Master’s Degree Programme
Computer Science

Revised 5 September 2019
### Structure of Master’s Degree Programme

<table>
<thead>
<tr>
<th>1st Semester</th>
<th>2nd Semester</th>
<th>3rd Semester</th>
<th>4th Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialization 1 (30 ECTS)</td>
<td>Specialization 2 (30 ECTS)</td>
<td>Elective (30 ECTS)</td>
<td>Thesis (30 ECTS)</td>
</tr>
</tbody>
</table>

### Specialization:
- Two 30 ECTS specializations

### Elective:
- Recommendation is a 3rd specialization.
- A small number of elective courses in computer science is offered in addition to specializations. Project work (partly) is also a possibility.
- Elective courses may be supportive rather than core computer science, e.g. extra mathematics courses.
- There may be requirements for the composition of the study program in connection with possible admission. In this case mandatory courses replace the elective courses (partly).

### Thesis:
Written within the area of specialization 1 or 2
Current specializations

- Specializations are taught by active researchers in the corresponding field

- Current offerings
  - Algorithmics (30 ECTS)
  - Cryptology (30 ECTS)
  - Data-Intensive Systems (30 ECTS)
  - Human-computer Interaction (30 ECTS)
  - Programming Languages (30 ECTS)
  - Ubiquitous Computing and Interaction (30 ECTS)
  - Bioinformatics (30 ECTS)

  - For more than a single specialization in bioinformatics apply for the special Master’s Degree Programme in Bioinformatics
1st Sem (Fall) | Computational Geometry: Theory and Experimentation (10 ECTS) | LA + PA
2nd Sem (Spring) | Advanced Data Structures (10 ECTS) | GSB + KGL
3rd Sem (Fall) | Theory of Algorithms and Computational Complexity (10 ECTS) | KAH

- Semesters are independent – can be taken in any order
- Third semester may be replaced with Advanced Data Management and Analysis (10 ECTS) from the Data-Intensive Systems group

## Algorithms and Data Structures
- Lars Arge
- Gerth Stølting Brodal
- Peyman Afshani
- Kasper Green Larsen
- Kristoffer Arnsfelt Hansen
Cryptology

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
<th>Instructor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Sem (Fall)</td>
<td>Cryptology (10 ECTS)</td>
<td>IBD</td>
</tr>
<tr>
<td>2nd Sem (Spring)</td>
<td>Cryptologic Protocol Theory (10 ECTS)</td>
<td>IBD + JBN</td>
</tr>
<tr>
<td>3rd Sem (Fall)</td>
<td>Cryptographic Computing (10 ECTS)</td>
<td>CO</td>
</tr>
</tbody>
</table>

• Semesters have progression
  • First semester is prerequisite for the other semesters
  • Last two semesters can be taken in any order

Cryptography and Security
• Ivan Bjerre Damgård
• Jesper Buus Nielsen
• Claudio Orlandi
• Peter Scholl
Data-intensive Systems

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
<th>Instructor(s)</th>
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</thead>
<tbody>
<tr>
<td>1st Sem (Fall)</td>
<td>Data Visualization (10 ECTS)</td>
<td>H-JS</td>
</tr>
<tr>
<td>2nd Sem (Spring)</td>
<td>Data Mining (10 ECTS) *</td>
<td>IA+PK+DM</td>
</tr>
<tr>
<td>3rd Sem (Fall)</td>
<td>Advanced Data Management and Analysis (10 ECTS)</td>
<td>IA+PK+DM</td>
</tr>
</tbody>
</table>

- Semesters are independent – can be taken in any order
- (*) Machine Learning is a prerequisite for Data Mining
- Data Visualization is taught by Hans-Jörg Schultz from the Ubiquitous Computing and Interaction group

Data-intensive Systems

- Ira Assent
- Panagiotis Karras
- Davide Mottin
Human-Computer Interaction

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Description</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Sem (Fall)</td>
<td>Interactivity and Computer Mediation – Concepts, Theories, Methods, Cases (10 ECTS)</td>
<td>SB</td>
</tr>
<tr>
<td>2nd Sem (Spring)</td>
<td>Designing Interactive Technologies (10 ECTS)</td>
<td>SB</td>
</tr>
<tr>
<td>3rd Sem (Fall)</td>
<td>Multimodal Interaction (10 ECTS)</td>
<td>EH</td>
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- Semesters are independent – can be taken in any order

Computer Mediated Activity
- Susanne Bødker
- Olav Bertelsen
- Eve Hoggan

Use, Design and Innovation
- Morten Kyng
Programming Languages

<table>
<thead>
<tr>
<th>Sem</th>
<th>Course</th>
<th>Credits</th>
<th>Tutors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Sem (Fall)</td>
<td>Program Analysis and Verification (10 ECTS)</td>
<td>AM + LB</td>
<td>Anders Møller, Magnus Madsen</td>
</tr>
<tr>
<td>2nd Sem (Spring)</td>
<td>Language-based Security (10 ECTS)</td>
<td>AA</td>
<td>Aslan Askarov, Bas Spitters</td>
</tr>
<tr>
<td>3rd Sem (Fall)</td>
<td>Functional Programming (10 ECTS)</td>
<td>BS</td>
<td>Jaco van de Pol</td>
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</tbody>
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- Semesters are independent – can be taken in any order

Programming Languages
- Anders Møller
- Magnus Madsen
- Andreas Pavlogiannis

Logic and Semantics
- Lars Birkedal
- Aslan Askarov
- Bas Spitters
- Jaco van de Pol
Ubiqitous Computing and Interaction

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
<th>ECTS</th>
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<tbody>
<tr>
<td>1st sem (Fall)</td>
<td>Building the Internet of Things with P2P and Cloud Computing (10 ECTS)</td>
<td>10</td>
<td>NOB</td>
</tr>
<tr>
<td>2nd Sem (Spring)</td>
<td>Augmented Reality (5 ECTS)</td>
<td>5</td>
<td>KG</td>
</tr>
<tr>
<td></td>
<td>Advanced Augmented Reality Project (5 ECTS)</td>
<td></td>
<td>KG</td>
</tr>
<tr>
<td>3rd Sem (Fall)</td>
<td>Data Visualization (10 ECTS) OR</td>
<td></td>
<td>H-JS</td>
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<td></td>
<td>Deep Learning for Visual Recognition (10 ECTS)</td>
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• Semesters are independent – can be taken in any order

Ubiqitous Computing and Interaction

• Kaj Grønbæk
• Niels Olof Bouvin
• Marianne Graves Petersen
• Jo Vermeulen
• Hans-Jörg Schultz
Specializations from Master’s degree Programme in **Bioinformatics**
(offered by Bioinformatics Research Centre)

Contact: Christian Storm Pedersen — Thomas Mailund—

### Algorithms and Programming

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
<th>Credits</th>
<th>Type</th>
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<tbody>
<tr>
<td>1st Sem (Fall)</td>
<td><strong>Algorithms in Bioinformatics</strong> (10 ECTS)</td>
<td></td>
<td>CSP</td>
</tr>
<tr>
<td>2nd Sem (Spring)</td>
<td><strong>Genome-Scale Algorithms</strong> (10 ECTS)</td>
<td></td>
<td>CSP+TM</td>
</tr>
<tr>
<td>3rd Sem (Fall)</td>
<td><strong>Advanced Programming in Bioinformatics</strong> (10 ECTS) OR <strong>Tree of Life</strong> (10 ECTS)</td>
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### Statistics and Data

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<tr>
<td>1st Sem (Fall)</td>
<td><strong>Data Science in Bioinformatics</strong> (10 ECTS)</td>
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</tr>
<tr>
<td>2nd Sem (Spring)</td>
<td><strong>Statistical and Machine Learning in Bioinformatics</strong> (10 ECTS)</td>
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</tr>
<tr>
<td>3rd Sem (Fall)</td>
<td><strong>Algorithms in Bioinformatics</strong> (10 ECTS) OR <strong>Tree of Life</strong> (10 ECTS)</td>
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For more info about the Master's program in bioinformatics, see [http://www.birc.au.dk/Studies](http://www.birc.au.dk/Studies)
Elective Courses (CS)

- Elective courses (apart from specialisations) offered in Computer Science in 2019/20:
  - Fall
    - Interdisciplinary Digital Entrepreneurship (10 ECTS)
    - Machine Learning (10 ECTS) (bachelor course)
  - Fall & Spring:
    - Project work in Computer Science (5 or 10 ECTS)
Guidance/Questions

- Guidance for your personal study program?
- Questions about rules for composition of the study program?

- Please contact
  - Gudmund Skovbjerg Frandsen
  - gudmund@cs.au.dk