Master’s Degree Programme
Computer Science

Revised 27 November 2018
Master’s Degree Programme
Computer Science

- Website
  http://kandidat.au.dk/en/computerscience/
- Admission requirements and prerequisites
- Structure of the Master’s Degree Programme
- Contact
Admission requirements and prerequisites

Prerequisite: a bachelor degree that in level, extent and contents corresponds to a bachelor degree in computer science from Aarhus University

Minimum requirements for the bachelor programme

- 20 ECTS programming, including object-oriented programming, functional programming and software architecture.
- 20 ECTS computer systems, including databases, computer architecture, networks, operating systems, distributed systems and security.
- 20 ECTS theoretical computer science, including algorithms and data structures, logic and computability, formal languages and compilers, optimization and complexity theory.
- 10 ECTS human-machine interaction and experimental system development.
- 20 ECTS basic subjects in mathematics, probability theory and statistics.

The course basis for admission must reflect contemporary theory and practice.
Admission requirements and prerequisites

- Interpretation:

- If a few topics is missing in the bachelor programme it is up to an individual assessment whether admission is possible.

- However, all prerequisites for a majority of the specializations offered must be satisfied.
### For comparison:
**Bachelor’s degree in Computer Science at AU**

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course 1</th>
<th>Course 2</th>
<th>Course 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st sem</td>
<td>Introduction to Programming (10 ECTS)</td>
<td>Foundations of Algorithms and Data Structures (10 ECTS)</td>
<td>Calculus beta (10 ECTS)</td>
</tr>
<tr>
<td>2nd sem</td>
<td>Introduction to Databases (5 ECTS)</td>
<td>Programming Languages (10 ECTS)</td>
<td>Linear algebra (10 ECTS)</td>
</tr>
<tr>
<td></td>
<td>Implementation and Applications of Databases (5 ECTS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd sem</td>
<td>Software Engineering and Architecture (10 ECTS)</td>
<td>Introduction to Human-Computer Interaction (10 ECTS)</td>
<td>Introduction to Probability Theory and Statistics (10 ECTS)</td>
</tr>
<tr>
<td>4th sem</td>
<td>Computer Architecture, Networks and Operating Systems (10 ECTS)</td>
<td>Experimental Systems Development (10 ECTS)</td>
<td>Computability and Logic (10 ECTS)</td>
</tr>
<tr>
<td>5th sem</td>
<td>Compilation (10 ECTS)</td>
<td>Distributed Systems and Security (10 ECTS)</td>
<td>Elective (recom: Machine Learning) (10 ECTS)</td>
</tr>
<tr>
<td>6th sem</td>
<td>Philosophy of Information Tech (5 ECTS)</td>
<td></td>
<td>Optimization (10 ECTS)</td>
</tr>
<tr>
<td></td>
<td>Bachelor Project (15 ECTS)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Taught in **Danish**, except for courses marked **English**.
- Bachelor in cs or similar is prerequisite for master level cs courses.

| Mathematics | Computer Science | Elective |
**Structure of Master’s Degree Programme**

<table>
<thead>
<tr>
<th>1&lt;sup&gt;st&lt;/sup&gt; Semester</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; Semester</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; Semester</th>
<th>4&lt;sup&gt;th&lt;/sup&gt; Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialization 1</td>
<td>Specialization 2</td>
<td>Elective</td>
<td>Thesis (30 ECTS)</td>
</tr>
<tr>
<td>(30 ECTS)</td>
<td>(30 ECTS)</td>
<td>(30 ECTS)</td>
<td></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)
  - 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>ECTS</th>
<th>Instructor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Sem (Fall)</td>
<td>Computational Geometry: Theory and Experimentation (10 ECTS)</td>
<td>LA + PA</td>
<td>Lars Arge, Gerth Stølting Brodal, Peyman Afshani, Kasper Green Larsen, Kristoffer Arnsfelt Hansen</td>
</tr>
<tr>
<td>2nd Sem (Spring)</td>
<td>Advanced Data Structures (10 ECTS)</td>
<td>GSB + KGL</td>
<td></td>
</tr>
<tr>
<td>3rd Sem (Fall)</td>
<td>Theory of Algorithms and Computational Complexity (10 ECTS)</td>
<td>KAH</td>
<td></td>
</tr>
</tbody>
</table>

- Semesters have progression
  - First semester is prerequisite for second semester
  - 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>Code</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
  • Second and third semester can be taken in any order

Cryptography and Security
• Ivan Bjerre Damgård
• Jesper Buus Nielsen
• Claudio Orlandi
# Human-Computer Interaction

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Title</th>
<th>Professor(s)</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>
</tr>
</tbody>
</table>

- Semesters have progression
  - First or third semester is prerequisite for the second semester

## Computer Mediated Activity

- Susanne Bødker
- Olav Bertelsen
- Eve Hoggan
- Roman Rädle

## Use, Design and Innovation

- Morten Kyng
Programming Languages

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Title</th>
<th>Credits</th>
<th>Instructors</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>Lars Birkedal, Aslan Askarov, Bas Spitters, Jaco van de Pol</td>
</tr>
<tr>
<td>3rd Sem (Fall)</td>
<td>Functional Programming (10 ECTS)</td>
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<td></td>
</tr>
</tbody>
</table>

- Semesters are independent – can be taken in any order

Programming Languages
- Anders Møller
- Magnus Madsen

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 Title</th>
<th>Credits</th>
<th>Instructor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Sem (Fall)</td>
<td>Building the Internet of Things with P2P and Cloud Computing (10 ECTS)</td>
<td>NOB</td>
<td></td>
</tr>
<tr>
<td>2nd Sem (Spring)</td>
<td>Augmented Reality (5 ECTS)</td>
<td>KG</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advanced Augmented Reality Project (5 ECTS)</td>
<td>KG</td>
<td></td>
</tr>
<tr>
<td>3rd Sem (Fall)</td>
<td>Advanced Data Management and Analysis (10 ECTS)</td>
<td>IA+PK</td>
<td></td>
</tr>
</tbody>
</table>

- Semesters are independent – can be taken in any order
- 3rd semester may be part of the Algorithmics specialization

### Ubiqitous Computing and Interaction

- Kaj Grønbæk
- Niels Olof Bouvin
- Marianne Graves Petersen
- Jo Vermeulen
- Hans-Jörg Schultz

### Data-intensive Systems

- Ira Assent
- Panagiotis Karras
- Davide Mottin
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>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Sem (Fall)</td>
<td>Algorithms in Bioinformatics (10 ECTS)</td>
<td>10</td>
<td>CSP</td>
</tr>
<tr>
<td>2nd Sem (Spring)</td>
<td>Genome-Scale Algorithms (10 ECTS)</td>
<td>10</td>
<td>CSP+TM</td>
</tr>
<tr>
<td>3rd Sem (Fall)</td>
<td>Advanced Programming in Bioinformatics (10 ECTS) OR Tree of Life (10 ECTS)</td>
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</tbody>
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### Statistics and Data

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
<th>Credits</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Sem (Fall)</td>
<td>Data Science in Bioinformatics (10 ECTS)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>2nd Sem (Spring)</td>
<td>Statistical and Machine Learning in Bioinformatics (10 ECTS)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>3rd Sem (Fall)</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 2018/19:

Fall
- Interdisciplinary Digital Entrepreneurship (10 ECTS)
- Machine Learning (10 ECTS) (bachelor course)

Fall & Spring:
- Project work in Computer Science (5 or 10 ECTS)

Summer
- (29 July - 16 August 2019): Identity and Privacy (5 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

Programme responsible:
- Gudmund Skovbjerg Frandsen
- Gerth Stølting Brodal