Master’s Degree Programme
Computer Science

Revised 10 December 2019
**Structure of Master’s Degree Programme**

- **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
Algorithmics

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Title</th>
<th>Credits</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Sem (Fall)</td>
<td>Computational Geometry: Theory and Experimentation (10 ECTS)</td>
<td></td>
<td>LA + PA</td>
</tr>
<tr>
<td>2nd Sem (Spring)</td>
<td>Randomized Algorithms (10 ECTS)</td>
<td></td>
<td>KGL</td>
</tr>
<tr>
<td>3rd Sem (Fall)</td>
<td>Theory of Algorithms and Computational Complexity (10 ECTS)</td>
<td></td>
<td>KAH</td>
</tr>
</tbody>
</table>

- 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

| 1st Sem (Fall) | Cryptology (10 ECTS) | IBD |
| 2nd Sem (Spring) | Cryptologic Protocol Theory (10 ECTS) | IBD + JBN |
| 3rd Sem (Fall) | Cryptographic Computing (10 ECTS) | CO |

- 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>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Sem (Fall)</td>
<td>Advanced Data Management and Analysis (10 ECTS)</td>
<td></td>
<td>IA+PK+DM</td>
</tr>
<tr>
<td>2nd Sem (Spring)</td>
<td>Data Mining (10 ECTS) *</td>
<td></td>
<td>IA+PK+DM</td>
</tr>
<tr>
<td>3rd Sem (Fall)</td>
<td>Data Visualization (10 ECTS) OR Deeper Learning for Visual Recognition (10 ECTS)</td>
<td></td>
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</tbody>
</table>

- Semesters are independent – can be taken in any order
- (*) Machine Learning is a prerequisite for Data Mining
- Data Visualization and Deep Learning for Visual Recognition are taught by and shared with 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 Title</th>
<th>Credits</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>
<td></td>
</tr>
<tr>
<td>2nd Sem (Spring)</td>
<td>Designing Interactive Technologies (10 ECTS)</td>
<td>SB</td>
<td></td>
</tr>
<tr>
<td>3rd Sem (Fall)</td>
<td>Multimodal Interaction (10 ECTS)</td>
<td>EH</td>
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</table>

- 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>Semester</th>
<th>Course</th>
<th>Credits</th>
<th>Instructor(s)</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, Andreas Pavlogiannis</td>
</tr>
<tr>
<td>2nd Sem (Spring)</td>
<td>Language-based Security (10 ECTS)</td>
<td>AA</td>
<td>Lars Birkedal, Aslan Askarov, Bas Spitters, Jaco van de Pol</td>
</tr>
<tr>
<td>3rd Sem (Fall)</td>
<td>Functional Programming (10 ECTS)</td>
<td>BS</td>
<td></td>
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- Semesters are independent – can be taken in any order

### Logic and Semantics
- Lars Birkedal
- Aslan Askarov
- Bas Spitters
- Jaco van de Pol

CS Master’s Programme
# Ubiqitous Computing and Interaction

<table>
<thead>
<tr>
<th>1st sem (Fall)</th>
<th>Building the Internet of Things with P2P and Cloud Computing (10 ECTS)</th>
<th>NOB</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd Sem (Spring)</td>
<td>Augmented Reality (5 ECTS)</td>
<td>KG</td>
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<tr>
<td></td>
<td>Advanced Augmented Reality Project (5 ECTS)</td>
<td>KG</td>
</tr>
<tr>
<td>3rd Sem (Fall)</td>
<td>Data Visualization (10 ECTS) OR Deep Learning for Visual Recognition (10 ECTS)</td>
<td>H-JS</td>
</tr>
</tbody>
</table>

- Semesters are independent – can be taken in any order

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

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<th>Sem (Fall)</th>
<th>Course</th>
<th>Credits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Data Science in Bioinformatics (10 ECTS)</td>
<td></td>
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<tr>
<td>2nd</td>
<td>Statistical and Machine Learning in Bioinformatics (10 ECTS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>Algorithms in Bioinformatics (10 ECTS) OR Tree of Life (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