructures and their role in policy-making and planning processes.

Skills
- must be able to identify and apply theories and models of governance, management, organisation and facilitation of spatial policy-making and planning processes.
- must be able to identify, analyse and assess challenges and opportunities of policy-making and planning settings, practices and methods, in particular in relation to norms, values, efficiency and resources.
- must be able to assess the role of different actors and networks in policy-making and planning activities.
- must be able to identify, analyse and assess challenges and opportunities concerning top-down as well as participatory and inclusive policy-making and planning practices, in particular stakeholder and citizen involvement practices.
- must be able to identify, analyse and assess challenges and opportunities of e-governance and –planning activities.
- must be able to critically analyse and discuss scientific and practical challenges to the facilitation and implementation of policy-making and planning processes.

Competencies
- must be able to manage knowledge and practical development situations concerning spatial development, policy-building and
planning processes as a complex governance system of actors, networks and relations.
- must be able to advice, manage, facilitate and develop spatial policy-making and planning settings and processes in cooperation and in 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.
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.

In support of the project work courses in “Scientific Article Writing” and “Project Management” are offered, which can be followed as optional courses (valgfag). It is also possible to choose other optional elective courses (the so-called valgfag) of maximum 10 ECTS in total – see http://www.teknat.aau.dk/Officielle+dokumenter/Uddannelsesregler+og+ressourcer/F%C3%A6lles+AAU+valgfag+p%C3%A5+dit+9.+semester/ - however, the courses in “Scientific Article Writing” and “Project Management” are recommended in particular.

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, Planning and Land Management. 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 inter-professional 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, Planning and Land Management. 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 specialization 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 analyze and describe the chosen problem by using relevant theories and empirical investigations.
- Is able to analyze 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 1st of September 2013.

Students who wish to complete their studies under the previous curriculum from 2011 must conclude their education by the summer examination period 2013 at the latest, since examinations under the previous curriculum are not offered after this time.

In accordance with the Framework Provisions and the Handbook on Quality Management for the Faculty of Engineering and Science 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 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.